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The role of the individual characteristics of university and firms for the spatial distribution of university-industry linkages in Brazil

Renato Garcia
Unicamp, Brazil
renatogarcia@eco.unicamp.br

Veneziano Araujo
Suelene Mascarini
Emerson Gomes Santos
Ariana Costa

The main aim of the paper

- To analyse the main factors that influence the geographical distance of university-industry linkages
  - Characteristics of the university
  - Characteristics of the firms
  - Territorial factors

- Controlling the individual characteristics

Conceptual remarks

- University
  - An important source of knowledge for firms' innovation
  - Particularly in industries closer to science and technology base

(Nelson, 1959; Klevorick et al, 1995; Cohen et al, 2002)

Conceptual remarks

- Geographical proximity U-I
  1. Firms close to university can benefit from local knowledge spillovers
  2. Local firms can participate in academic knowledge networks
  3. Proximity facilitates interactive learning process

(Jaffe et at., 1993; Audrestch e Feldman, 1996; Barthelt et al., 2004; Maskell, 2001; Breschi e Lissoni, 2001; Storper e Venables, 2004; Crescenzi et al., 2007; Varga, 2000; Asheim e Gertler, 2004; Laursen et al, 2010).

Conceptual remarks

- However, in certain cases, firms go far to interact with university

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1. Characteristics of the university
   - High quality research groups
   - Lack of local academic knowledge
   - Experience of the research group

Mansfield and Lee, 1996; Tornquist and Kallsen,1994; Schartinger et al., 2001; Abramovsky et al., 2007; D'Este and Iammarino, 2010; Bishop et al., 2011; Perkmann et al., 2011; De Fuentes and Dutrenit, 2012.

Conceptual remarks

- However, in certain cases, firms go far to interact with university

1. Characteristics of the research group
2. Characteristics of the firm
   - High absorptive capacity
   - Size
   - Experience in interaction

Boschma and Ter Wal, 2007; Levy et al., 2009; Gallie and Le Roux, 2010; Bruneel et al, 2010; Balland, 2011; Laursen et al., 2011; Bishop et al., 2011; Muscio, 2012

Conceptual remarks

- However, in certain cases, firms go far to interact with university

1. Characteristics of the research group
2. Characteristics of the firm
3. Territorial aspects
   - Local productive structure
   - Local industrial R&D
   - Local academic research

Storper and Venables, 2004; D'Este e Iammarino, 2010; Laursen et al., 2011; D'Este et al., 2012

University-industry linkages in Brazil

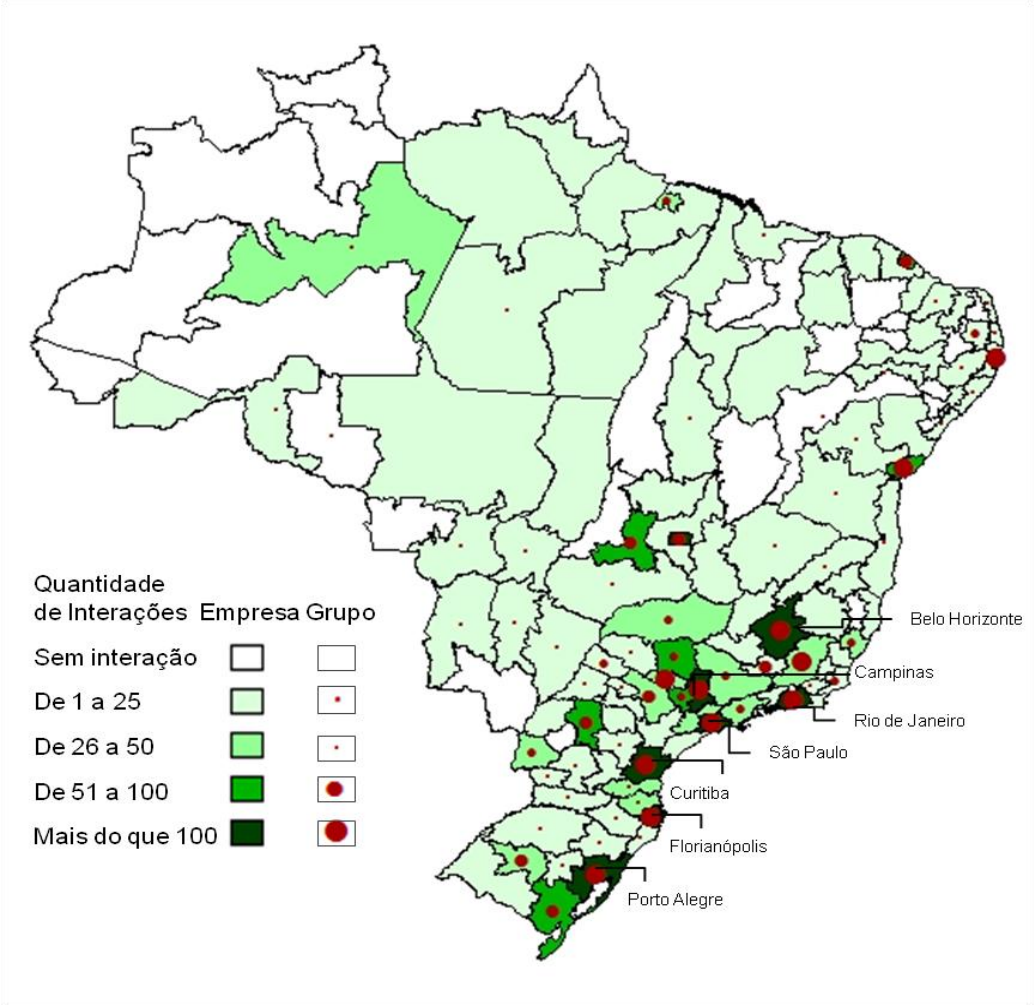
- Database
  - Lattes Database, Brazilian Council of Research

Rapini et al. (2009), Suzigan at al. (2009); Fernandes et al. (2010); Garcia et al (2013)

University-industry linkages in Brazil

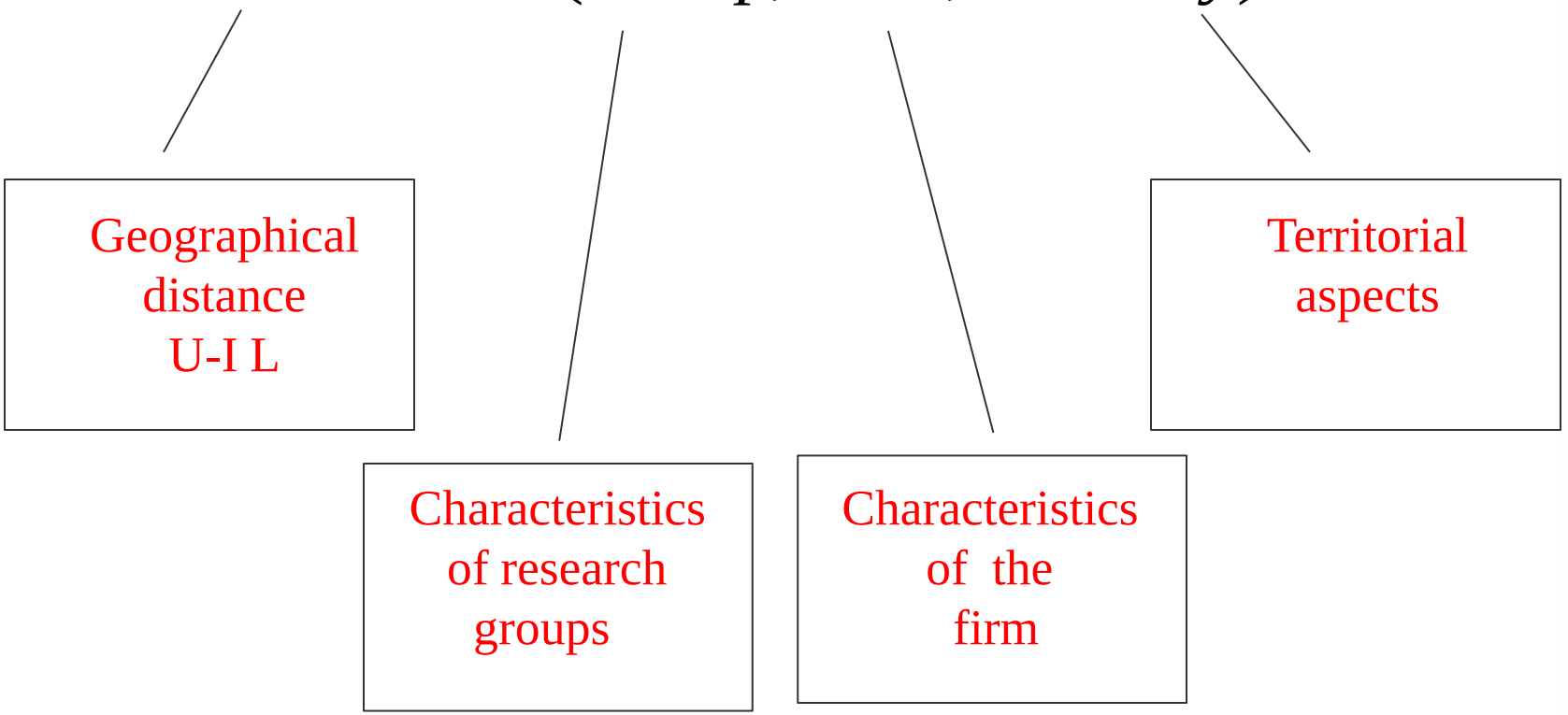
- Database
  - Lattes Database, Brazilian Council of Research, 2010
  - Engineering and Agrarian Sciences
  - 3,712 interactions

Regional distribution in Brazil



Empirical model

$$DistInt = F(Group; Firm, Territory)$$



Empirical Model

$$DistInt = SizeGroup + Quali + Lifetime + IntGroup + AbsorptiveCapacity + SizeFirm + IntFirm + kindex + UnivRD + IndRD + Dummies$$

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Dependent variable:
Geographical distance U-I L

Empirical Model

$$DistInt = SizeGroup + Quali + Lifetime + IntGroup + AbsorptiveCapacity + SizeFirm + IntFirm + kindex + UnivRD + IndRD + Dummies$$

Characteristics of the university:

-Size of the research group

-Quality of academic research

-Lifetime of the research group

-Number of interactions of the group

Empirical Model

$$DistInt = SizeGroup + Quali + Lifetime + IntGroup + AbsorptiveCapacity + SizeFirm + IntFirm + kindex + UnivRD + IndRD + Dummies$$

Characteristics of the firm:
-Absorptive capacity
-Size
-Number of interactions

Empirical Model

$$DistInt = SizeGroup + Quali + Lifetime + IntGroup + AbsorptiveCapacity + SizeFirm + IntFirm + kindex + UnivRD + IndRD + Dummies$$

Territorial aspects:
-Krugman Index
-Industrial R&D
-Academic research

Empirical Model

$$DistInt = SizeGroup + Quali + Lifetime + IntGroup + AbsorptiveCapacity + SizeFirm + IntFirm + kindex + UnivRD + IndRD + Dummies$$

Dummies for:
-Industry
-Scientific Field
-Type of resource
-Type of interaction

Results – Tobit model

Characteristics	Variable	Coefficient
Research Group	*SizeGroup*	0,128 (0,055)*
	Quali	0,086 (0,025)**
	Lifetime	-0,005 (0,004)
	IntGroup	0,028 (0,004)***
Firms	Absorptive*Capacity*	0,801 (0,147)***
	SizeFirm	-0,009 (0,09)
	IntFirm	0,038 (0,011)**
Territory	*kindex*	0,564 (0,181)**
	I*ndRD*	0,001 (0,000)***
	U*nivRD*	-0,011 (0,001)***
Constant		3,342 (0,362)***
Dummies	Industry Type	Yes
	Scientific field	Yes
	Resource Type	Yes
	Interaction Type	Yes

Number of obs = 3712 LR chi2 (46) = 642,08

Prob>chi2 = 0,000

Log likelihood=-78574528 PseudoR2 = 0,039

Obs. summary: 149 left-censored observations at lndist=0 ; 3563 uncensored observations

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Characteristics of the research groups:

1. Size
2. Quality of academic research
3. Number of interactions

} positive and significant

Results I

- Characteristics of research groups
  - Larger groups: have more skill to handle interactions with the long-distance firms

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    - In spite of the distance

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- Characteristics of research groups
  - Larger groups: have more skill to handle interactions with the long-distance firms
  - Higher quality: firms search for more skilled research groups
    - In spite of the distance
  - More experience: lower transactional barriers, longer distance

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4. Lifetime: no significant coefficient

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Characteristics of the firms:

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2. Number of interactions

} positive and significant

3. Size: no significant coefficient

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Results II

- Characteristics of firms
  - Higher absorptive capacity: firms are able to search for more distant academic capabilities
  - More experienced firms are able to perform distant interactions

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- Characteristics of firms
  - Higher absorptive capacity: firms are able to search for more distant academic capabilities
  - More experienced firms are able to perform distant interactions
  - Size of firm
    - Previous research (Levy et al., 2009; Gallie and Le Roux, 2010) show that larger firms interact more
    - BUT, nothing can be concluded on how these interactions are shaped on space

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Territorial aspects:

1. Local industrial structure
2. Industrial R&D

} positive and significant

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Results III

- Territorial aspects
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	Interaction Type	Yes

Territorial aspects:

3. Academic R&D: negative and significant

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Results III

- Territorial aspects
  - More diversified regions: local firms tend to interact in longer distances
  - Regions with higher R&D expenditure: longer distant interactions
  - Higher local academic R&D: local interactions

Brief conclusions

- How university-industry linkages are shape on space
  - Factors to take into account:
  - The characteristics of the university
  - The characteristics of the firms
  - Territorial aspects

Some policy implication

- Policy should be driven to:

- Firms
  - Strengthen absorptive capacity of firms
  - Foster industrial R&D

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- Policy should be driven to:

- Firms
  - Strengthen absorptive capacity of firms
  - Foster industrial R&D
- University
  - Reinforce capabilities of high-performance research groups
  - Stimulate the built of networks of research with poorer-performance groups

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