

The European Commission's science and knowledge service

Joint Research Centre



Determinants of the location of FDI in R&D across time, industry and regions

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INNOVA Measure Workshop: Innovation, high-growth and internationalization of R&D
28/11/2017, Brussels

Outline

General interest in getting a better understanding of determinants and consequences of the internationalization of R&D.

Today presentation focuses on two studies:



i) one (completed) study with Dániel Vertesy on the **determinants of FDI in R&D to European NUTS-2 regions**, and

ii) one (ongoing) study with Davide Castellani and Dániel Vertesy on the **global competition for attracting FDI in R&D**



The object (of the completed study)



Mechanisms and factors that influence MNEs choice about where to make FDI in R&D

In particular, tests for the presence of possible shifts in location determinants:

- i) **after the economic crisis**, which made a significant impact on global FDI flows causing a steep decline and a slow recovery, and
- ii) **across sectors of economic activity**, which is of interest for public authorities to design policies tailored to the features of their innovation system.

The argument

Differences in the relative importance of location factors reveal differences in the purpose for making an investment. **Two purposes** for FDI in R&D in the literature:

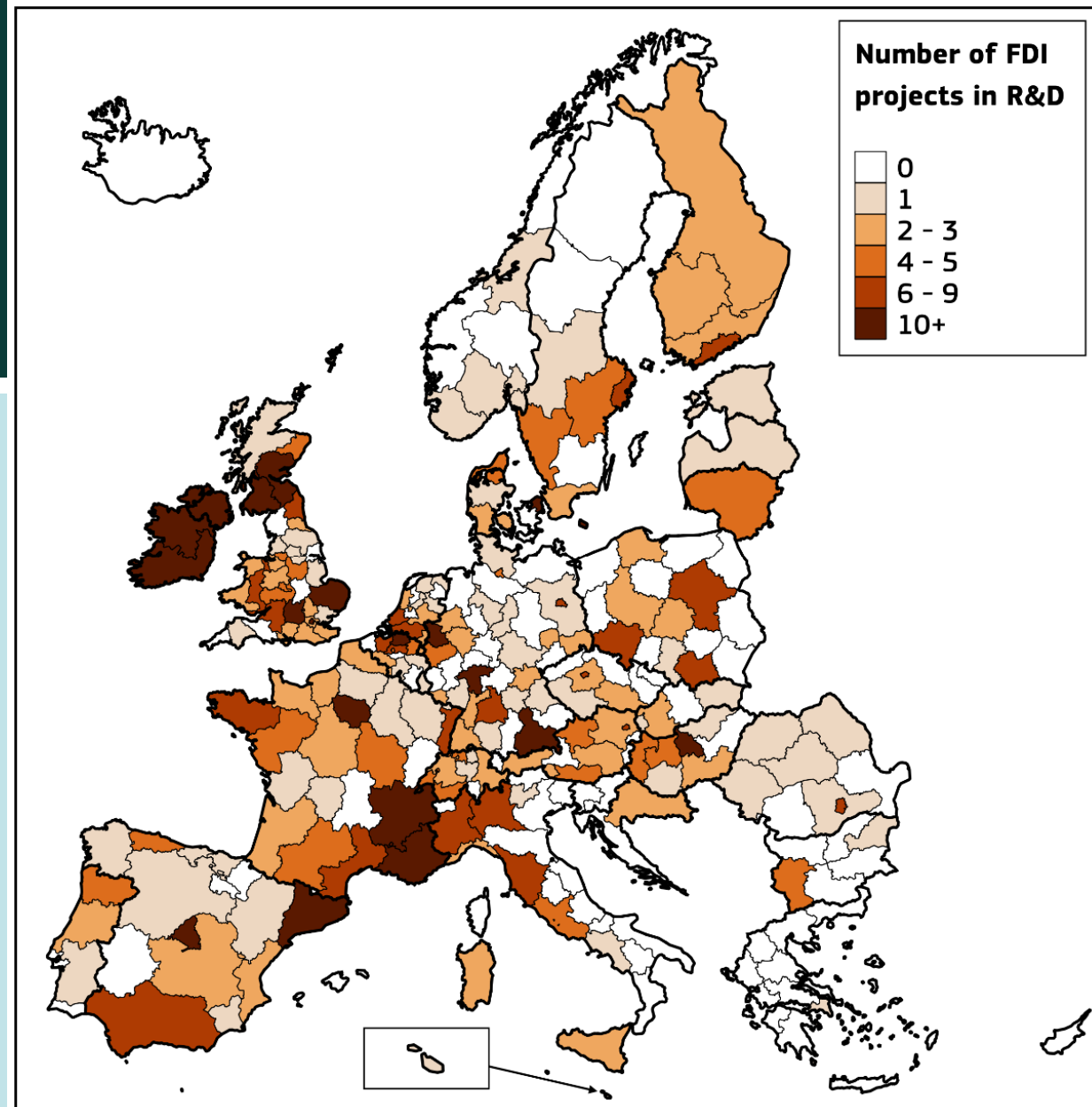
- **Home-base exploitation**: adapting existing product to foreign markets
- **Home-base augmenting**: absorbing foreign knowledge from destination regions

We assess to what extent:

- ✓ The purpose for FDI in R&D varies across time: **increase in uncertainty after crisis may imply increase in the importance of determinants such as the size of destination market (related to safer FDI) with respect to knowledge absorption ones (related to riskier FDI)**
- ✓ The purpose for FDI in R&D varies across industries: **differences in the relative importance of location factors can reveal whether a certain purpose is more widespread in a certain industry**

The analysis

- draws on data on cross-country FDI in R&D projects from the **fDi Markets database** (Financial Times),
combined with
data on a broad variety of potential determinants of R&D location decisions from **various sources** (Eurostat, OECD, CEPII, Scopus)
- uses **mixed logit models**



The sample

Table 1 Inward FDI in R&D to European regions, 2003–14

	Total	Timing		ICT services	Pharmaceutical	Industry Computer, electronic and optical manufacture	Other manufacture
		Before crisis	After crisis				
Number of FDI	784	414	370	120	267	116	281
Number of yearly FDI	65.3	82.8	52.9	10.0	22.3	9.7	23.4
Distribution of FDI across European regions							
Average number of FDI per region	3.38	1.78	1.59	0.52	1.15	0.50	1.21
p25	0	0	0	0	0	0	0
p50	1	1	0	0	0	0	0
p75	4	2	2	0	1	0	2
p90	8	5	4	1	3	2	3
p95	16	8	8	3	7	3	4
p99	28	12	16	6	12	5	10
Max	64	35	29	18	21	11	20
Number of MNEs	517	300	277	74	164	76	222
Average number of FDI per MNE	1.52	1.38	1.34	1.62	1.63	1.53	1.27

Key findings

- Benchmark (all projects pooled):
 - the effects of potential determinants show the **expected sign** & are in most cases **statistically significant**
- Across time:
 - **stable** attractive effect of **market size**
 - **knowledge absorption** effects more **varied**:
 - **stable** attracting effects of **R&D expenditure** intensity and **technological strength**
 - **academic strength** and **agglomeration economies** of host regions **cease to be significant after the crisis's occurrence**
 - **stable** effects of **institutional factors** typically, but **fiscal policy** that ceases to influence location choices after the crisis

Table 2 Estimation results of mixed logit models on determinants of the location choice of

	Benchmark	Timing	
		Before crisis	After crisis
Real GDP (in log)	0.857*** (0.086)	0.769*** (0.117)	0.907*** (0.121)
R&D expenditure as % of GDP	0.212*** (0.042)	0.266*** (0.064)	0.158*** (0.057)
Number of establishments (in log)	0.229*** (0.065)	0.294*** (0.085)	0.147 (0.095)
Technological strength	0.167*** (0.020)	0.133*** (0.031)	0.224*** (0.025)
Academic strength	0.129** (0.052)	0.199*** (0.061)	0.068 (0.082)
Technological concentration	-0.906 (0.702)	-0.710 (0.788)	-1.389** (0.659)
Total <u>labour</u> costs per employee (in log)	-0.380** (0.162)	-0.338 (0.211)	-0.246 (0.319)
Scientists and engineers as % of population	0.024 (0.039)	-0.022 (0.054)	0.062 (0.056)
Strictness of employment protection	-0.645*** (0.167)	-0.535** (0.227)	-1.088** (0.261)
Regulatory restrictiveness	-1.091*** (0.286)	-0.951*** (0.343)	-1.686*** (0.593)
Corporate tax rate	-0.039*** (0.014)	-0.047** (0.020)	0.008 (0.028)
R&D tax incentives	2.260*** (0.796)	6.312** (2.668)	-0.512 (1.242)
Geographic distance (in log)	-0.454*** (0.156)	-0.300 (0.198)	-0.446* (0.234)
Common language	0.593** (0.233)	0.233 (0.343)	1.136*** (0.274)

Key findings

➤ Across industries:

- The attractive effect of **market size** is present in all industries, but **particularly large in the ICT services**
- Factors related to **knowledge absorption** are present in **manufacture industries**, not in the ICT services industry
- As for **institutional determinants**, **differences** across industries **are** even more **striking** than differences across time

	Benchmark	Industry			
		ICT services	Pharmaceutical	Computer, electronic and optical manufacture	Other manufacture
Real GDP (in log)	0.857*** (0.086)	2.041*** (0.398)	0.392** (0.161)	0.950*** (0.219)	0.842*** (0.136)
R&D expenditure as % of GDP	0.212*** (0.042)	0.222* (0.120)	0.078 (0.066)	0.364*** (0.087)	0.133* (0.068)
Number of establishments (in log)	0.229*** (0.065)	-0.507* (0.281)	0.507*** (0.132)	0.130 (0.129)	0.173* (0.102)
Technological strength	0.167*** (0.020)	-0.045 (0.125)	0.361*** (0.104)	1.043*** (0.237)	0.164*** (0.021)
Academic strength	0.129** (0.052)	0.419 (0.402)	-0.157 (0.132)	0.790 (0.564)	0.225*** (0.060)
Technological concentration	-0.906 (0.702)	0.195 (0.402)	-5.218*** (1.469)	-2.550* (1.404)	-1.078 (0.780)
Total labour costs per employee (in log)	-0.380** (0.162)	-1.294** (0.583)	-0.648** (0.301)	0.386 (0.461)	-0.203 (0.255)
Scientists and engineers as % of population	0.024 (0.039)	0.172* (0.102)	0.164*** (0.054)	-0.250*** (0.089)	-0.018 (0.063)
Strictness of employment protection	-0.645*** (0.167)	-0.111 (0.363)	-1.285*** (0.301)	0.010 (0.353)	-0.910*** (0.296)
Regulatory restrictiveness	-1.091*** (0.286)	-0.701 (0.580)	-1.011** (0.509)	-1.290* (0.668)	-1.146** (0.496)
Corporate tax rate	-0.039*** (0.014)	-0.076** (0.037)	0.006 (0.024)	-0.073*** (0.021)	-0.040* (0.023)
R&D tax incentives	2.260*** (0.796)	5.284*** (1.929)	-0.111 (1.632)	3.315** (1.636)	1.976 (1.430)
Geographic distance (in log)	-0.454*** (0.156)	0.694* (0.395)	-0.483 (0.329)	-0.479 (0.403)	-0.530** (0.225)
Common language	0.593** (0.233)	1.257*** (0.414)	0.538 (0.381)	1.234*** (0.371)	0.060 (0.452)

Key messages

- ✓ Market size increased its attractive role after the crisis with respect to determinants related to knowledge absorption
 - ➔ the fall in FDI in R&D observed in the aftermath of the crisis is driven by the canceling or postponement of riskier investments aimed at absorbing knowledge from destination regions
- ✓ Market size exerts a stronger attractive role in the ICT services than in manufacturing industries, while the opposite occurs in manufacturing industries
 - ➔ FDI in R&D in the ICT services industry predominantly have the purpose of adapting existing products to foreign markets; by contrast, in manufacturing industries both knowledge absorption and exploitation of economies of scale purposes are present
- ✓ Institutional factors also affect MNEs location choices, with marked differences across industries and more nuance ones across time
 - ➔ Public authorities have a considerable room to create favorable conditions for FDI in R&D; importance of considering the specificities of local innovation system

The object (of the ongoing study)



Extend our analysis outside Europe to benchmark European performances.

Research question:

- To what extent is competition for attracting Knowledge-intensive investments global?

Does a European town, i.e. Amsterdam, compete for attracting foreign investments more with Berlin or Milan than with cities having similar characteristics in other continents or macro-areas, i.e., as Phoenix or Melbourne?



GLOBAL COMPETITION

Approach

- Combine data on knowledge-intensive FDI projects (fDi Markets) with information on Functional Urban Areas (FUAs) with 500,000+ population (OECD, Eurostat)

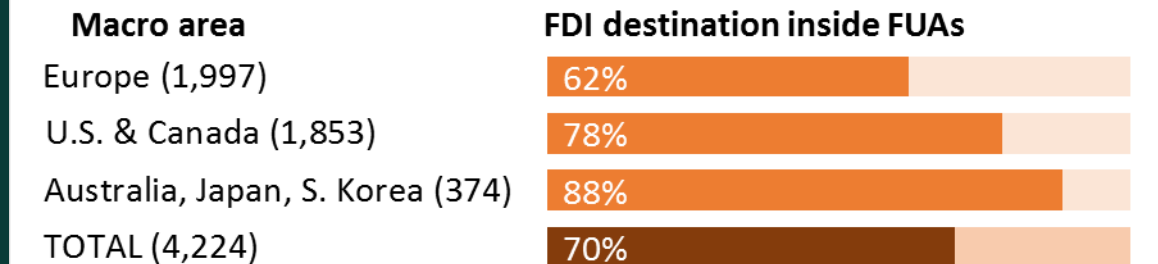
Focusing on FUAs with 500,000+ population as level of geographical granularity

Key advantages

- FUAs defined by demographic (population density) and economic (commuting patterns) criteria
- Comparable data available on key characteristics (population, GDP, number of patents) from the OECD metropolitan database

Key disadvantage

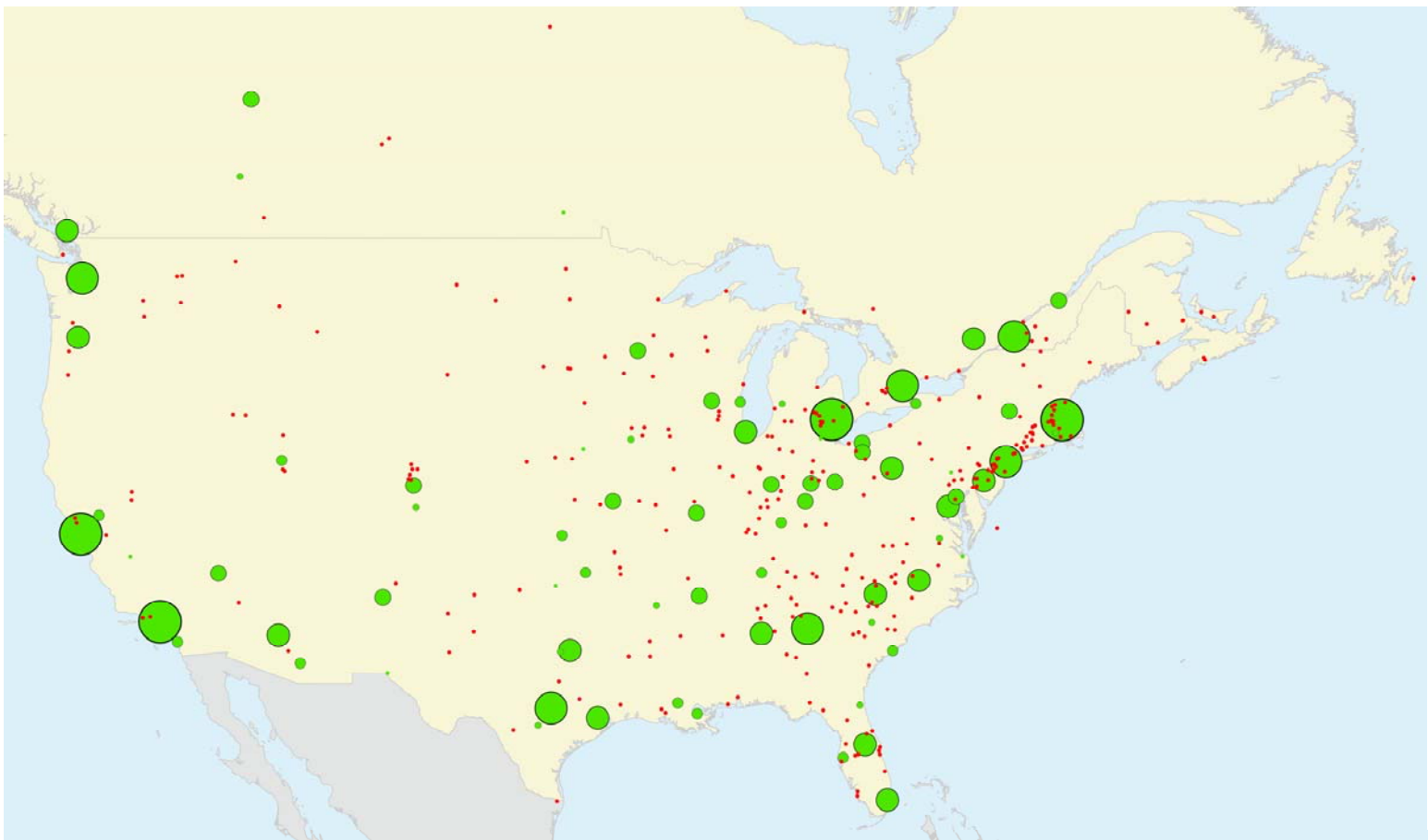
- FDI directed outside FUAs excluded from analysis











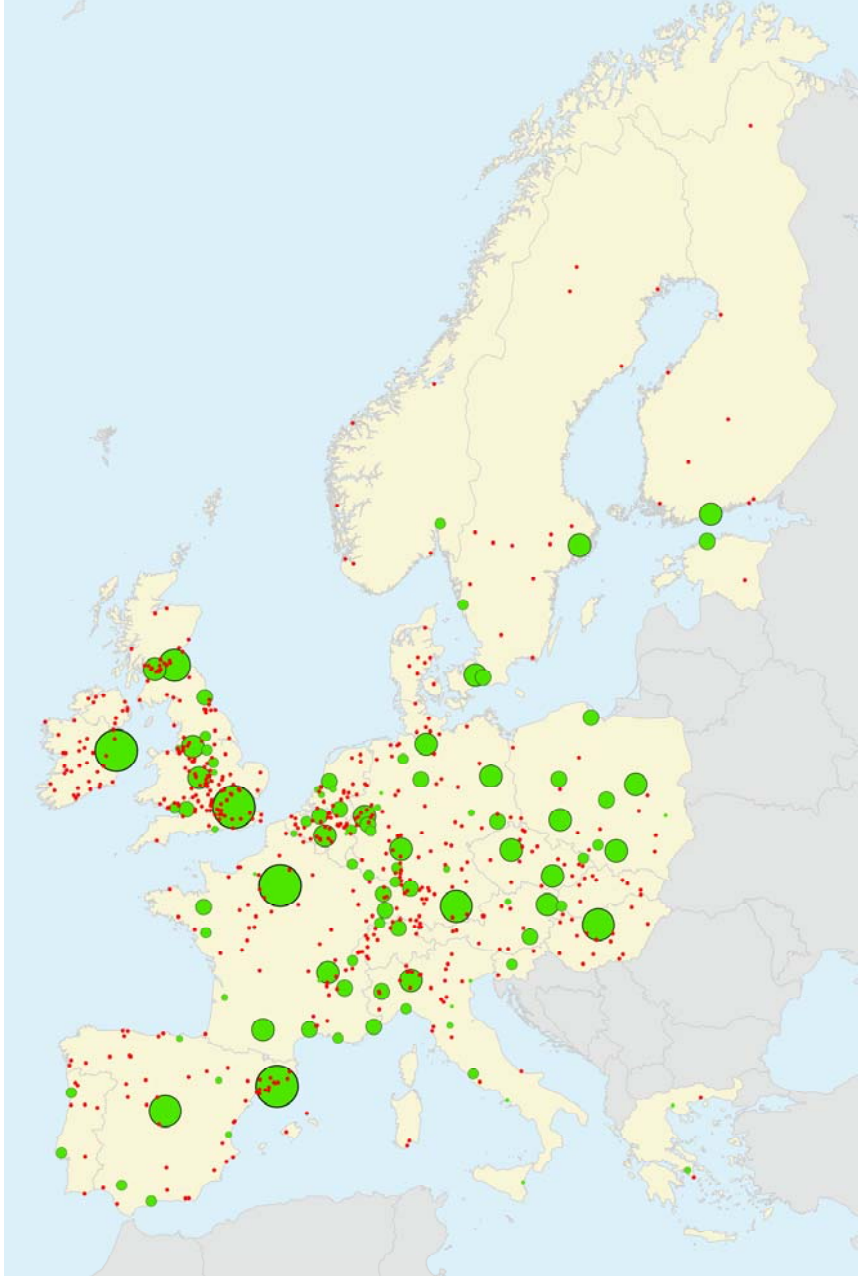
- Nested logit models with potential nesting structure (to be tested):
 - 3 macro-areas (Europe, US & Canada, Far East) as first nest level, nations as second nest level, and functional urban areas as basic element of the nests

Policy relevance

- To what extent are European 'areas' globally competitive in attracting investments in R&D?
- What attributes, especially among those related to policy/institutions, make European 'areas' competitive, and conversely how can European global attractiveness be improved?
- Which European 'areas' are more globally competitive, which ones are less, and which ones have the potential to become global competitors, where to concentrate efforts/resources?



location of FDIs	outside	inside FUAs						
								
number of FDIs		1-2	3-5	6-10	11-20	21-50	51-100	100+





Thanks

Any questions?

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