The Impact of Technological Distance on M&A Target Choice and Transaction Value

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Agenda

1. Introduction & Motivation
2. Hypotheses
3. Choice model
4. Data
5. Descriptives
6. Results & robustness checks
7. Conclusions

What is technological distance?

- I am interested in the technological distance **between firms**
- Other researchers use the terms technological relatedness, proximity or similarity
- **Conceptually**: The overlap of knowledge base between firms: e.g. methods of search, sources of knowledge, area of application, etc. (Breschi, Lissoni & Malerba, 2003)

  $\Rightarrow$ More overlap means less distance
- **Formally**: The length of technological space between two firms
- Typically **measured** using patent data, especially the classification (IPCs or USPTO) of patents into patent classes, subclasses, etc.
  - Firms are described as a vector in knowledge space, where the elements represent the share of a particular patent class for a particular firm

Measuring technological distance

	(1) Micro-economic foundations	(2) Own distance	(3) Symmetry	(4) Indepen-dence to scaling	(5) Robustness to the propensity to patent	(6) Same field patenting	(7) Accout for field relatedness	(8) Insensitivity to level of aggegation	(9) Indepen-dence of irrelevant fields	(10) Ease of calculation
Angular separation		✓	✓	✓		✓		✓		✓
Euclidean distance		✓	✓	✓		✓		✓		✓
Jaffe covariance	✓		✓	✓	✓	✓		✓	✓	✓
Pearson correlation		✓	✓	✓		✓		✓		✓
CRTA		✓	✓	✓		✓				✓
Min-complement		✓	✓	✓		✓		✓	✓	✓
Mahalanobis distance			✓	✓		✓	✓	✓		(✓)
Weighted angular separation		✓	✓	✓		✓	✓	✓		(✓)
Patent-to-patent angular separation	✓		✓	✓	✓	✓		✓		
Patent-to-patent textual distance	✓		✓	✓	✓	(✓)		*n/a*	*n/a*	

=> **Jaffe covariance has stronger microeconomic foundations (Bloom, Schankerman & van Reenen, 2013), no bias in small samples (->bootstrapping analysis) and satisfies the independence of irrelevant patent classes criterion (Bar & Leiponen, 2012)**

Impact of technological distance on innovation performance post M&A

- Ahuja and Katila (2001): innovation output (patents) post M&A is higher when there is an intermediate level of technological distance.

ABSORPTIVE CAPACITY ⟷ LEARNING / NOVELTY GAIN

- Subsequently confirmed by Cloodt, Hagedoorn and van Kranenburg (2006), Prabhu, Chandy and Ellis (2005) and Sears and Hoetker (2014).
- Alliance literature has also found that an intermediate level of relatedness is most conducive to innovation (Nooteboom, van Haverbeke, Duysters, Gilsing & van den Oord, 2007).

An intermediate level of technological distance is most conducive to post M&A innovation performance

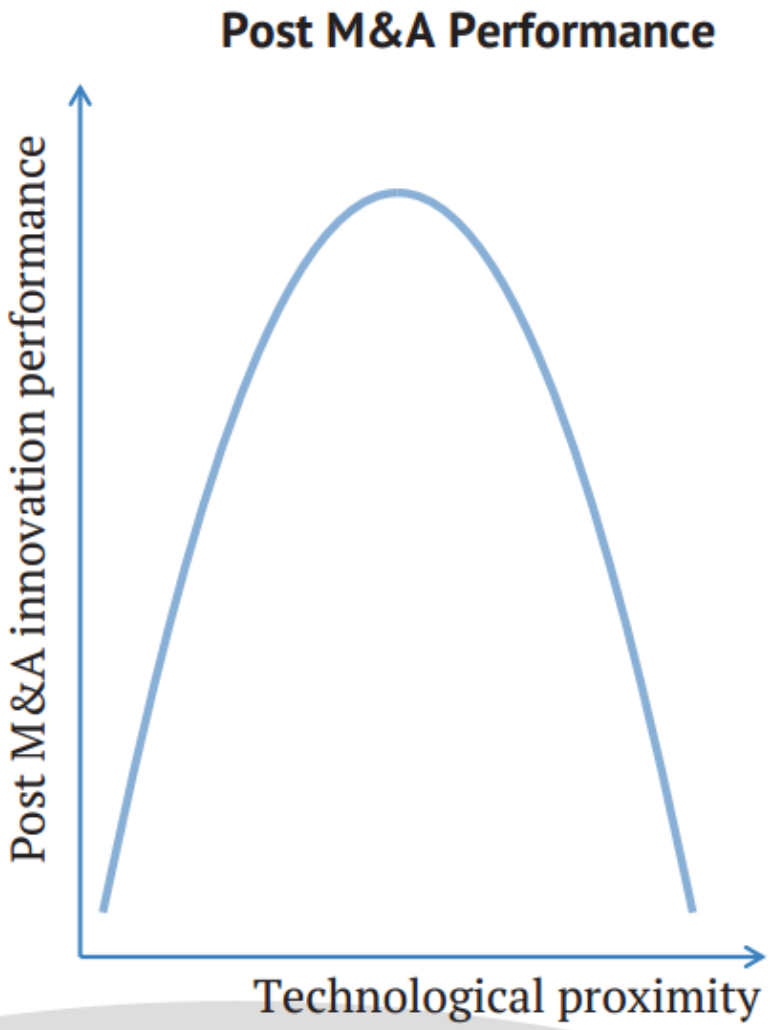
The impact of technological distance on M&A target choice and transactions values

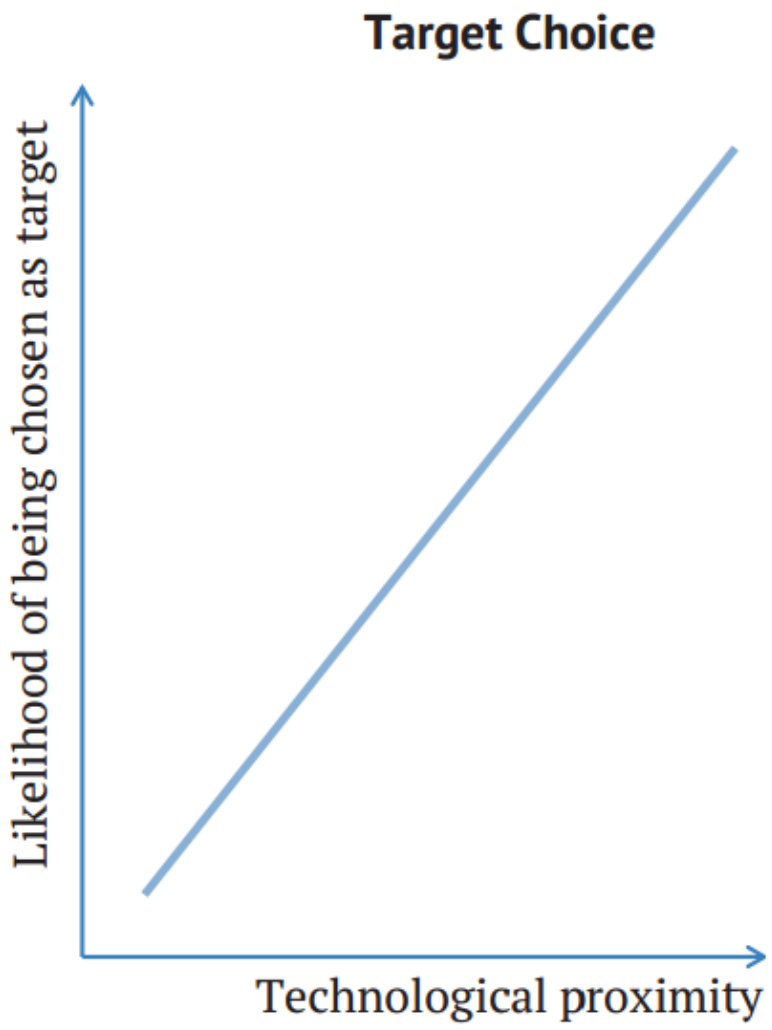
- Typically analyzed with a **binary choice model** estimated using conditional logit going back to Hall (1988).
  - Also used by AlAzzawi (2008); Bena & Li (in press); Frey & Hussinger (2006); Hussinger (2010).

  ⇒ Firms choose technologically close firms; no indication of curvilinear effect (sometimes not tested for)

Acquirers choose targets which are close to them in technology space

Post M&A Performance vs. Target Choice





Hypothesis 1

Hypothesis 1: Acquirers choose targets with an intermediate level of technological distance.

Advantages of Proximity

- **CURRENT ABSORPTIVE CAPACITY**
- **PATENT FENCE**
- **AVOIDING DUPLICATION**
- **LESS DISRUPTION**

Advantages of Distance

- **LEARNING/NOVELTY GAIN**
- **FUTURE ABSORPTIVE CAPACITY**
- **RISK REDUCTION**
- **CAN'T DEVELOP ITSELF**

- Cohen & Levinthal (1990): *"While common knowledge improves communication, commonality should not be carried so far that diversity across individuals is substantially diminished"* (p. 134).

- Consistency with post M&A innovation performance evidence

Hypothesis 2

Hypothesis 2: The transaction price is highest when the target and acquirer exhibit an intermediate level of technological distance.

- Barney (1988): Acquirers achieve abnormal returns when they can generate synergies with the target that other bidders cannot generate
- With many potential bidders, a higher price can be paid for a target if the value of the target to one firm is higher than the value to another firm, e.g. because of technological synergies (Adegbesan, 2009)

⇒ **Transaction price as a reflection of expected synergies**

⇒ **Same arguments as above**

Hypothesis 3

Hypothesis 3: The higher the product market (technological) distance between the acquirer and the target, the more will acquirers prefer firms which are close in technological (product market) space.

Acquiring companies which are distant in technology or product market space is associated with uncertainty and asymmetric information.

- When acquiring a company which is close in technology space, the acquirer can venture into new product markets
- When acquiring a company which is close in terms of product market, the acquirer can venture into new technology fields

Hall's (1988) model of target choice

- The decision of the acquirer which firm to buy
- The value of a firm is a function of its characteristics: $V(X_i) = V(X_1, X_2, X_3 \dots)$
- Denote j the acquirer, S the choice set and $V_j(X_i)$ the value increment to j from an acquisition , and P_i the price j has to pay for firm i
- An acquisition will take place under two conditions: $V_j(X_i) - P_i > V_j(X_k) - P_k \quad \forall (k \neq i) \in S$

$$V_j(X_i) - P_i \geq 0$$

- The probability that j acquires i is estimated using a conditional logit model:

$$P(j \text{ acquires } i|S) = \frac{\exp(f(X_i, X_j))}{\sum_{k \in S} \exp(f(X_k, X_j))}$$

- Net gain from is modeled as a function of the target characteristics, acquirer characteristics (<u>not measureable</u>!) and the relationship between the two

Choice set

- Each acquirer is given a choice of non-chosen firms in addition to the target
  a. Random sample of firms
  b. Matching based on identical 2-digit primary SIC (and size)

Data

- 538 M&A transactions in the time period 1985-2005
- Covering both public and VC financed firms
- Subsample of 380 firms for which financials are available
- Both target and acquirer must have filed for at least one patent in the five years prior to the transaction
- Sources: Thomson Reuters SDC for M&A transactions and VC financed firms; NBER Patent Data Project for US patents, Compustat for financials
- Aside: Determining the patent portfolio of company X at time T:
  - Name standardization (typos, parent company)
  - Dynamic reassignments for listed firms (reorganizations, M&A)
  - Name matching algorithm for private firms

Variables

- ***Dependent variable 1****:* Indicator function equal to one if a firm is acquired
- ***Dependent variable 2:*** Natural logarithm of the transaction price

Distances

- *Technological distance:* Angular separation or Jaffe covariance based on the 37 technology subcategories determined by Hall, Jaffe and Trajtenberg (2001)
- *Product market overlap:* Set to 0, 1, 2 or 3 depending on 4-,3- or 2-digit SICs overlap

Innovation metrics

- *Patent stock (ln):* Patent (successfully) applied for in the five calendar years prior to the transaction, depreciated by 15%
- *Patenting growth (ln):* Number of patent applied for in Y1+2+3 prior to the transaction relative to patent applied for in Y4+5+6 prior to the transaction.
- *Technological diversification:* Number equivalent entropy
- *R&D (ln)*

Financials

- *Assets (ln)*
- *Return on assets (RoA)*
- *Sales growth*

Descriptives

Acquiror Sector	Target Sector: Business Services	Instruments & Related Products	Electronic & Other Electric Equipment	Industrial Machinery & Equipment	Chemical & Allied Products	Other	SUM
Business Services	11.9%	0.6%	1.1%	1.3%	0.0%	0.2%	15.1%
Instruments & Related Products	1.5%	10.8%	2.0%	1.9%	0.7%	0.6%	17.5%
Electronic & Other Electric Equipment	1.3%	1.1%	11.0%	1.3%	0.0%	0.7%	15.4%
Industrial Machinery & Equipment	4.3%	0.9%	3.5%	7.2%	0.0%	0.7%	16.7%
Chemical & Allied Products	0.0%	3.5%	0.0%	0.2%	12.1%	3.2%	19.0%
Other	0.6%	0.9%	1.7%	2.0%	0.4%	10.8%	16.4%
SUM	19.5%	17.8%	19.3%	13.9%	13.2%	16.2%	100.0%

#	Sample *	Transactions	Strata	Choice set statistics: Size	Average	Median	Min.	Max.
1	Public & private, matched (SIC)	538	507	172,259	341	363	9	776
2	Public & private, random	538	507	244,841	484	484	473	495
3	Public, matched (SIC, size)	380	362	48,199	134	146	3	245
4	Public, random	380	362	65,336	182	190	35	256

* Matched refers the case where the choice set is constituted of firms in with the same 2-digit SIC code as the target and, in the case of public firms for which financials are available, where assets are not in excess of twice the acquirer's assets. Random refers to the case where the choice set is allocated randomly the acquirers.

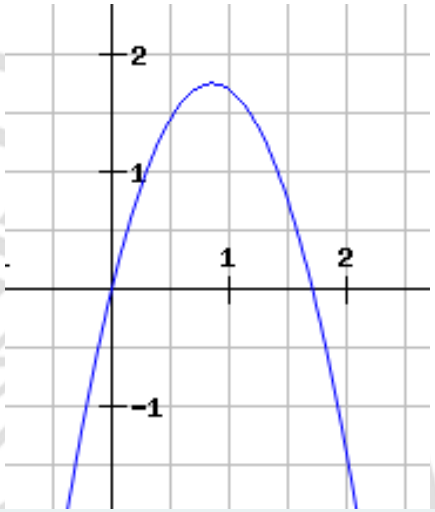
Choice model

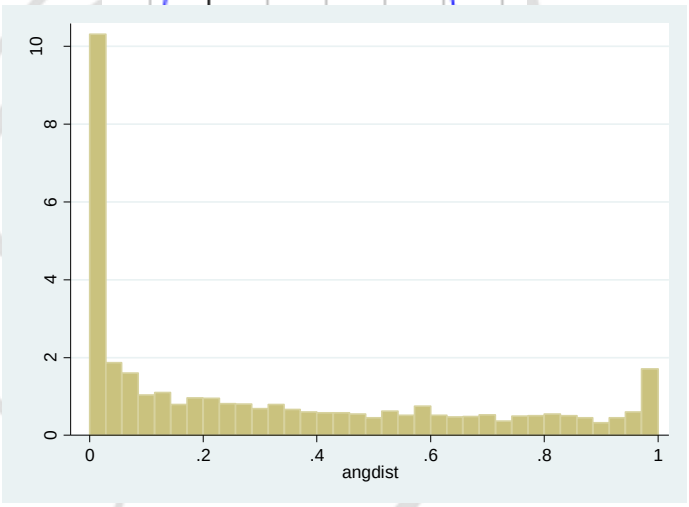
	Public & Private, matched (SIC)		Public & Private, random		Public, matched (SIC, size)		Public, random	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Angular separation	5.660***		6.874***		5.404***		7.145***	
	(0.610)		(0.580)		(0.755)		(0.707)	
(Angular separation)^2	-3.207***		-3.968***		-2.679***		-3.898***	
	(0.633)		(0.609)		(0.764)		(0.739)	
Jaffe covariance		8.990***		10.64***		9.143***		11.53***
		(0.613)		(0.614)		(0.781)		(0.781)
(Jaffe covariance)^2		-7.588***		-8.801***		-7.095***		-9.114***
		(0.747)		(0.775)		(0.896)		(0.975)
Product market overlap	1.065***	1.109***	1.006***	1.051***	1.020***	1.064***	0.867***	0.913***
	(0.107)	(0.107)	(0.0527)	(0.0528)	(0.127)	(0.126)	(0.0597)	(0.0605)
Size of patent portfolio (ln)	0.0844*	0.0720*	0.0894*	0.0751*	-0.175**	-0.169**	-0.152**	-0.154**
	(0.0369)	(0.0361)	(0.0358)	(0.0350)	(0.0580)	(0.0573)	(0.0561)	(0.0555)
Patenting growth	-0.119***	-0.117***	-0.132***	-0.130***	-0.157***	-0.155***	-0.161***	-0.159***
	(0.0261)	(0.0262)	(0.0271)	(0.0274)	(0.0382)	(0.0385)	(0.0390)	(0.0397)
Technological diversification	-0.113***	-0.0185	-0.116***	-0.00248	-0.121**	-0.0174	-0.126**	0.0104
	(0.0315)	(0.0274)	(0.0312)	(0.0264)	(0.0401)	(0.0360)	(0.0399)	(0.0346)
R&D productivity					0.0189	0.0161	0.00706	0.00391
					(0.0312)	(0.0314)	(0.0262)	(0.0268)
R&D expenditures (ln)					0.292**	0.282**	0.294***	0.284***
					(0.0937)	(0.0939)	(0.0847)	(0.0845)
R&D intensity					-0.202	-0.202	-0.751	-0.774
					(0.521)	(0.521)	(0.509)	(0.518)
Total assets (ln)					0.0641	0.0658	0.0137	0.0147
					(0.0828)	(0.0828)	(0.0743)	(0.0740)
Return on assets					-0.115	-0.101	-0.141	-0.136
					(0.190)	(0.191)	(0.189)	(0.193)
Sales growth					-0.0851	-0.0858	-0.0962	-0.0960
					(0.0495)	(0.0502)	(0.0559)	(0.0556)
N	172797	172797	245379	245379	48579	48579	65716	65716
Pseudo R^2	0.106	0.099	0.244	0.234	0.146	0.137	0.296	0.284

* p<0.05, ** p<0.01, *** p<0.001; numbers in parentheses are standard errors

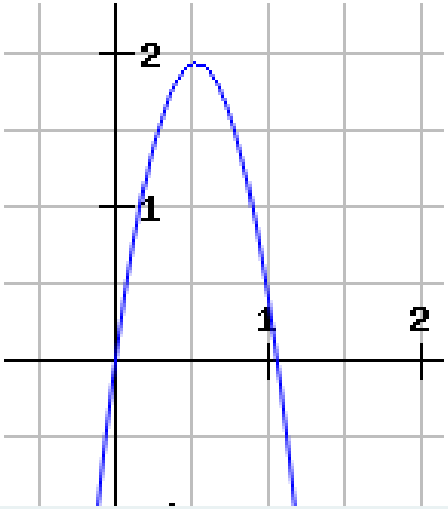
Inverted U-shape?

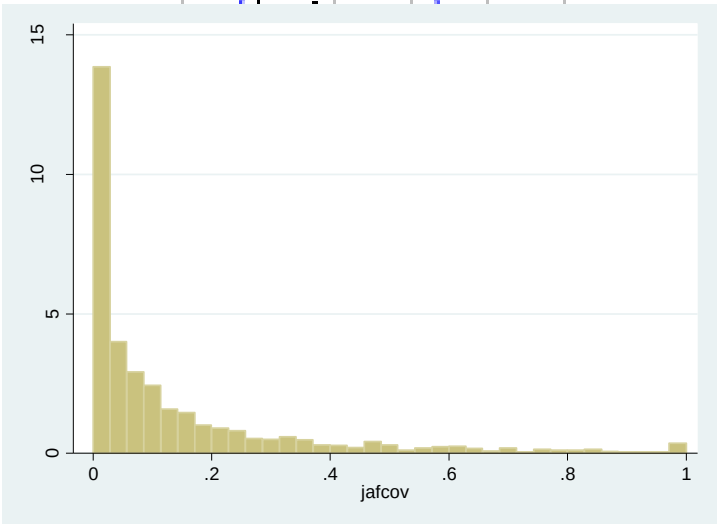
Angular separation





Jaffe covariance



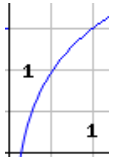
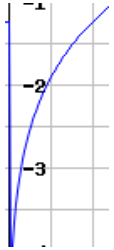
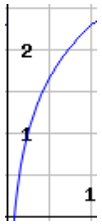
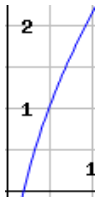


Dummy variable approach

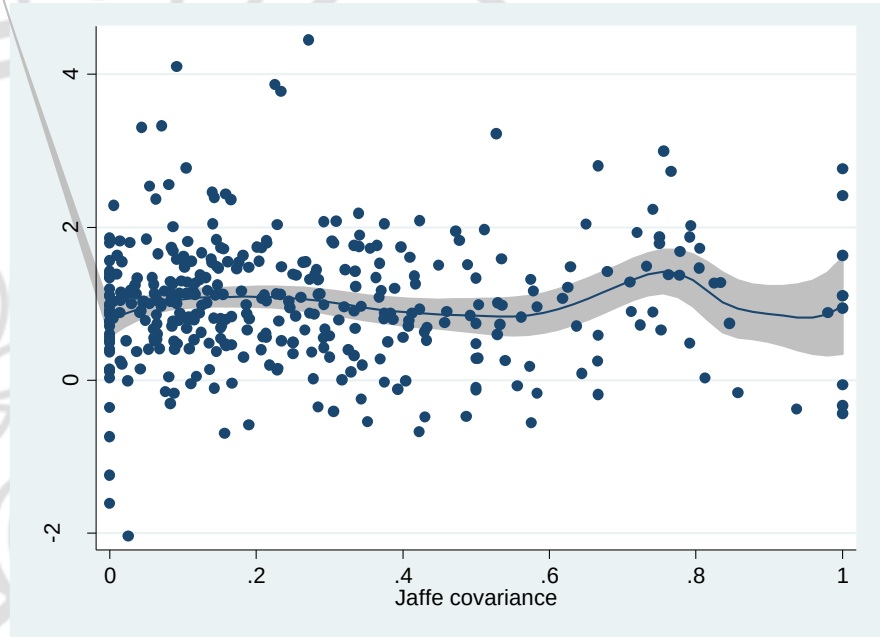
	Public & Private, matched (SIC)		Public & Private, random		Public, matched (SIC, size)		Public, random	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Angular separation 1st decile Dummy	-2.464***		-3.012***		-2.673***		-3.310***	
	(0.189)		(0.191)		(0.239)		(0.248)	
Angular separation 2nd decile Dummy	-1.700***		-1.935***		-1.827***		-2.045***	
	(0.243)		(0.237)		(0.282)		(0.280)	
Angular separation 3rd decile Dummy	-1.154***		-1.396***		-1.351***		-1.589***	
	(0.221)		(0.225)		(0.262)		(0.274)	
Angular separation 4th decile Dummy	-0.731**		-0.990***		-0.816**		-1.037***	
	(0.228)		(0.231)		(0.269)		(0.267)	
Angular separation 5th decile Dummy	-0.907***		-0.987***		-1.101***		-1.152***	
	(0.242)		(0.242)		(0.283)		(0.295)	
Angular separation 6th decile Dummy	-0.781***		-0.882***		-0.842**		-0.902**	
	(0.236)		(0.237)		(0.269)		(0.275)	
Angular separation 7th decile Dummy	-0.167		-0.337		-0.320		-0.406	
	(0.237)		(0.238)		(0.274)		(0.283)	
Angular separation 8th decile Dummy	-0.257		-0.311		-0.299		-0.292	
	(0.204)		(0.202)		(0.235)		(0.248)	
Angular separation 10th decile Dummy	0.0722		0.00117		0.0907		0.0622	
	(0.188)		(0.191)		(0.212)		(0.228)	
Jaffe covariance 1st decile Dummy		-2.108***		-2.640***		-2.737***		-3.370***
		(0.253)		(0.258)		(0.324)		(0.350)
Jaffe covariance 2nd decile Dummy		-0.910***		-1.138***		-1.489***		-1.722***
		(0.265)		(0.268)		(0.321)		(0.354)
Jaffe covariance 3rd decile Dummy		-0.293		-0.480		-0.866**		-0.957**
		(0.262)		(0.263)		(0.316)		(0.347)
Jaffe covariance 4th decile Dummy		0.0411		-0.0775		-0.541		-0.575
		(0.257)		(0.254)		(0.318)		(0.341)
Jaffe covariance 5th decile Dummy		0.105		0.0228		-0.495		-0.587
		(0.256)		(0.259)		(0.324)		(0.368)
Jaffe covariance 6th decile Dummy		0.00792		-0.0535		-0.269		-0.476
		(0.312)		(0.315)		(0.344)		(0.381)
Jaffe covariance 7th decile Dummy		-0.366		-0.448		-0.612		-0.687
		(0.359)		(0.345)		(0.406)		(0.415)
Jaffe covariance 9th decile Dummy		0.0573		0.193		-0.323		-0.160
		(0.388)		(0.374)		(0.497)		(0.491)
Jaffe covariance 10th decile Dummy		-0.121		-0.0817		-0.570		-0.612
		(0.574)		(0.588)		(0.790)		(0.861)
Product market distance	1.066***	1.109***	1.006***	1.055***	1.019***	1.059***	0.864***	0.911***
	(0.106)	(0.106)	(0.0526)	(0.0537)	(0.125)	(0.126)	(0.0598)	(0.0614)
Controls (Patent measures)		Yes		Yes		Yes		Yes
Controls (R&D metrics; financials)		No		No		Yes		Yes
N	172797	172797	245379	245379	48579	48579	65716	65716
Pseudo R^2	0.106	0.099	0.243	0.232	0.146	0.137	0.295	0.282

* p<0.05, ** p<0.01, *** p<0.001; numbers in parentheses are standard errors

Fractional polynomials

Sample / Measure	*Best specification*	*Graphical*
Sample: Public, matched (SIC, size) *Measure: Jaffe covariance (JC)*	*β_1 *(X^(-0.5)-2.64)+ β_2*(ln(X)+1.94)* *where X=JC+2.328*e^(-10)* *β_1=0.0002161 (t-stat: 8.47)* *β_2=0.7773188 (t-stat: 9.60)*	
Sample: Public, matched (SIC, size) *Measure: Angular separation (AS)*	*β_1 *(ln(X)-1.16)+ β_2*(ln(X)*ln(X) - 1.34)* *where X=AS+3.818*e^(-10)* *β_1=1.003695 (t-stat: 9.79)* *β_2=0.0494789 (t-stat: 8.58)*	
Sample: Public, random *Measure: Jaffe covariance (JC)*	*β_1 *(X^(-0.5)-3.49)+ β_2*(ln(X)+2.50)* *where X=JC+1.164*e^(-10)* *β_1=0.0001852 (t-stat: 9.07)* *β_2=0.9177666 (t-stat: 10.30)*	
Sample: Public, random *Measure: Angular separation (AS)*	*β_1 *(X^(0.5)-.436)* *where X=AS+7.451*e^(-9)* *β_1=3.817814 (t-stat: 14.27)*	

Hypothesis 2: Transaction values



Semiparametric regression with Jaffe covariance

	(1) lImpTV	(2) lImpTV
Angular separation	0.755	
	(0.540)	
(Angular separation)^2	-0.643	
	(0.520)	
Jaffe covariance		0.243
		(0.550)
(Jaffe covariance)^2		-0.121
		(0.617)
Product market overlap	0.0528	0.0482
	(0.0374)	(0.0373)
Size of patent portfolio (ln)	0.0229	0.0182
	(0.0571)	(0.0572)
Patenting growth	-0.0326	-0.0301
	(0.0272)	(0.0272)
Technological diversification	-0.0471	-0.0337
	(0.0359)	(0.0368)
R&D productivity	0.0431	0.0462
	(0.0293)	(0.0294)
R&D expenditures (ln)	0.0660	0.0659
	(0.0818)	(0.0819)
R&D intensity	2.049***	2.055***
	(0.574)	(0.576)
Total assets	0.886***	0.893***
	(0.0736)	(0.0738)
Return on assets	1.388***	1.394***
	(0.207)	(0.207)
Sales growth	0.222***	0.219***
	(0.0555)	(0.0557)
Industry dummies	Yes	Yes
Year dummies	Yes	Yes
Constant	-4.997***	-4.961***
	(0.362)	(0.366)
N	377	377
Adj. R-sq	0.802	0.802

* p<0.05, ** p<0.01, *** p<0.001; numbers in parentheses are standard errors

Hypothesis 3: Interaction effect

	Private & Public, matched (SIC)		Private & Public, random		Public, matched (SIC, size)		Public, random	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Angular separation	3.048***		3.956***		3.029***		4.130***	
	(0.218)		(0.169)		(0.274)		(0.215)	
Jaffe covariance		4.218***		5.021***		4.750***		5.738***
		(0.354)		(0.245)		(0.527)		(0.377)
Product market overlap	1.234***	1.349***	1.370***	1.350***	1.108***	1.312***	1.226***	1.222***
	(0.125)	(0.113)	(0.0681)	(0.0544)	(0.152)	(0.135)	(0.0858)	(0.0668)
Product market overlap * Angular separation	-0.301**		-0.667***		-0.151		-0.626***	
	(0.114)		(0.0944)		(0.155)		(0.128)	
Product market overlap * Jaffe covariance		-0.725***		-0.893***		-0.706**		-0.912***
		(0.152)		(0.101)		(0.235)		(0.149)
Controls (Patents)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls (Innovation & Financials)	No	No	No	No	Yes	Yes	Yes	Yes
N	172797	172797	245379	245379	48567	48567	65480	65480
Pseudo R^2	0.103	0.083	0.244	0.217	0.142	0.122	0.293	0.263

* p<0.05, ** p<0.01, *** p<0.001; numbers in parentheses are standard errors

Conclusion

- No robust evidence for inverted U-shape relationship between technological distance and the likelihood of being chosen as a target
- Rather, the relationship appears to be better represented by a flattening curve
- Importance of methodological rigor
- What may explain the apparent puzzle between post M&A performance and target choice?
  - Risk averse managers
  - Improving innovation *output* may not be the driver of the transactions. Acquirers may choose close firms if it generates economies of scale that outweigh the innovation output effect
  - Post M&A evidence has not been thoroughly tested (only linear and squared terms included, but also very little mass in declining part of the curve)

Thank you for your attention!

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APPENDIX

Technology as a motivation for M&A

- **Cost driven motivations** such as economies of scale or scope in R&D activities (Cassiman & Ueda, 2006), avoiding duplication (Comanor & Scherer, 2012)
- **Creating synergies** (Barney, 1988; Karim & Mitchell, 2000)
- **Strengthening core competencies and restructure existing competencies** (Frey & Hussinger, 2006)
- **Exploring and adapting to a changing environment:** overcoming the competency trap (Levitt & March, 1988) & core rigidities (Leonard-Barton, 1995)
- **Reducing the risk profile**
- **For "strategic" reasons** (Gans & Stern, 2000; Grimpe & Hussinger, 2008, 2013)
- **Obtaining access to valuable and scarce resources, e.g.** key inventors and engineers (Ranft & Lord, 2000) or key patents
- **Internalizing positive or negative knowledge spillovers** (Hart & Holmstrom, 2010; Marco & Rausser, 2011)
- **Providing the right incentives and organizational structure for innovation**

Ex ante vs. ex post

- Ex post impact is very interesting from a (merger) policy perspective, but…
  - Ex post analysis suffers from many confounding effects; the smaller the target relative to the acquirer, the more difficult it is to measure an impact
  - Ex post performance in terms of R&D is difficult to interpret
  - There are also endogeneity concerns, as the innovation outlook of the acquirer may impact the choice of technologically distant vs. close targets
  - Difficulties addressing timing and value aspects
- Ex ante investigation is much more amenable for empirical research
  - The model presented below takes endogeneity explicitly into account
  - Can determine the role of distance when a large firm acquires a small firm
  - Timing issues as in the above case do not arise
- Relationship between expected benefits/synergies and realized benefits/synergies
  - Managerial hubris (Roll, 1986) as well as empire building
  - Different focus: the chosen firms vs. the choice set

Descriptives

Descriptive statistics and correlation matrix (Public firms with choice set matchtched according to SIC and assets)

#	Variable	Sample	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Angular separation	48,579	0.29	0.33	1.00													
2	(Angular separtion)^2	48,579	0.19	0.30	0.96	1.00												
3	Jaffe covariance	48,579	0.14	0.21	0.89	0.92	1.00											
4	(Jaffe covariance)^2	48,579	0.06	0.16	0.70	0.80	0.93	1.00										
5	Product market overlap	48,579	1.10	1.07	0.27	0.29	0.32	0.29	1.00									
6	Size of patent portfolio (ln)	48,579	1.79	1.51	0.07	0.03	-0.07	-0.10	-0.04	1.00								
7	Patenting growth	48,579	2.02	2.06	0.01	0.01	0.00	-0.01	0.03	0.15	1.00							
8	Technological diversification	48,579	2.57	1.92	-0.01	-0.08	-0.19	-0.20	-0.10	0.68	-0.01	1.00						
9	R&D productivity	48,579	1.78	3.17	-0.06	-0.05	-0.05	-0.02	-0.05	0.12	-0.03	0.05	1.00					
10	R&D expenditures (ln)	48,579	2.18	1.68	0.14	0.09	0.03	-0.02	0.06	0.54	0.12	0.40	-0.54	1.00				
11	R&D intensity	48,579	0.15	0.18	0.13	0.14	0.16	0.14	0.13	-0.05	0.02	-0.15	-0.14	0.10	1.00			
12	Total assets (ln)	48,579	4.62	1.74	0.04	-0.01	-0.08	-0.11	-0.04	0.53	0.07	0.48	-0.31	0.78	-0.42	1.00		
13	Return on assets	48,579	-0.11	0.41	-0.10	-0.12	-0.14	-0.13	-0.10	0.13	0.00	0.18	-0.05	0.15	-0.69	0.47	1.00	
14	Sales growth	48,579	1.40	1.32	0.04	0.05	0.07	0.07	0.04	-0.04	0.15	-0.10	-0.02	0.00	0.06	-0.04	-0.12	1.00

Descriptive statistics and correlation matrix (Public transactions excluding choice set)

#	Variable	Sample	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Angular separation	380	0.56	0.34	1.00													
2	(Angular separtion)^2	380	0.43	0.36	0.97	1.00												
3	Jaffe covariance	380	0.27	0.25	0.81	0.85	1.00											
4	(Jaffe covariance)^2	380	0.14	0.22	0.64	0.72	0.95	1.00										
5	Product market overlap	380	1.40	1.29	0.28	0.30	0.27	0.24	1.00									
6	Size of patent portfolio (ln)	380	1.79	1.58	0.22	0.17	-0.09	-0.13	0.06	1.00								
7	Patenting growth	380	1.59	1.52	0.00	-0.01	0.00	-0.01	0.08	0.06	1.00							
8	Technological diversification	380	2.57	1.95	0.05	-0.02	-0.31	-0.32	0.03	0.72	-0.06	1.00						
9	R&D productivity	380	1.23	2.36	0.02	-0.01	-0.04	-0.06	-0.14	0.19	0.14	0.09	1.00					
10	R&D expenditures (ln)	380	2.59	1.57	0.17	0.15	-0.06	-0.11	0.16	0.55	-0.08	0.44	-0.46	1.00				
11	R&D intensity	380	0.15	0.17	0.15	0.19	0.26	0.25	0.08	-0.15	0.00	-0.23	-0.17	0.05	1.00			
12	Total assets (ln)	380	5.03	1.71	0.06	0.02	-0.22	-0.25	0.06	0.59	-0.08	0.56	-0.21	0.76	-0.48	1.00		
13	Return on assets	380	-0.08	0.38	-0.18	-0.21	-0.30	-0.29	-0.05	0.20	0.02	0.22	0.07	0.14	-0.79	0.50	1.00	
14	Sales growth	380	1.24	0.83	0.05	0.06	0.11	0.12	0.01	-0.02	0.26	-0.12	-0.04	0.01	0.12	-0.08	-0.14	1.00