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**Is the shopping spree of Chinese and Indian multinationals
good for their innovation output?
An empirical analysis on acquisitions
in Europe, Japan and the USA**

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Motivation

- Recent surge of FDI outflows from emerging countries taking the form of cross-border acquisitions (CBAs);
- Examples are: Tata which acquired Corus Steel, Tetley Tea and Jaguar Land Rover; Geely which has bought Volvo; Mahindra bought Pininfarina; ChemChina acquired Pirelli and Syngenta;
- **How do these acquisitions affect the innovation capacity of the acquiring emerging market multinational enterprises (EMNEs)?**

Shopping spree		
ChemChina's confirmed and possible foreign purchases		
Company (country)	Business area	Status
Adisseo (France)	Animal-feed ingredients	Bought 2006
Parts of Rhodia (France)	Organic silicon/sulphide	Bought 2006
Qenos (Australia)	Plastics	Bought 2006
ADAMA Agricultural Solutions* (Israel)	Agrichemicals	Bought 2011
Elkem (Norway)	Silicon	Bought 2011
Pirelli (Italy)	Tyres	Purchase agreed 2015
Syngenta (Switzerland)	Agrichemicals	Reported takeover approach 2015
Mercuria (Switzerland)	Oil trader	Reported to be seeking stake, 2015
KraussMaffei (Germany)	Industrial machinery	Joint bid, with other Chinese investors, 2016
Source: The Economist		*Formerly known as Makhteshim Agan

Economist.com

Aim of the study

- Do EMNEs benefit – in terms of their innovative output – from their acquisitions in advanced economies?
- What are the factors moderating this impact?
 - Focus on the acquisitions of EU28, Japanese and US companies (466 deals) made by 301 Chinese and Indian multinationals in the period 2003-2011;
 - Focus on post acquisition innovation, by measuring the patent outputs of the acquiring EMNEs.

Background literature on CBAs and innovation

- Mainly focused on advanced economies;
- Theory and evidence point at both positive and negative impacts:
 - **Positive impact:** complementarity of knowledge (Makri et al, SMJ 2010) and economies of scale and scope in R&D processes (Valentini, SMJ 2012);
 - **Negative impact:** costs of integration and reduced motivations of R&D personnel (Colombo and Rabbiosi, RP 2014);
- Factors playing a role on the innovative outcome of acquisitions:
 - **Absolute (and relative) knowledge base of the target** (Ahuja and Katila, 2001; Cloudt, Hagedoorn, and Van Kranenburg, 2006);
 - **Institutional distance between the target and the acquirer** (Cloudt et al, 2006; Björkman, Stahl, and Vaara, 2007);
 - **Past investment experience of the acquirer.**

EMNEs investing in the North

- Investments in the 'North' for “strategic asset seeking” motivations;
- Some recent studies on the impact of FDI on EMNEs economic performance (Cozza, Rabelloiti & Sanfilippo, CER 2015; Chen and Tang, ADR 2014; Edamura et al, CER 2014 and with a focus on acquisitions Buckley et al, JWB 2014; Lebedev et al, JWB 2015; Nicholson and Salaber, IBR 2013);
- Few case studies investigate the impact on EMNEs innovation capacity (Bonaglia et al, JWB 2007; Duysters et al, IIC 2009; Awate et al, GSJ 2012; Hansen et al, JEG 2014; Kedron and Bagchi-Sen, JEG 2012).

Our hypotheses (1)

- **Liability of emergingness** (LOE) (Madhok & Kayhani, 2012; Ramachandran & Pant, 2001) and social status theory:
 - The **more innovative acquired firms** perceive a stronger distance from their acquiring companies and they are likely to resist more to EMNEs sourcing of knowledge
 - Hypothesis 1: All else constant, the more innovative the acquired firm, the less innovative the acquiring EMNE after the deal.*
 - In the **more innovative regions** the EMNEs opportunity to tap into the local knowledge is affected by a possible **disruption of the pre-existing networks**
 - Hypothesis 2: All else constant, the more innovative the target region, the less innovative the acquiring EMNE after the deal.*

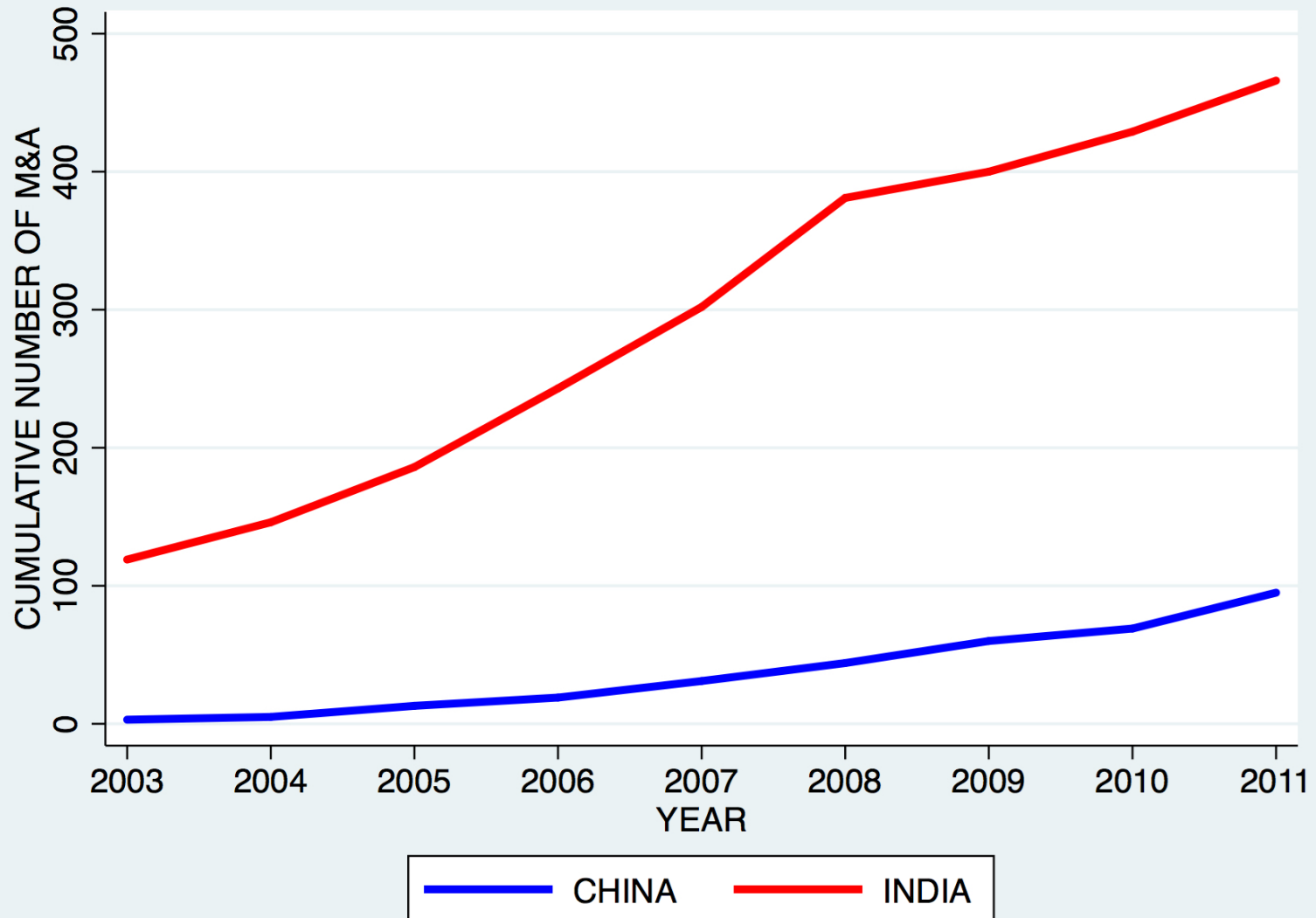
Our hypotheses (2)

- EMNEs' knowledge base prior to the acquisition acts as a moderating factor: a) it enhances the EMNE absorptive capacity of local knowledge and b) it signals about EMNEs' capabilities, contributing to reduce LOE.
 - *Hypothesis 3: All else constant, the relationship between the innovativeness of the acquired firm and the post-deal innovation output of the acquiring EMNE is positively moderated by the acquiring EMNE's knowledge base;*
 - *Hypothesis 4: All else constant, the relationship between the innovativeness of the target region and the post-deal innovation output of the acquiring EMNE is positively moderated by the acquiring EMNE's knowledge base.*

Data

- All completed majority stake cross-border acquisitions by Indian and Chinese MNEs in EU27, Japan and USA from 2003 to 2011: 466 deals;
- The data sources are Zephyr and SDC Platinum (28% of the acquisitions are only reported in Zephyr and 31% are only in SDC Platinum);
- Medium and high-tech sectors (Ahuja and Katila, 2001; Cloudt, Hagedoorn, and Van Kranenburg, 2006; Valentini and Di Guardo, 2012).

Time evolution of CBAs



Sectoral and geographical distribution

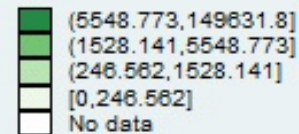
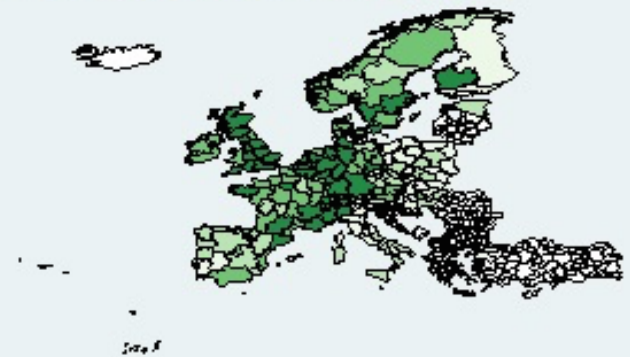
	Total #	Manufacturing*	Services*	Host countries #
China	95 (20.4)	59 (28.2)	36 (14.0)	30 USA 20 Germany 9 France 9 Japan
India	371 (79.6)	150 (71.8)	221 (86.0)	176 USA 78 UK 32 Germany
Total	466 (100)	209 (100)	257 (100)	

EU REGIONS

N. of Chinese and Indian M&As to Europe

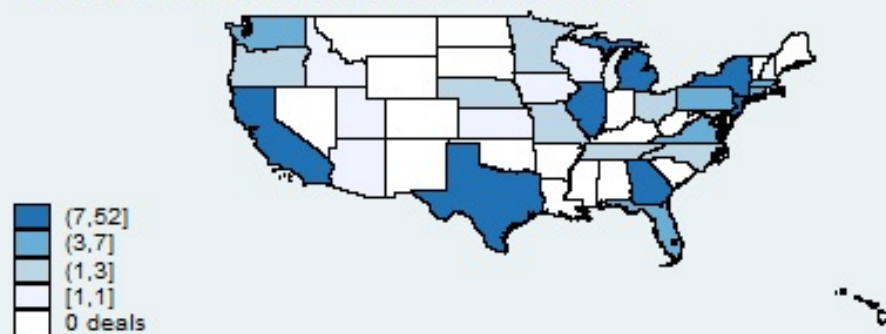


PCT patents in European regions

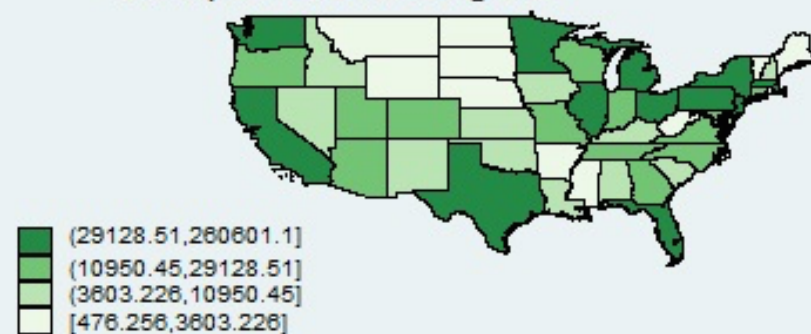


US REGIONS

N. of Chinese and Indian M&As in US

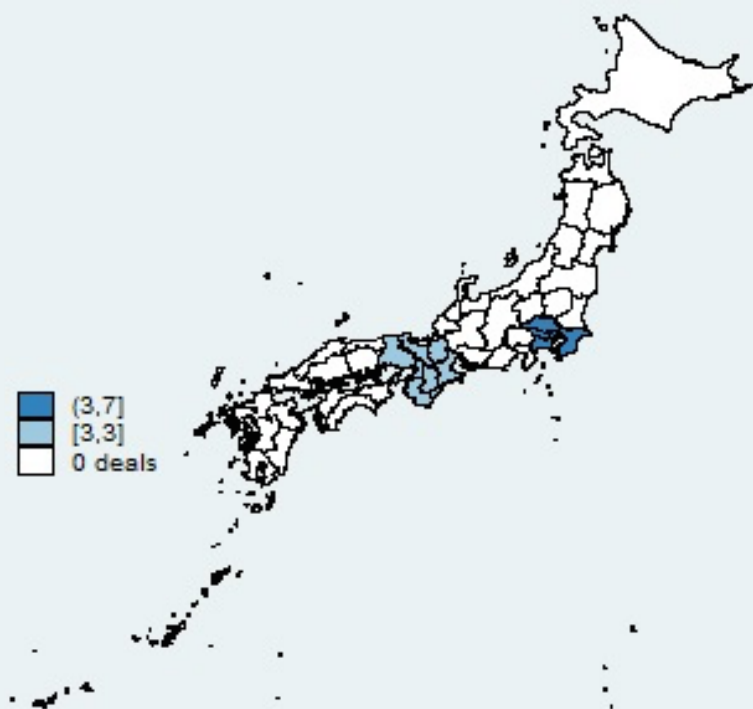


PCT patents in US regions

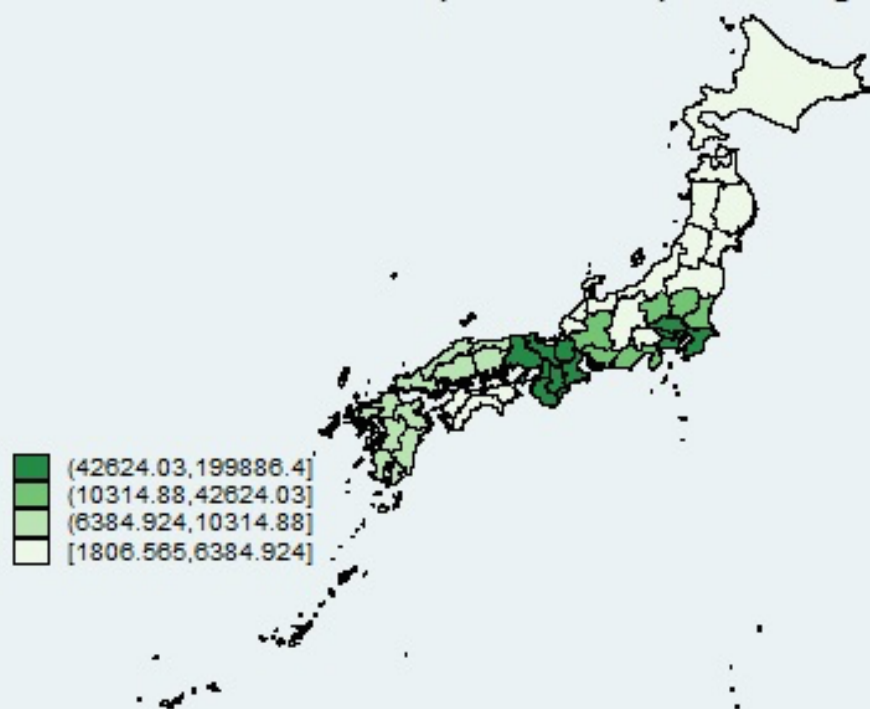


JAPANESE REGIONS

N. of Chinese and Indian M&As in Japan



PCT patents in Japanese regions



Dependent Variable

- **EMNE_POST_INNOV**: # of INPADOC (International Patent Documentation) families filed by the acquirers at any patent office in the **3 years after the acquisition** (EPO-PATSTAT Database and ORBIS);
- INPADOC families: group of patents covering the same invention in different legislations with the same priority dates;
 - Easier to compare the innovative performance of firms of different nationality;
- Robustness check: # of USPTO patents.

Main independent variables

- **TARGET_FIRM_INNOV**: # of INPADOC families of the target company filed in the **5 years before the acquisition (HYPOTHESIS 1)**
- **TARGET_REGION_INNOV**: Log of the cumulated # of PCT patents per capita in the region (TL2) where the target company is located in the **5 years before the acquisition (HYPOTHESIS 2)**;
- **EMNE_KB**: # of INPADOC families of the acquired company filed **in the 5 years before the acquisition** augmented with the number of their cited patents (**HYPOTHESES 3 & 4**).

Control variables

- ***FDI_EXPERIENCE***: cumulative # of majority acquisitions and greenfield of the acquirer before the deal;
- ***HORIZONTAL_MA***: dummy equal to 1 when the acquisition is horizontal (both the target and the acquirer belong to the same SIC 2 digit);
- ***INSTITUTIONAL_DIST***: indicator of cross-country distance (Berry, Guillen, and Zhou, 2010);
- ***SIZE***: dummy equal to 1 if the acquirer is classified “small” or “medium” size by the ORBIS database;
- ***CHINA; JP; US*** dummy equal to 1 if the acquirer is Chinese, Japanese or from United States;
- YEAR DUMMY and macro-sector fixed effects.

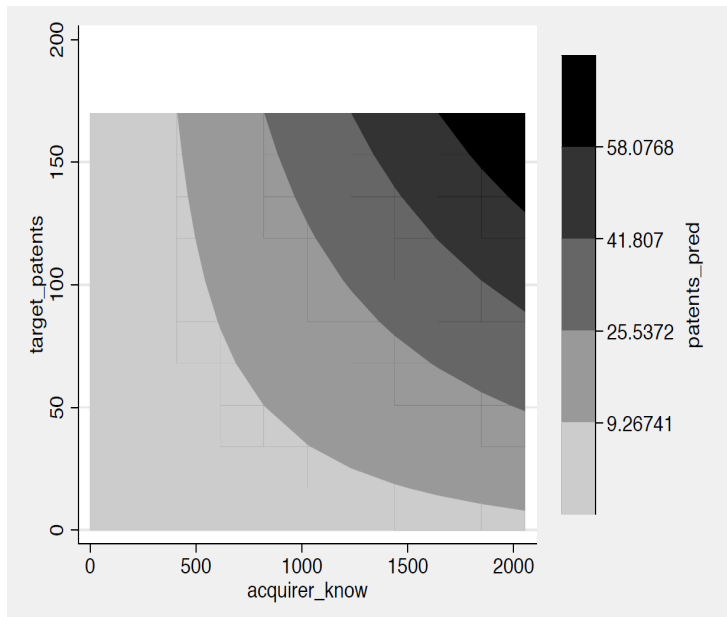
Estimation method

- Poisson Quasi Maximum Likelihood estimation with industry fixed effects at NACE 1 digit;
- Robustness checks:
 - Control for the possibility that patenting & acquiring might not be not independent (Valentini and Di Guardo, 2012) with a **two-stage count model with sample selection** adding an auxiliary equation controlling for the probability to undertake an international acquisition (Bratti and Miranda, 2011);
 - **Zero-inflated Poisson regressions** due to the high number of zeros (Hu and Jefferson, 2009).

	Controls	Full Models				Full Model with Interactions	
Models	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CHINA	1.8289*** (0.1373)	1.8338*** (0.1439)	1.8947*** (0.1593)	1.9020*** (0.1652)	2.2340*** (0.6007)	2.2692*** (0.5849)	2.3066*** (0.6726)
JP	-1.1888** (0.4124)	-0.9756* (0.4525)	-1.1076** (0.4248)	-0.8944* (0.4484)	-0.4668 (0.3598)	-0.4301 (0.4077)	-0.4558 (0.3917)
US	-0.0760 (0.5765)	-0.0810 (0.5866)	0.0088 (0.5961)	0.0095 (0.6055)	0.1737 (0.2143)	0.1179 (0.2501)	0.1236 (0.2272)
FDI_EXPERIENCE	0.2571*** (0.0301)	0.2520*** (0.0299)	0.2567*** (0.0363)	0.2513*** (0.0359)	0.0528* (0.0249)	0.0732*** (0.0174)	0.0734* (0.0298)
INSTITUTIONAL_DIST	-0.0466 (0.0297)	-0.0468 (0.0303)	-0.0457 (0.0358)	-0.0463 (0.0364)	-0.0245*** (0.0021)	-0.0273*** (0.0022)	-0.0196*** (0.0024)
HORIZONTAL_MA	0.9832 (0.5683)	1.0080 (0.5778)	0.6660 (0.5622)	0.6884 (0.5697)	0.8056* (0.3417)	0.8129* (0.3506)	0.8765** (0.3273)
SIZE	-3.0603*** (0.8490)	-3.0647*** (0.8546)	-3.0894*** (0.8352)	-3.0966*** (0.8412)	-3.1112*** (0.8134)	-3.0998*** (0.8218)	-3.0932*** (0.8411)
TARGET_FIRM_INNOV		-0.0336*** (0.0063)		-0.0351*** (0.0087)	-0.0200*** (0.0037)	-0.0405*** (0.0058)	-0.0167*** (0.0025)
TARGET_REGION_INNOV			-0.0421 (0.0322)	-0.0342 (0.0334)	-0.0160 (0.0367)	-0.0175 (0.0404)	-0.0822** (0.0305)
EMNE_KB					0.0030*** (0.0003)	0.0030*** (0.0003)	-0.0047 (0.0027)
EMNE_KB * TARGET_FIRM_INNOV						0.0002*** (0.0001)	
EMNE_KB * TARGET_REGION_INNOV							0.0010** (0.0004)
YEAR DUMMY	YES	YES	YES	YES	YES	YES	YES
OBSERVATIONS	442	442	428	428	428	428	428
LOG LIKELIHOOD	-9.0e+03	-9.0e+03	-8.8e+03	-8.8e+03	-5.8e+03	-5.7e+03	-5.4e+03

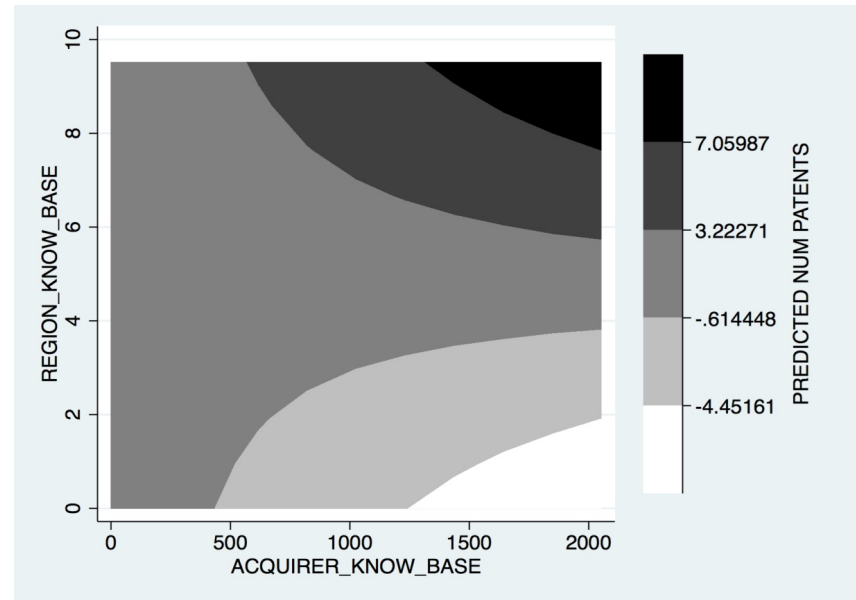
Hypothesis 3:

EMNE_KB*TARGET_FIRM_INNOV



Hypothesis 4:

EMNE_KB*TARGET_REGION_INNOV



Conclusions

- Acquisitions are not a quick fix for EMNEs' lack of technological capabilities at home;
- LOE does impact on EMNEs' capacity to fully take advantage of the knowledge available at the acquired companies and at the destination regions;
- There is **heterogeneity among EMNES**: only more innovative EMNEs are able to take advantage of their acquisitions in EU27, Japan and US;
- Therefore, acquisitions need to be at the same time **knowledge augmenting** (i.e. adding novel technological skills and building up new innovative capabilities) as well as **knowledge exploiting** (i.e. exploiting and building upon existing knowledge).

Policy implications

- **Emerging countries** need to invest in building up domestic innovation capabilities (not only production capabilities) via different channels;
- **Advanced countries** should try to minimize the probability of predatory behaviors and attract investors interested in embedding in the local contexts where their acquired companies are located (Giuliani et al, 2014).

Thank you

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Descriptive statistics

VARIABLES	N	Mean	Std. Dev.	Min	Max
<i>Continuous variables</i>					
<i>EMNE_POST_INNOV</i>	466	14.223	63.459	0	691
<i>TARGET_FIRM_INNOV</i>	466	211.700	4206.825	0	90811
<i>TARGET_REGION_INNOV</i>	452	7.708	1.346	0	9.530
<i>EMNE_KB</i>	466	59.341	217.683	0	2053
<i>FDI_EXPERIENCE</i>	466	2.352	2.492	0	18
<i>INSTITUTIONAL_DIST</i>	466	19.803	7.489	1.300	38.182
<i>Categorical/dummy variables</i>			Frequency (%)		
<i>CHINA</i>	466		20.39		
<i>JP</i>	466		2.36		
<i>US</i>	466		44.21		
<i>HORIZONTAL_MA</i>	466		19.53		
<i>SIZE</i>	466		43.78		

ROBUSTNESS CHECK 1: ZERO-INFLATED MODEL

	Dep. Var.: N. of INPADOC PATENTS		
	<i>Full model</i>		
<i>CHINA</i>	1.7256*** (0.0373)	1.6687*** (0.0376)	1.7257*** (0.0373)
<i>JP</i>	0.3372*** (0.0895)	0.3666*** (0.0896)	0.3378*** (0.0901)
<i>US</i>	0.0281 (0.0514)	-0.0248 (0.0512)	0.0278 (0.0516)
<i>FDI_EXPERIENCE</i>	-0.0477*** (0.0060)	-0.0448*** (0.0060)	-0.0477*** (0.0060)
<i>INSTITUTIONAL_DIST</i>	0.0202*** (0.0033)	0.0288*** (0.0034)	0.0202*** (0.0033)
<i>HORIZONTAL_MA</i>	0.1278 (0.0668)	0.1772** (0.0669)	0.1278 (0.0668)
<i>MANUFACTURING</i>	0.1337*** (0.0315)	0.2946*** (0.0354)	0.1336*** (0.0315)
<i>SIZE</i>	-1.4936*** (0.1431)	-1.3956*** (0.1433)	-1.4937*** (0.1431)
<i>PRE_2008</i>	-0.3556*** (0.0331)	-0.3409*** (0.0332)	-0.3558*** (0.0332)
<i>TARGET_FIRM_INNOV</i>	-0.0442*** (0.0039)	-0.0426*** (0.0038)	-0.0443*** (0.0046)
<i>TARGET_REGION_INNOV</i>	-0.0866*** (0.0096)	-0.1350*** (0.0101)	-0.0866*** (0.0096)
<i>EMNE_KB</i>	0.0018*** (0.0000)	0.0000 (0.0002)	0.0018*** (0.0000)
<i>EMNE_KB * TARGET_REGION_INNOV</i>		0.0002*** (0.0000)	
<i>EMNE_KB * TARGET_FIRM_INNOV</i>			0.0001 (0.0001)
<i>CONSTANT</i>	3.1800*** (0.1159)	3.2607*** (0.1138)	3.1801*** (0.1159)
Observations	452	452	452
ll	-4.2e+03	-4.1e+03	-4.2e+03

Legend: *<0.05, **<0.01, ***<0.001. Standard errors are reported below coefficients. In the Zero-Inflated Poisson test, the inflate equation includes origin country dummy, sector dummies, acquirer knowledge base and acquirer size.

ROBUSTNESS CHECK 2: ENDOGENOUS SAMPLE SELECTION

	Dep. Var.: N. of INPADOC PATENTS		
	Full model		
CHINA	1.3748***	1.7596***	1.7632***
	(0.0501)	(0.0529)	(0.0526)
JP	-1.2048***	-0.2178*	-0.1365
	(0.0867)	(0.0906)	(0.0883)
US	1.0313***	0.7661***	0.3641***
	(0.0827)	(0.0753)	(0.0789)
FDI_EXPERIENCE	-0.1105***	-0.0696***	-0.0298***
	(0.0068)	(0.0068)	(0.0067)
INSTITUTIONAL_DIST	-0.1165***	-0.0800***	-0.0865***
	(0.0047)	(0.0047)	(0.0048)
HORIZONTAL_MA	0.5180***	-0.2335**	0.1606
	(0.0816)	(0.0803)	(0.0895)
MANUFACTURING	-0.6198***	-0.0720	-0.4600***
	(0.0532)	(0.0519)	(0.0522)
LOG_OPERATING_REV	0.7003***	0.5877***	0.6199***
	(0.0120)	(0.0112)	(0.0118)
PRE_2008	0.2274***	0.4677***	0.3118***
	(0.0389)	(0.0388)	(0.0400)
TARGET_FIRM_INNOV	-0.0101**	-0.0345***	-0.0690***
	(0.0033)	(0.0030)	(0.0038)
TARGET_REGION_INNOV	-0.2671***	-0.2095***	-0.3726***
	(0.0146)	(0.0149)	(0.0152)
EMNE_KB	0.0040***	-0.0032***	0.0034***
	(0.0001)	(0.0002)	(0.0001)
EMNE_KB * TARGET_REGION_INNOV		0.0009***	
		(0.0000)	
EMNE_KB * TARGET_FIRM_INNOV			0.0004***
			(0.0000)
CONSTANT	-5.1737***	-4.1472***	-3.4584***
	(0.1959)	(0.1901)	(0.2135)
Observations	2438	2438	2438
ll	-1.3e+03	-1.3e+03	-1.3e+03
Legend: *<0.05, **<0.01, ***<0.001. Standard errors are reported below coefficients. In the two-stage test, the selection equation includes revenues, solvency capability, acquirer knowledge base, manufacturing sector dummy and origin country dummy.			