WP5 Evolution of demand and dynamics of knowledge base in knowledge intensive sectors and regions

leading partner: Utrecht University (URU)

Ron Boschma & Tom Broekel

other participants:

University of Sophia Antipolis (France)
The Samuel Neaman Institute (Israel)

Torino, 4 February 2011
**WP5 Evolution of demand and dynamics of knowledge base in knowledge intensive sectors and regions**

**main objectives:**

1. to investigate the dynamics of knowledge bases in knowledge-intensive industries (related variety, coherence)

2. to analyze the evolution of the industry mix of regions over time (rise and fall of industries)

3. to determine the extent to which new industries are technologically related to existing industries at regional level

 start month: 13 - end month: 36
WP5 Evolution of demand and dynamics of knowledge base in knowledge intensive sectors and regions

three tasks

- task 5.1 Technological variety and coherence of knowledge structure in knowledge-intensive sectors (UNS)
- task 5.2: Evolution of industry mix and relatedness among industries in regions (URU)
- task 5.3 Policy implications (URU, UNS, SNI)
Task 5.1 Technological variety and coherence of knowledge structure in knowledge-intensive sectors (UNS)

1. interaction between evolution of knowledge and demand pull

2. outcome of a recombination process: stems from search activities locally conducted in technological and geographical space

3. in previous work, we identified 3 properties of the knowledge base of a sector
   - coherence: the extent to which the pieces of knowledge that agents within the sector combine to create new knowledge are complementary to one another
   - similarity: the extent to which the pieces of knowledge used in the sector are close to one another in technology space
   - variety: the technological differentiation within the knowledge base, with respect to possible combinations of pieces of knowledge in the sector, from the creation of a radically new type to the more incremental recombination of already existing types of knowledge
Task 5.1 Technological variety and coherence of knowledge structure in knowledge-intensive sectors (UNS)

objectives

1. map the dynamics of knowledge bases of 3 different knowledge-intensive sectors using measures of the properties of knowledge base

2. compare the dynamics of knowledge bases of 3 different knowledge-intensive sectors, i.e. biotechnology, telecommunications and electronics

3. analyse how the dynamics of the knowledge bases have an impact on the industrial dynamics of the knowledge-intensive sectors
Task 5.1 Technological variety and coherence of knowledge structure in knowledge-intensive sectors (UNS)

- **data**
  - Espacenet data base, European Patent Office
  - USPTO patent dataset
  - relatedness indicator: co-occurrence analysis of technology classes in the same patent document
  - all data will be georeferenced as to allow for the analysis of the dynamics in geographical space
Task 5.2: Evolution of industry mix and relatedness among industries in regions (URU)

Background:

1. Variety as key driver of regional growth: the more variety, the more knowledge spillovers, the better.

2. However, some degree of cognitive proximity between sectors is needed to enable effective learning between sectors.

3. So what matters for regional growth: sectors that are technologically related in a region: induces knowledge spillovers.

4. Related variety major driver of urban and regional growth.

5. Countries tend to expand and diversify into sectors that are closely related to their existing industrial structure.

6. Regional branching: new industries grow out of technologically related industries, in which new firms recombine and exploit the knowledge and skills taken from local related industries.
Task 5.2: Evolution of industry mix and relatedness among industries in regions (URU)

objectives

1. evolution of related variety at the regional level

2. its impact on long-term regional employment growth

3. entry and exit of industries in regions: depending in the degree of technological relatedness with existing industries in a region?

4. growth and decline of industries in regions: depending on the degree of technological relatedness with existing industries in a region?

this will also provide critical insights for the analysis carried out under Workpackage 6: especially mechanisms that connect related sectors, like labor mobility
Task 5.2: Evolution of industry mix and relatedness among industries in regions (URU)

Data

• industry data (4-6 digit) by region from 1970s - now: Germany (220 regions), Sweden (70 regions) and Italy (784 regions)

• several measures of technological relatedness between industries will be applied: skill relatedness, based on the intensity of labor flows across industries
Task 5.3 Policy implications (URU, UNS, SNI)
PICK-ME
Kick-off Meeting
Torino, 3-4 February 2011

WP6: Demand and skills matching in local labour markets

Leader partner: LSE
Contributing partners: LSE, UU, SNI
Start month: 13 End month: 36
WP6: Demand and skills matching in local labour markets

Main objectives:
To investigate the nature, directions, dynamics and impact of interregional flows of labour skills (WP6):

- to analyse ‘regional branching’ and labour mobility over time (Tasks 6.1: UU)
- to determine the degree of overlap and relatedness between extra-regional inflows of labour skills and regional industry portfolio, assessing their impact on regional growth (6.2: UU & LSE)
- to explore the extent of complementarity between graduates/high-skilled’ knowledge and regional knowledge bases (Task 6.3: LSE & SNI)
- to investigate interregional migration of graduates and the phenomenon of brain attraction/drain as results of demand and supply (mis)matching (Task 6.3: LSE & SNI)
- to derive policy implications (Task 6.4: LSE & UU)

Deliverables:  
D6.1 = Task 6.1 + Task 6.2  
D6.2 = Task 6.3 + Task 6.4
Task 6.1 – Regional branching, relatedness & labour mobility

Background

• Regional branching: regions’ industrial development depends on own industry relatedness structure
• Labor mobility as mechanism of regional branching as inter-industrial mobility indicates relatedness

Main research questions

• What type of relatedness matters at what life-cycle stages of an industry?
• Do differences exist between industries in the importance of related variety (mature vs. emerging, high vs. low technology-intensity, ..?)
WP6: Demand and skills matching in local labour markets (cont.)

Task 6.1 – Regional branching, relatedness & labour mobility (cont.)

Data

- Data from German social security
- Plant-level and employment data 1973-2009

Methodology

- Focus on a number of selected industries (multiple life-cycle stages)
- Quantitative empirical approach with focus on firm level
- Industry-relatedness indicator developed by Neffke & Henning (2009)
WP6: Demand and skills matching in local labour markets (cont.)

Task 6.2 – Relatedness and extra-regional inflows of labour skills

Background

- Inter-industrial linkages across regions are crucial
- Labor mobility as important mechanism of knowledge & skill transfer

Main research questions

- To what extent does the inflow of labor from outside a region contribute to the development of emerging industries?
- What dimension of these “inflowing” employees matters most - their skills (managers, blue-collar) or their industrial background?
Task 6.2 – Relatedness and extra-regional inflows of labour skills (cont.)

Data
- Data from German social security
- Plant-level and employment data 1973-2009

Methodology
- Focus on a number of selected industries (multiple life-cycle stages and presence in multiple regions)
- Quantitative empirical approach
- Industry-relatedness indicator developed by Neffke & Henning (2009) + ad hoc relatedness indicator capturing skill relatedness
Task 6.3 - Graduates/high-skilled’ mobility and regional knowledge base

Based on the long standing and broad debate on: the role of human capital in the creation of knowledge (e.g. Nelson & Phelps, 1965; Lucas, 1988; Pavitt, 1991; Salter & Martin, 2001; etc.) and the importance of skill-mobility as a critical mechanisms for knowledge transfer (e.g. Saxenian, 2002; Faggian & McCann 2006; 2009):

• analysis of interregional migration patterns with respect to demand and supply (mis-)matching. Focus on both:

  a) Graduates’ mobility (LSE & SNI)
  b) High-skilled workers’ mobility (LSE)
Task 6.3 (cont.)

a) Graduate migration, skills (mis-)match and demand

Background: Public R&D & Higher Education impact on creation of knowledge through (among others): spatial mobility of graduates. But: knowledge embedded in graduates needs to complement that of the region of destination (i.e. the RSI) for a positive impact to occur (e.g. Marinelli, 2011): knowledge demand and supply need to match for higher education to have an impact on innovation (Nelson and Phelps, 1966)

- Aim: demand-supply knowledge (mis)matches in interregional graduate mobility
- Method: quantitative and qualitative case studies of regions with different economic structure and innovation system
**WP6: Demand and skills matching in local labour markets (cont.)**

**Task 6.3 (cont.)**

a) Graduate migration, skills (mis-)match and demand

**Skill use (education-job matches):** Example from the Istat survey: *Indagine sull’inserimento professionale dei laureati*

**Matrix of education-job (mis)matches**

<table>
<thead>
<tr>
<th>Was the degree formally required?</th>
<th>Was the degree effectively necessary to do the job?</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td><strong>OBJ.Match:</strong> Objective education-job match</td>
<td><strong>SUB.Over:</strong> Subjective Overeducation</td>
</tr>
<tr>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td><strong>SUB.Match:</strong> Subjective education-job match</td>
<td><strong>OBJ.Over:</strong> Objective Overeducation</td>
</tr>
</tbody>
</table>

Based on, among others, Ungaro and Verzicco (2005), Quintano *et al.* (2008)
WP6: Demand and skills matching in local labour markets (cont.)

Task 6.3 (cont.)
a) Graduate migration, skills (mis)match and demand (cont.)

LSE
Cross-country regional perspective: studies will cover Italy and the UK, countries with very different degrees of internal mobility, and selected comparable regional systems

Regional case studies

ITALY: Lazio, Lombardia, Campania (NUTS 2)

UK: Greater London, South East, Midlands (NUTS 1)

Data

ITALY: Istat survey: Indagine sull’inserimento professionale dei laureati

UK: HESA survey: Destination of leavers of higher education

In depth interview with key actors (e.g. universities, uffici colloquamento, policy makers, etc.)

In depth interviews with key actors (e.g. universities, recruitment agencies, policy makers, etc.)
WP6: Demand and skills matching in local labour markets (cont.)

Task 6.3 (cont.)
a) Graduate migration, skills (mis)match and demand (cont.)

SNI

Sub-national perspective: Israel

• The regional distribution of higher-education investments in Israel is fairly balanced. Strong academic institutions (e.g. Technion, Hebrew University, regional colleges locate outside the core region (Tel-Aviv metropolis).

• These institutions are characterized by high level of research, teaching and diversified study curricula, including science and technology fields.

• Yet, the Israeli High-tech industry and services labor market is characterized by severe spatial imbalance:

  Approximately 72% of R&D activity in the business sector and 73% of R&D activity in the ICT sector are conducted in the core region (Tel-Aviv and Central Districts).
**WP6: Demand and skills matching in local labour markets (cont.)**

**Task 6.3 (cont.)

a) Graduate migration, skills (mis)match and demand (cont.)**

**SNI**

**Research Objectives:**
- To investigate, with different quantitative methods, the scope of spatial mismatch between labor demand and supply (in specific fields) through the analysis of interregional migration trends of university graduates.
- To estimate the contribution of university graduates to the local innovation milieu.

**Preliminary Methodology:**
- Discrete choice model will be employed in order to explain the factors that influence the choice of work location by university’s graduates four years after graduation.

**Research data sources:**
- "Recipients of First Degrees from Institutions of Higher Education in Israel" Survey (CBS, 2006). Complementary databases may be used.
Task 6.3 (cont.)
b) High-skilled labour mobility and knowledge creation

Background: mobility of skilled workers as a key mechanism for the creation and diffusion of knowledge (e.g. Malecky, 1997; Zucker & Darby, 1996). But: structural conditions of the local labour market may affect the match between demand and supply preventing the exploitation of these new valuable human resources: *the conditions for the efficient match of demand and supply need to be in force for skilled mobility to have an impact on innovation*

- **Aim:** link between **high-skilled labour mobility** and **innovative performance** of local areas
- **Method:** **quantitative** analysis of regions with different structural labour market conditions
- **Data sources:** **CIS4 UK** and **LFS UK**
WP6: Demand and skills matching in local labour markets (cont.)

Task 6.3 (cont.)

b) High-skilled labour mobility and knowledge creation

Sub-national sub-regional perspective: studies will focus on the UK looking at areas with different innovative performances

Regional case studies

National level: UK

Local Area:
Travel to Work Areas TTWA)

Econometric analysis
(discrete choice models, OLS, etc.)
WP 4
Task 4.1
Inventor Survey

Aldo Geuna
Survey - Objectives

- Analysis of demand characteristics in UNIV-IND interactions;
  - We intend to survey COMPANY INVENTORS of EPO patents as they are those directly involved in the interactions with university researchers;
  - We want to do include regions/countries with a different development in science and technology policies to support knowledge transfer.
Survey - Objectives

- Investigate the channels used for knowledge transfer from university to industry
- Investigate different forms of governance for university-industry collaborations
- Investigate the inventors' objectives and their reasons for using different channels of knowledge transfer
- Investigate the mobility of inventors
Structure of the Questionnaire

- General Information (Individual characteristics)
- Assessment of different types of university knowledge and interaction channels
- Effectiveness of different types of collaboration
- Mobility of Inventors
Sample

- Inventors in EPO patents with address in the selected regions (I, NL, S, UK);
- Filing date 2002-2008 (to be decided depending on the number of patents in each region);
- Data sources Patstat (CESPRI elaboration).
Partners

- Simona Iammarino (LSE) – UK
- Ron Boschma, (Urban and Regional Research Centre) – NL
- Aldo Geuna (BRICK) - I