



Universiteit Utrecht

Technological relatedness and regional development

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June 21-23, 2010



structure of lecture

- technological relatedness and related variety
- 5 (empirical) applications in economic geography
 1. spatial externalities literature
 2. global pipelines
 3. labour market studies
 4. entrepreneurship
 5. regional diversification (Swedish study)



technological relatedness and related variety

- firms differ: firm-specific competences
- variety as key driver of regional growth: the more, the better (Adam Smith)
- knowledge will spill over to other firms now and then, and geographical proximity is an enabling factor (Jane Jacobs)
- effective learning requires cognitive proximity between firms
- but too much cognitive proximity may be harmful (lock-in)
- need for technological relatedness and related variety to enable knowledge spillovers
- regional level might be crucial: knowledge spillovers are often geographically bounded



(1) spatial externalities literature

- Jacobs' externalities and regional growth?
- what matter for regional growth: sectors that are technologically related in a region
- the higher related variety in a region, the higher regional growth: effective knowledge transfer requires some but not too much cognitive proximity between sectors in a region
- Frenken *et al.* (2007) for the Netherlands, confirmed by studies in other countries (e.g. Italy, Great Britain, Finland)



(2) global pipelines

- regional growth: may also depend on extra-regional knowledge flows: non-local linkages bring new variety into the region
- Boschma and Iammarino 2009, *Economic Geography* 85 (3), 289-311: study on related variety, trade linkages and regional growth in Italy
- it is not inflows of extra-regional knowledge *per se* that matters for regional growth
- inflows of extra-regional knowledge related (but not identical) to the knowledge base in a region that do matter for regional growth
- this concerns new knowledge that can be understood and exploited by related sectors in the region and, thus, be transformed into regional growth



(3) labour market studies

- labour mobility key mechanism through which knowledge diffuses: however, no attention paid to relatedness
- Boschma, Eriksson and Lindgren (*Journal of Economic Geography*, vol. 9 (2), 2009): effect of labour mobility on plant performance through relatedness
- **(1) at the plant level:** the more related the skill portfolio of a plant is, the higher plant productivity growth
- **(2) through labour mobility:** inflow of new skills that are related to the knowledge base of the plant had a positive effect on plant performance (in contrast to inflows of identical skills)
- **(3) extra-regional linkages:** labour mobility across regions has only a positive effect on plant performance when this concerns new employees with skills that are related (but not similar) to the existing set of skills at the plant level



(4) entrepreneurship studies

- through entrepreneurship, new industries emerge, but these do not start from scratch: relatedness is again crucial
- empirical study on the spatial evolution of British automobile sector 1895-1968 (Boschma and Wenting, *Industrial and Corporate Change*, 2007)
- experienced entrepreneurs (with relevant knowledge from related industries) are crucial for first stage of the industry lifecycle
- related knowledge and skills are transferred from old sectors (engineering, cycle making, coach making) to the new (automobile) sector: this increased their survival rate, in comparison to other types of entrepreneurs
- British regions endowed with these related industries also had a higher probability to develop the new automobile industry: effective knowledge transfer from the old to the new requires relatedness: regional diversification or branching



(5) regional diversification

- many case studies on regional diversification or branching, but no systematic study
- creative destruction (Schumpeter): rise and fall of industries in regions
- depending on the degree of technological relatedness with existing industries in a region?
- two research questions
 - (1) rise of new industries: do industries have a higher probability to enter a region when these are technologically related to pre-existing industries in a region?
 - (2) fall of existing industries: do industries have a lower probability to exit a region when these are technologically related to pre-existing industries in a region?



(5) regional diversification

- long-term analysis of 70 Swedish regions 1969-2002 (Neffke, Henning and Boschma, 2009)
- first, we needed an indicator to measure the degree of technological relatedness between industries
- co-occurrence analysis to assess inter-industry relatedness
- co-occurrence of products that belong to different industries in the portfolios of manufacturing plants: economies of scope
- control for profitability and size of industries
- Sweden: data on manufacturing plants concerning the products produced 1969-2002: product data assigned to standard industry codes (a total of 174 6-digit industries)
- we calculated the average degree of technological relatedness between each pair of industries in the period 1969-2002

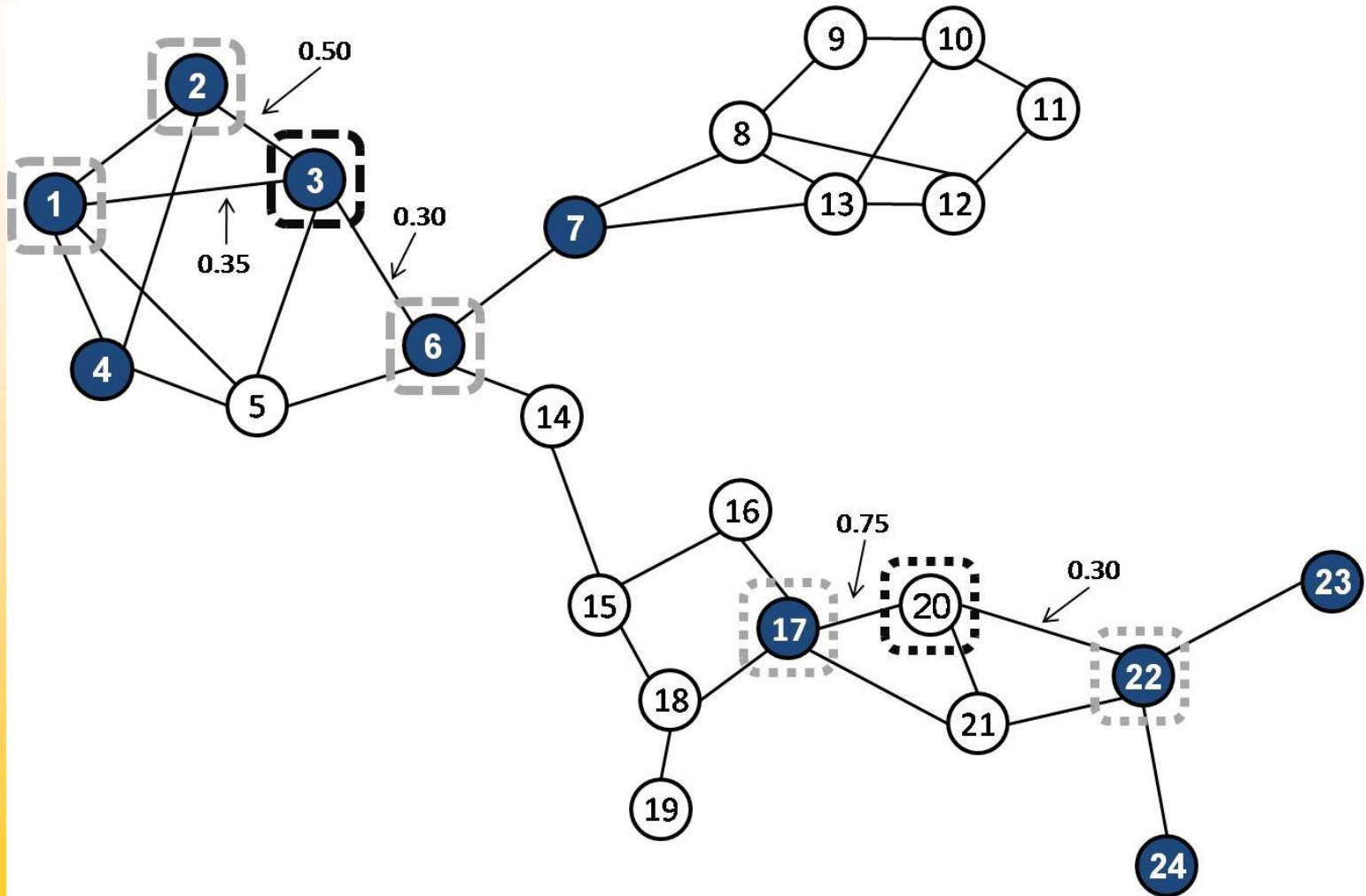


(5) regional diversification

- in order to determine whether entries and exits of industries in a region are affected by the degree of technological relatedness with other industries in the region, we aggregated our data to 70 Swedish regions
- then, we developed an indicator to determine how close an industry is to all other industries in a region: technological closeness
- defined as the number of industries in a region that an industry is technologically related to above a certain threshold



illustration of closeness indicator



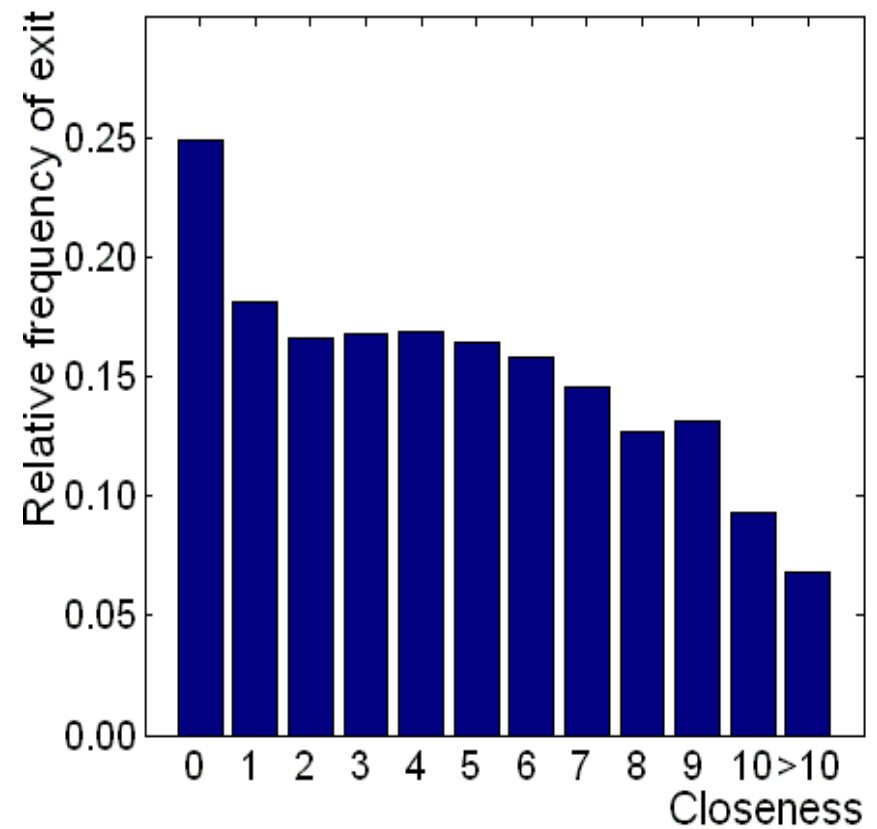
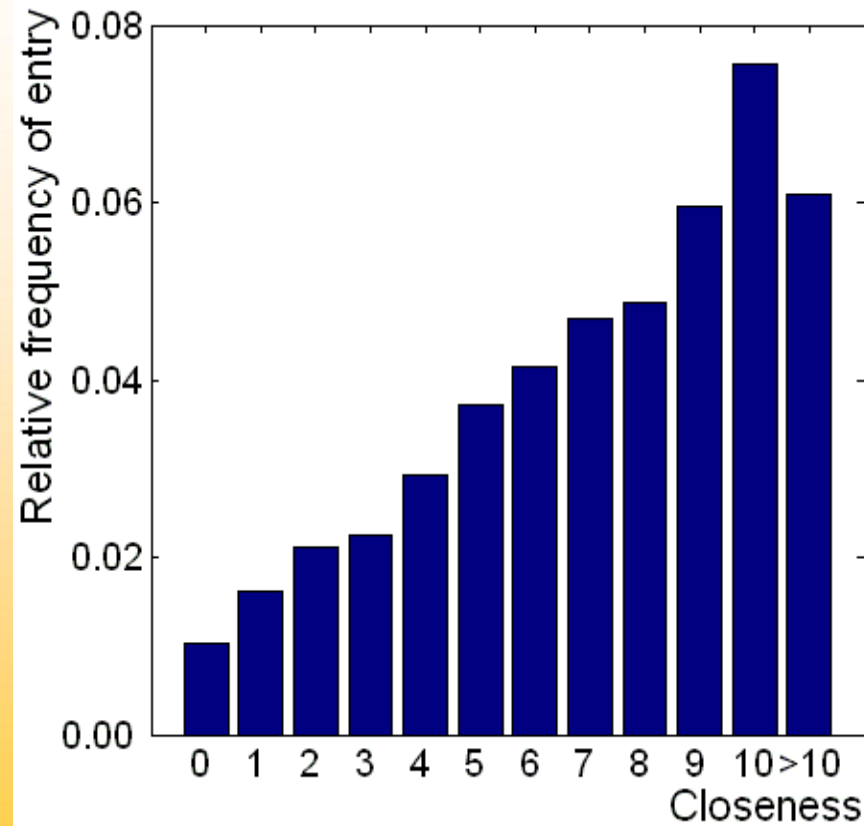


(5) regional diversification

- we estimated the entry probability of an industry in a region, and how that is affected by the closeness of the new industry to a region's portfolio
- as expected, industries that are technologically related to pre-existing sectors in a region have a higher probability to enter the region
- we also estimated the exit probability of an industry in a region, and how that is affected by its closeness to the region's portfolio
- as expected, unrelated sectors have a higher probability to exit the region



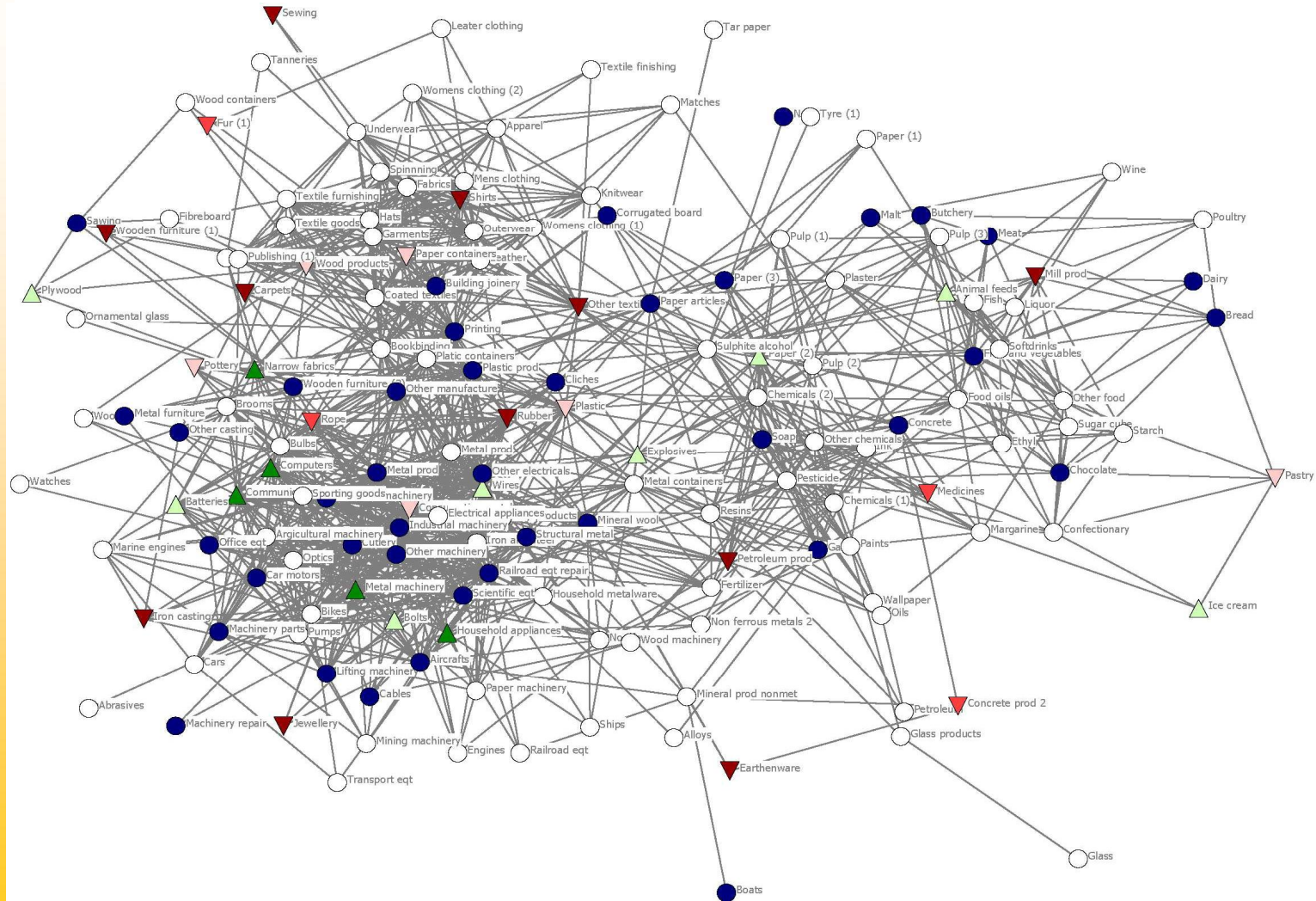
entry and exit probabilities





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average industry space in Sweden 1969-2002, with the evolution of the production structure of Linköping





(5) regional diversification

- thus, systematic evidence: regions tend to diversify by branching into new industries that are related to their current industries: path dependent process
- the same applies to the destruction process: existing industries tend to disappear from regions when these are not embedded in current industries
- many open questions: e.g. through which mechanisms (entrepreneurship, labour mobility, pipelines, etc.) do new industries connect to existing industries?