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# THE GEOGRAPHY OF SCIENCE-INDUSTRY COLLABORATIONS: SIZE AND PROXIMITY EFFECTS

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# **THE GEOGRAPHY OF SCIENCE-INDUSTRY COLLABORATIONS: SIZE AND PROXIMITY EFFECTS**



*Toulouse, June 10-11th, 2010*



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# 1. Aims of the paper

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# Aims of the paper

- The geography of partnerships dedicated to innovation
- What are the determining factors of this geography?
- We focus here on the science-industry collaborations

# Aims of the paper

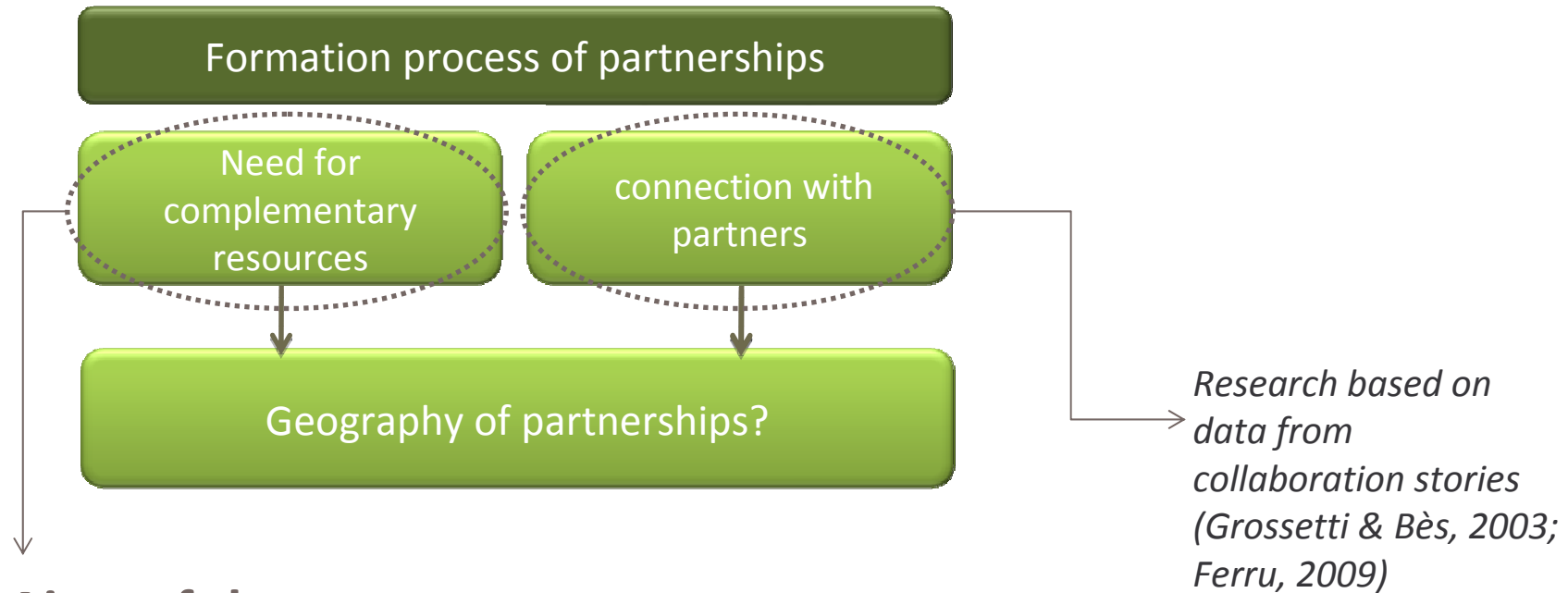
## **Main theoretical proposal**

- Knowledge spillovers: co-location of actors
- Evolutionist argumentation: tacit knowledge could be exchanged by face to face
- Empirical validations by the first studies

## **Empirical contestations**

- Data: tests of co-location
- Collaborations not only local and constraints linked to the exchange of tacit knowledge are reduced

# Aims of the paper



## Aims of the paper:

To assess the impact of resources constraints on the geography of partnerships and more generally structural effects

## Main issue:

To have relational database



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## 2. A proximist framework

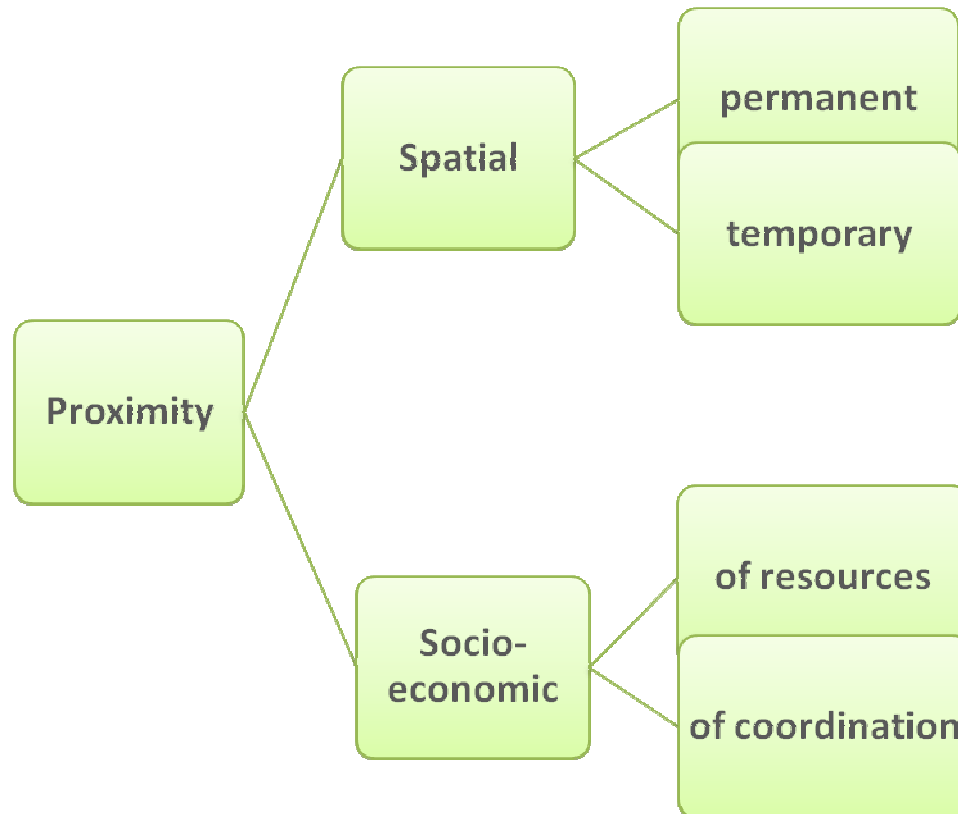
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# A proximist typology

- Our theoretical framework is based on the proximist typology developed by Bouba-Olga and Grossetti (2008)
- It allows to integrate the analysis of the construction of collaborations and to study both local and non local relationships
- They introduce a distinction between spatial proximity and socio-economic proximity



# A proximist typology



Capacity and constraints of ubiquity  
→ **Spatial proximity could be temporary**  
Choices of collaboration do not involve  
necessary choices of location

Project leaders look for complementary  
resources, not located everywhere  
→ **Geography of resources matters :**  
- size effects  
- specialisation effects



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# 3. Data and method

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# Data and method

- Gravity model
- Generalized tobit specification → two equations
  - Selection equation (probit): probability/tendency that potential partners collaborate

$$d_{r_1, r_2}^* = a_0 + a_1 \ln X_{r_1} + a_2 \ln Y_{r_2} - a_3 D_{r_1, r_2} + a_4 \text{int ra}_{r_1, r_2} + a_5 QI_{r_1, r_2} + a_6 QS_{r_1, r_2} + u_{1t}$$

- Output equation : intensity/number of such collaborations

With the same significant endogenous variables

# Data and method

- Original database : informations about CIFRE contracts during the period 1997-2006 (around 8 000 data)

<b>Economic size</b>	<b>Relative GDP (1997-2006)</b>
<b>Scientific size</b>	<b>Relative number of state researchers (1997-2006)</b>
<b>Spatial proximity</b>	<b>Contiguity matrix</b>
<b>Sectoral proximity</b>	<b>Matrix of similarity with the VA by sector in 1999</b>
<b>Scientific proximity</b>	<b>Matrix of similarity with DIRD by scientific domain in 1999</b>

Based on the **Aquino Index** : With  $Q_{ij} = \frac{\sum_k |V_{ik} - V_{jk}|}{X_{ik}^2}$   
 And  $V_{ik} = \frac{X_{ik}}{X_i}$   $V_{jk} = \frac{X_{jk}}{X_j}$

→ **Index of dissimilarity**

(tends to 1: great difference between regions)



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## 4. Main results

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# Results (1) : Probit specification

$$\hat{d}_{r_1, r_2}^* = -0,14 + 0,98 \ln X_{r_1} + 0,75 \ln Y_{r_2} - 0,30 D_{r_1, r_2} + 5,38 \text{int } ra_{r_1, r_2} + 0,21 QI_{r_1, r_2} - 1,08 QS_{r_1, r_2}$$

(0,72)
(0,00)
(0,00)
(0,00)
(0,97)
(0,57)
(0,65)

- Economic and scientific resources & spatial distance are heavily significant ; they have the expected sign.
- Proximity measures and the dummy Intra are not significant

## Results (2) : probabilities to collaborate

$$P(d_{r_1, r_2} = 1) = \Phi(0,98 \ln X_{r_1} + 0,75 \ln Y_{r_2} - 0,30 D_{r_1, r_2})$$

**Probabilities according to each variables**

	Mimimum value	Average value	Maximum value
$\ln X_{r_1}$	0,474	0,878	0,999
$\ln Y_{r_2}$	0,466	0,878	0,999
$D_{r_1, r_2}$	0,970	0,878	0,536



# Results (2) - Probabilities to collaborate

## Probabilities to collaborate with two disadvantageous and one average situations

	Probability
$\ln X_{r_1}$ and $\ln Y_{r_2}$ minimum	0,094
$\ln X_{r_1}$ minimum and $D_{r_1, r_2}$ maximum	0,126
$\ln Y_{r_2}$ minimum and $D_{r_1, r_2}$ maximum	0,122



## Results (3) – generalized tobit

$$\hat{d}_{r_1, r_2}^* = -0,94 + 1,73 \ln X_{r_1} + 0,98 \ln Y_{r_2} - 0,37 D_{r_1, r_2}$$

(0,00) (0,00) (0,00) (0,00)

$$\begin{cases} d_{r_1, r_2} = 1 & \text{if } d_{r_1, r_2}^* > 0 \\ d_{r_1, r_2} = 0 & \text{if } d_{r_1, r_2}^* \leq 0 \end{cases}$$

$$\ln \hat{C}_{r_1, r_2}^* = -0,72 + 1,32 \ln X_{r_1} + 0,75 \ln Y_{r_2} - 0,28 D_{r_1, r_2} + 2,70 \text{int ra}_{r_1, r_2} + 0,001 QI_{r_1, r_2} - 0,001 QS_{r_1, r_2}$$

(0,00) (0,00) (0,00) (0,00) (0,00) (0,91) (0,99)

$$\begin{cases} C_{r_1, r_2} = C_{r_1, r_2}^* & \text{if } d_{r_1, r_2}^* > 0 \\ C_{r_1, r_2} = 0 & \text{if } d_{r_1, r_2}^* \leq 0 \end{cases}$$



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# 5. Extensions

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# Extensions

- Possibility to integrate new variables to measure scientific and sectoral proximities
- Necessity to reply this gravity model on other database (forthcoming, Dime september)



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