Related variety, economic networks and regional economic growth in Europe

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Szeged, 25 May 2013

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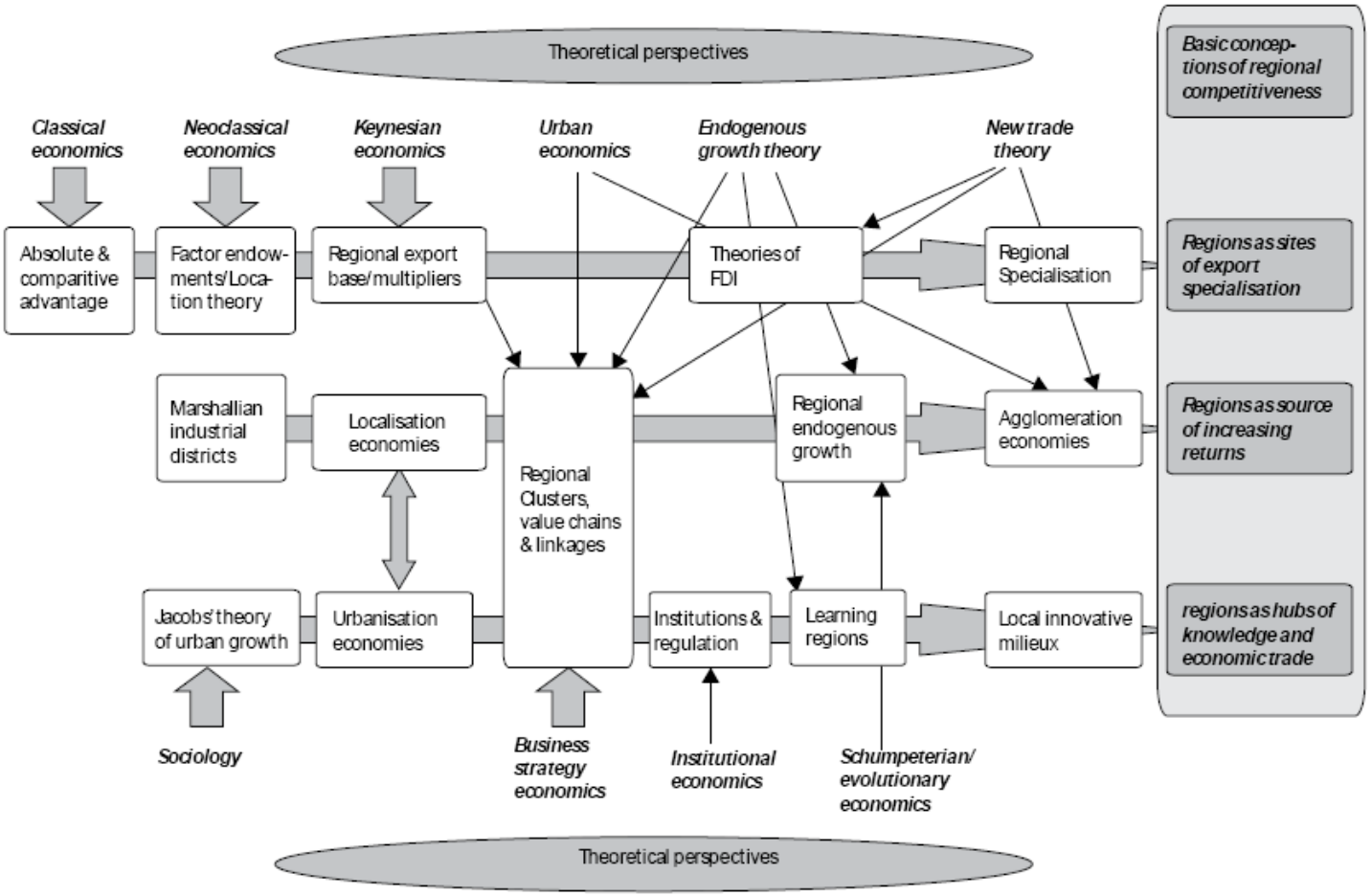
Economic networks and regional competitiveness in Europe

1. The regional competitiveness debate
2. The EU-cohesion policy debate
3. A new revealed competition measure
4. Case-studies
5. Network determinants and benchmarks
6. Conclusions and implications (competitiveness)
7. Related variety and regional economic growth in Europe

The regional competitiveness debate

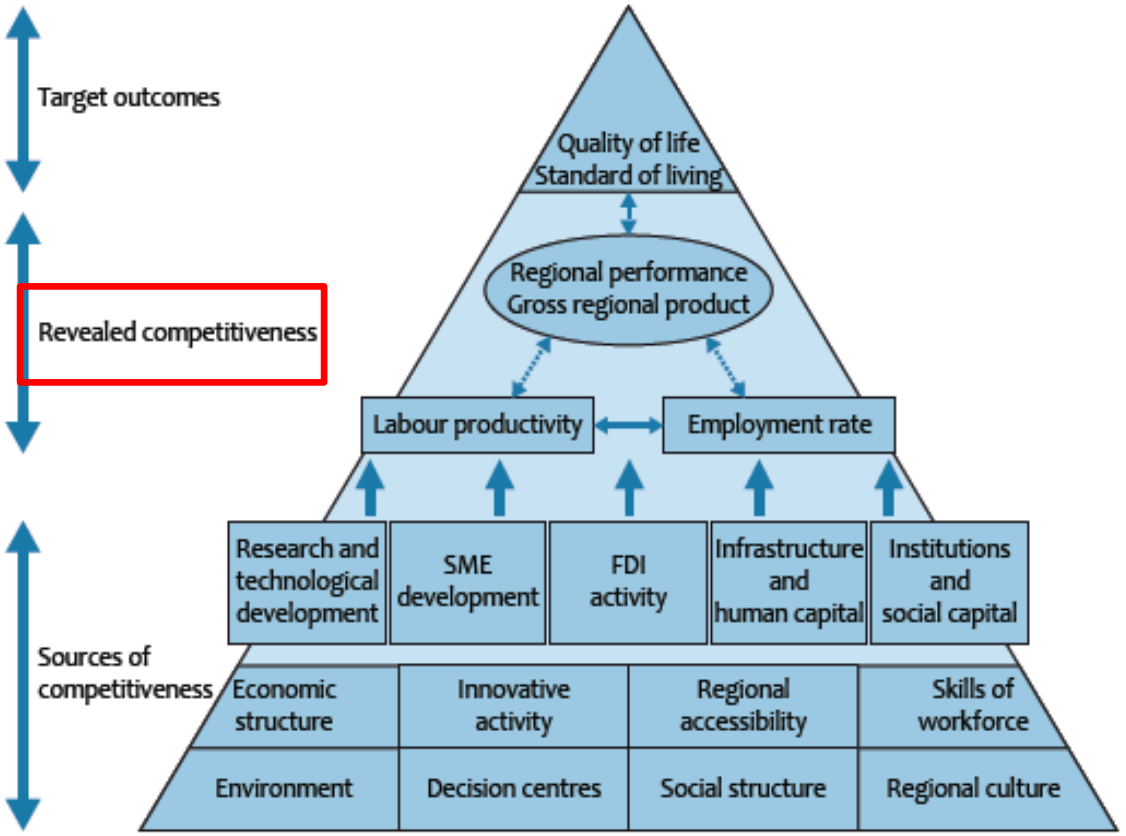
Figure 1.2: Conceptions of regional competitiveness in theoretical disciplines*



*Adapted from Martin (2005), p. 14.

The regional competitiveness debate

Porter (1995,2000)
Krugman (1996)
Storper (1997)
Glaeser (2001)
Camagni (2002)
Lengyel (2004)
Kitson et al (2004)
Gardiner (2004)
Bristow (2005)
Borras & Tsagdis (2008)
European Union (2010)



Competitiveness and benchmarking

Ranking of regions according to:

- Typical factors that are **assume**d to have an effect on the competitiveness of regions
- Compare **all** possible regions

Problems:

- What is competitiveness?
- What regions do you compare and why them?
- Regions are presented as independent points - is this absence of spatial effects conform a measure for competitiveness?
- How should the different factors be evaluated (weighted)?

The regional competitiveness debate

1. Who are your competitors?
2. What are the locational, network and industrial characteristics of these?
3. What is your position concerning these characteristics?
4. When (implicitly) causal, what is good to invest in?

- For now applied to trade, later also for FDI and knowledge networks
- Explicitly test for causality, trade-offs and complementarities of various networks in relation to growth

The EU cohesion policy debate

- The EU Single Market; BRIICS countries; NAFTA; ICT technological advances; The Internet; growth in multinationals; out-sourcing and off-shoring; EU expansion
- Slow *inter*-national convergence, increasing *intra*-national *inter*-regional divergence
- Formation of global regionalism: EC NAFTA South and East Asia
- Increasing role of *cities* – global cities: place-based development and smart specialization

The EU cohesion policy debate

- People-based " versus" place-based development strategies (Barca et al 2012), Worldbank (2009), Barca (2009)
- Importance of the World Bank argument is that it shows that it is not simply institutions that matter for growth – but also geography
- 'Home market' effects and agglomeration are necessary for growth (Collier 1996; Venables 2010)
- **Regulatory reform alone will not solve the problems but also 'correct' geography is required**

The EU cohesion policy debate

Smart specialization strategies of EU-regions:

- Local specializations
- Entrepreneurship
- Related variety
- Positions in networks
- Network effects of investments
- (New) cohesion policy?

The EU cohesion policy debate

Smart specialization strategies of EU-regions:

- Local specializations
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- (New) cohesion policy?

A new revealed competition measure

ESI: Export Similarity Index (Finger and Kreinin, 1979)

- Similarity in the export structure of two regions in a specific market (Balassza):

$$ESI_{ik,j} = \sum_g \min\left(ES_{gij}, ES_{gkj}\right)$$

$$ESI_{ik,j} = 1 - \frac{1}{2}\sum_g \left|ES_{gij} - ES_{gkj}\right|$$

- **BI (A,j)=share industry j in export region A / share industry j in export EU**
- More recent proposed measures: Coefficient of Conformity (CC), Index of Trade competition (ITC)

Drawbacks of the existing measures:

1. Symmetry: small and big regions face the same level of competition
2. Specialization: specialized regions do not compete with diversified regions
3. Dynamics: increasing size of regions does not affect their competition when shares remain constant (consequence of 1)
4. No treatment of multiple markets within sectors

A new revealed competition measure

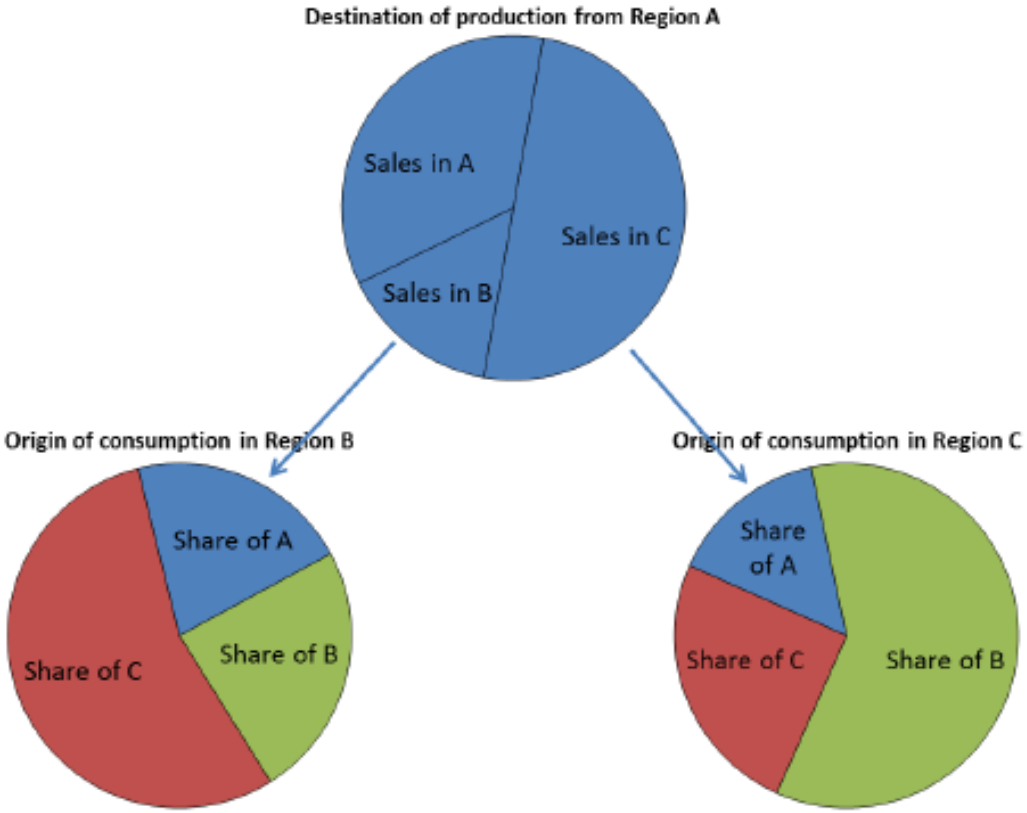


Figure 5.1: Example of revealed competition.

Region A receives strong competition from region B because region B holds a strong position on market C, which is an important export market for region A. Region A does not receive strong competition from region C. Even though region C holds a strong position on market B, region A only exports a small amount to region B.

A new revealed competition measure

Revealed competition is

the sum of the market shares (M) of region A's competitors weighted

with the importance of the different markets (E) for region A.

RC: Revealed competition
that region *i* faces from region *k*

$$RC_{ik} = \sum_{j} E_{ij} M_{jk}$$

$$E_{ij} = \frac{T_{ij}}{P_i}, \; M_{jk} = \frac{T_{jk}}{D_k}$$

MD: the share of competition a region gives to all other regions

$$MD_k = \frac{\sum_i RC_{ik}}{\#\, i}$$

Trade network Data

Multiregional supply and Use Tables for Europe 2000, dimensions:
17 industries, 60 products, 256 nuts2 regions, 20 other groups of nations

Multiregional IO Table with trade relations: $((256+20)x(60+5))^2=321.843.600$
Actual relations: 169.728.071

		Industries		**goods**		**Hhd**		**Government**	**Total**
		Region X	**Other regions**	**Region_ X**	**Other regions**	**Region_ X**	**Other regions**		
Industry	**Region X**								**T1**
	Other_regions								
Goods	**Region X**								**T2**
	Other_regions								
Factors	**Region X**								**T3**
	Other_regions								
Government									**T4**
Total		**T1**		**T2**		**T3**		**T4**	

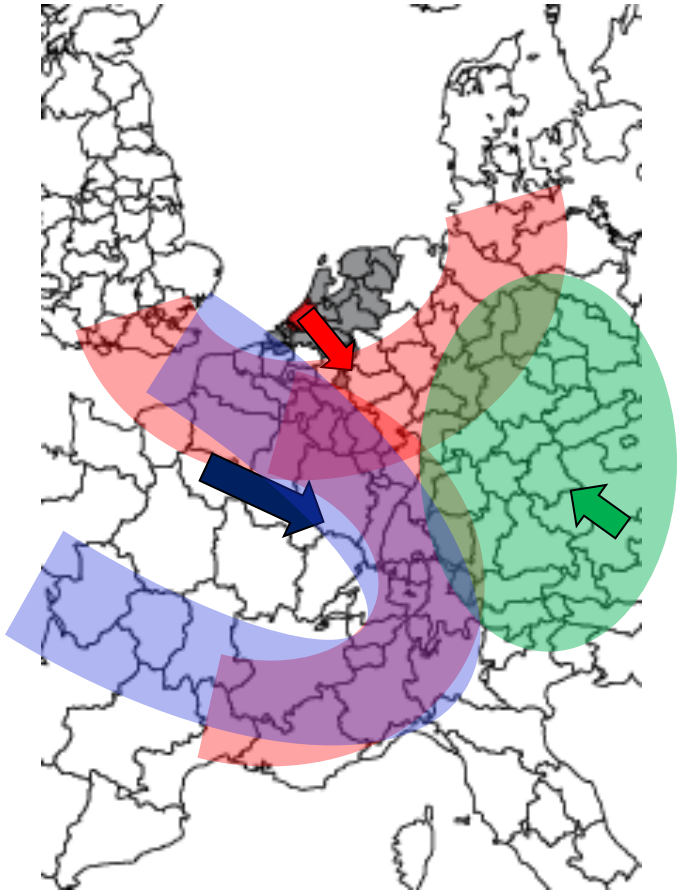
Market dominance and competitors

Amsterdam main exports

Paris main exports

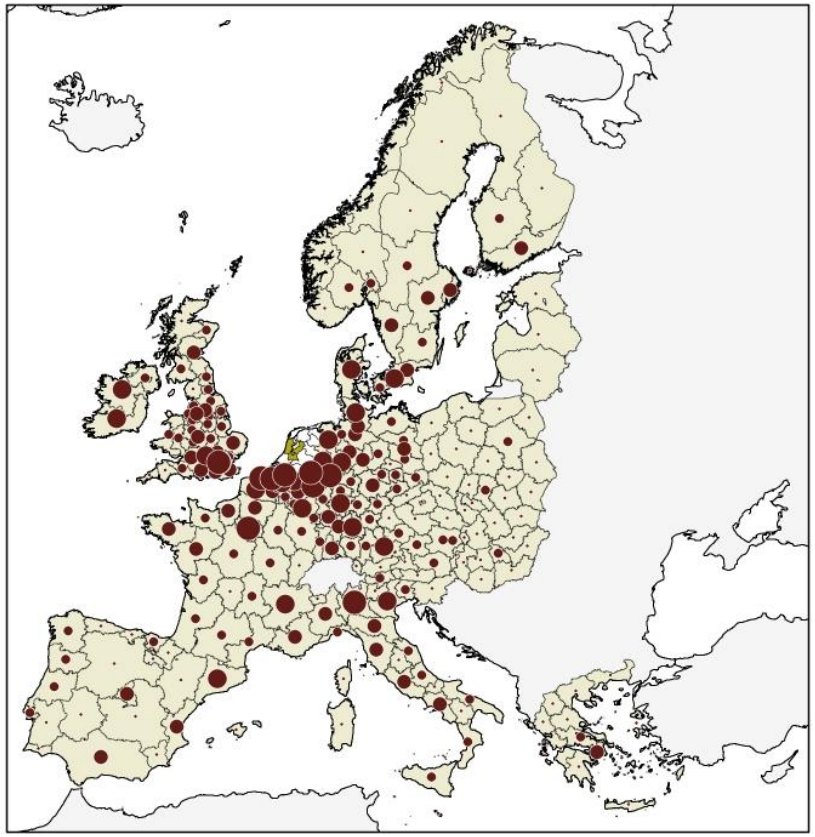
Vienna Main exports

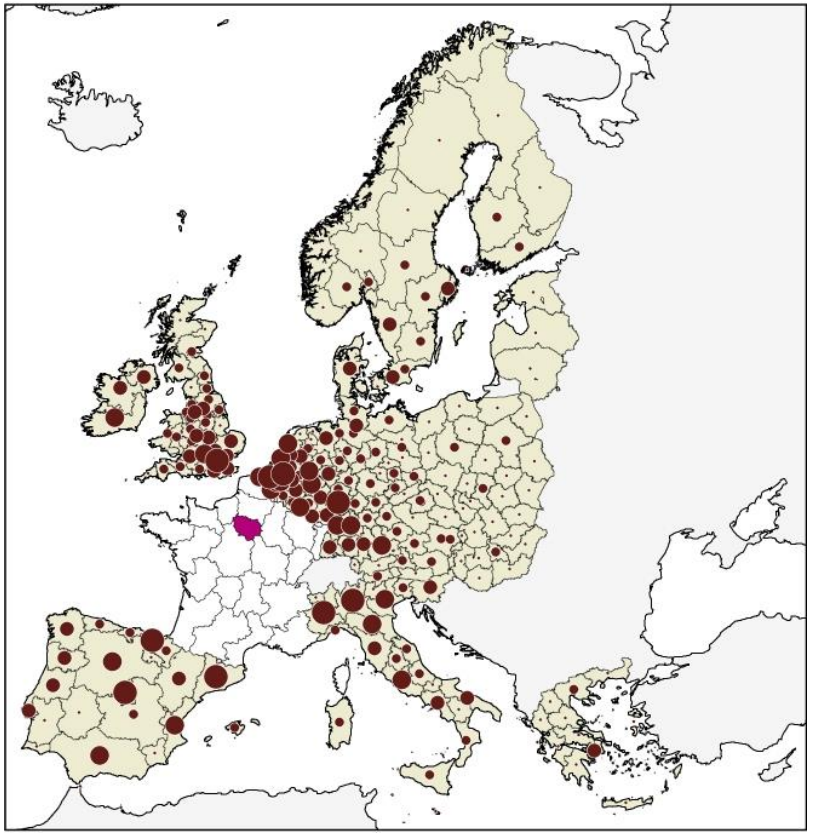
Amsterdam and Paris have the most overlap in export markets



Market dominance and competitors

Trade : Exports of Amsterdam and Paris





Agglomerations & short distance

Market dominance and competitors

Table 5.1: Top 30 of regions which are seen as important competitor by many other regions.

	All sectors	Agriculture	Low-tech manufacturing	Medium-tech manufacturing	High-tech manufacturing	Services sector - total	Marketing and Financial Services	Other Marketing Services
1	Paris - FR	Rotterdam - NL	Milan - IT	Milan - IT	Dublin - IE	Paris - FR	Luxembourg - LU	S.E.Ireland – IE
2	Milan - IT	Danish mainland - DK	Paris - FR	Paris - FR	Paris - FR	Luxembourg - LU	Paris - FR	Milan- IT
3	Dublin - IE	Andalucía - ES	Stuttgart - DE	Stuttgart - DE	Helsinki - FI	Inner London - UK	Inner London - UK	Inner London – UK
4	Dusseldorf - DE	Eindhoven - NL	Emilia Romagna - IT	Dusseldorf - DE	Milan - IT	Dublin - IE	Dublin - IE	Luxembourg – LU
5	Stuttgart - DE	Milan - IT	Dusseldorf - DE	Munich - DE	Lyon - FR	Outer London - UK	Outer London - UK	Frankfurt – DE
6	Munich - DE	Amsterdam - NL	Veneto - IT	Dublin - IE	Stuttgart - DE	Copenhagen - DK	Stockholm - SE	Brussels – BE
7	Frankfurt - DE	Gelderland - NL	Munich - DE	Lyon - FR	Göteborg - SE	Stockholm - SE	Brussels - BE	Paris – FR
8	Lyon - FR	Paris - FR	Dublin - IE	Arnsberg - DE	Dusseldorf - DE	Rotterdam - NL	Oxfordshire - UK	Amsterdam – NL
9	Veneto - IT	Aquitaine - FR	Danish mainland - DK	Frankfurt - DE	Munich - DE	Amsterdam - NL	Frankfurt - DE	Rotterdam – NL
10	Koln - DE	Barcelona - ES	Eindhoven - NL	Veneto - IT	Border Midlands - IE	Frankfurt - DE	Rotterdam - NL	Lazio – IT
11	Barcelona - ES	Champagne - FR	Barcelona - ES	Koln - DE	Lansi Suomi - FI	Danish mainland - DK	Amsterdam - NL	Düsseldorf – DE
12	Inner London - UK	Veneto - IT	Lyon - FR	Barcelona - ES	Inner London - UK	Oxfordshire - UK	Surrey/Sussex - UK	Wien – AT
13	Arnsberg - DE	Pays de la Loire - FR	Piemonte - IT	Karlsruhe - DE	Frankfurt - DE	Dusseldorf – DE	Dusseldorf - DE	Helsinki – FI
14	Emilia Romagna - IT	Castilla y Leon - ES	Helsinki - FI	Piemonte - IT	Veneto – IT	Brussels - BE	Helsinki - FI	Stockholm – SE
15	Danish mainland - DK	Lyon - FR	Frankfurt - DE	Antwerp - BE	Upsalla - SE	Surrey/Sussex - UK	West Midlands - UK	Outer London – UK
16	Rotterdam - NL	Bretagne - FR	Koln - DE	Emilia Romagna - IT	Stockholm - SE	Helsinki – FI	Madrid - ES	Copenhagen – DE
17	Piemonte - IT	Limburg - NL	Arnsberg - DE	Freiburg - DE	Koln – DE	Milan - IT	Milan - IT	Veneto – IT
18	Eindhoven - NL	Emilia Romagna - IT	Antwerp - BE	Nord Pas Calais - FR	Oxfordshire - UK	Munich - DE	Manchester - UK	Antwerp – BE
19	Antwerp - BE	Overijssel - NL	Rotterdam - NL	Madrid - ES	Arnsberg - DE	Madrid - ES	Munich - DE	Piemonte – IT
20	Karlsruhe - DE	Castilla Mancha - ES	Karlsruhe - DE	Eindhoven - NL	Outer London - UK	Oslo - NO	Utrecht - NL	Utrecht – NL
21	Helsinki - FI	Friesland - NL	Toscana - IT	Detmold - DE	Eindhoven - NL	Eindhoven - NL	Wien – AT	Eindhoven – NL
22	Madrid - ES	Dublin - IE	Nord Pas Calais - FR	Tubingen - DE	Piemonte - IT	West Midlands – UK	Copenhagen - DK	Vest for Stor. – DK
23	Outer London - UK	Piemonte - IT	Lazio – IT	Mittelfranken - DE	Karlsruhe - DE	Manchester -UK	Eindhoven - NL	Munich – DE
24	Amsterdam - NL	Nord Pas Calais - FR	Copenhagen - DK	Rheinhes. Pfalz - DE	Rotterdam - NL	Wien - AT	Barcelona - ES	Campania – IT
25	Copenhagen - DK	Provence Alpes - FR	Amsterdam - NL	Weser Ems - DE	S./W.Scotland - UK	Athens - GR	Stuttgart - DE	Toscane – IT
26	Stockholm - SE	Valencia - ES	Göteborg - SE	Danish mainland - DK	Malmö - SE	Barcelona - ES	Gloucestershire - UK	Puglia - IT
27	Lazio - IT	Centre - FR	Madrid - ES	Basque country - ES	Gloucestershire - UK	Utrecht - NL	Danish mainland - DK	Sicilia – IT
28	Göteborg - SE	Weser Ems - DE	Oberosterreich - AT	Braunschweig - DE	West Midlands - UK	Koln - DE	Antwerp - BE	Niederosterreich – AT
29	Nord Pas Calais - FR	Bourgogne - FR	East Flanders - BE	Schwaben - DE	Nord Pas Calais - FR	Stuttgart - DE	Bedfordshire - UK	Emilia Romagna – IT
30	Toscana - IT	Galicia - ES	Pays de la Loire - FR	Göteborg - SE	East Scotland - UK	Lyon - FR	Gelderland - NL	Gelderland – NL

Market dominance and competitors

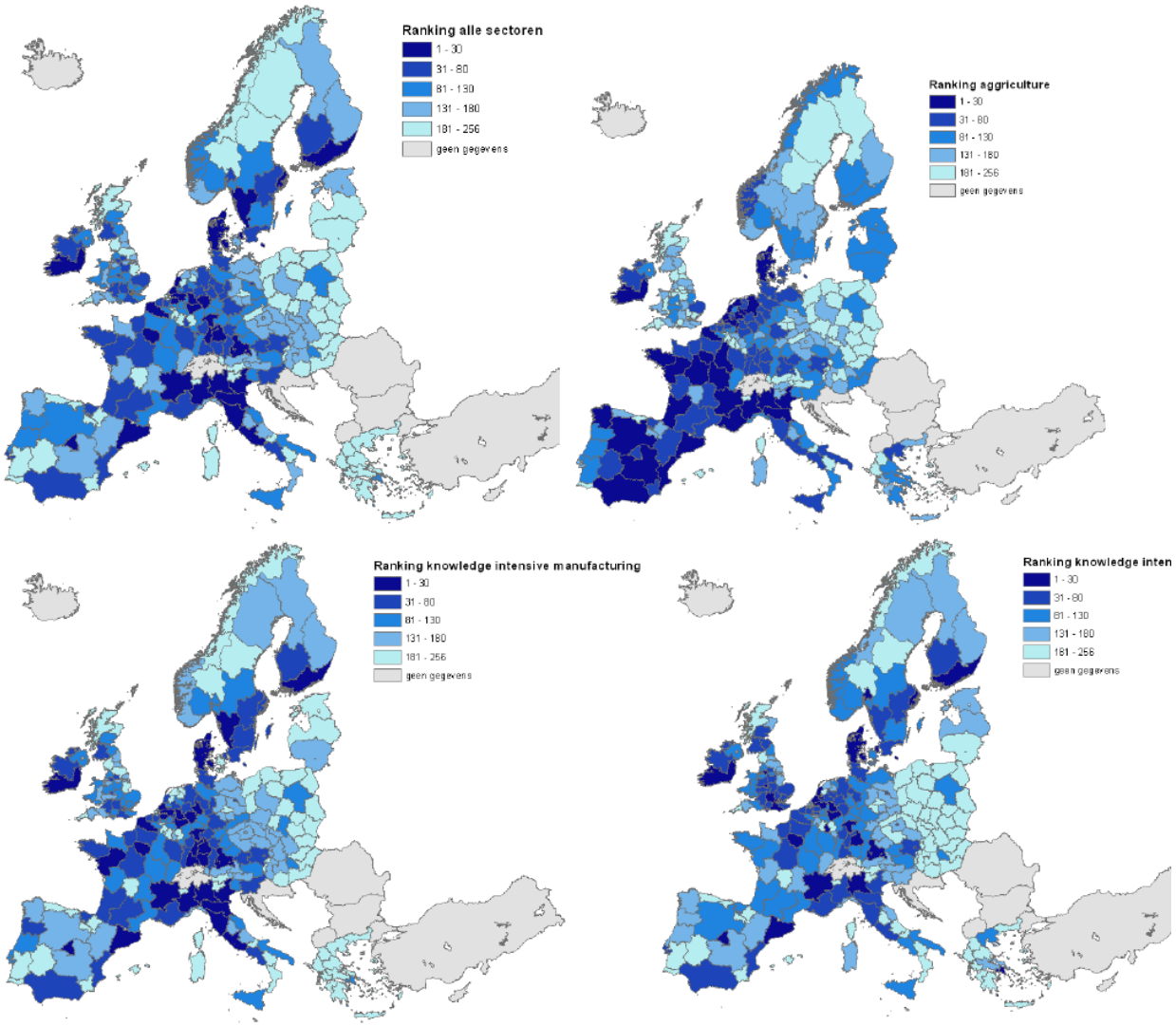
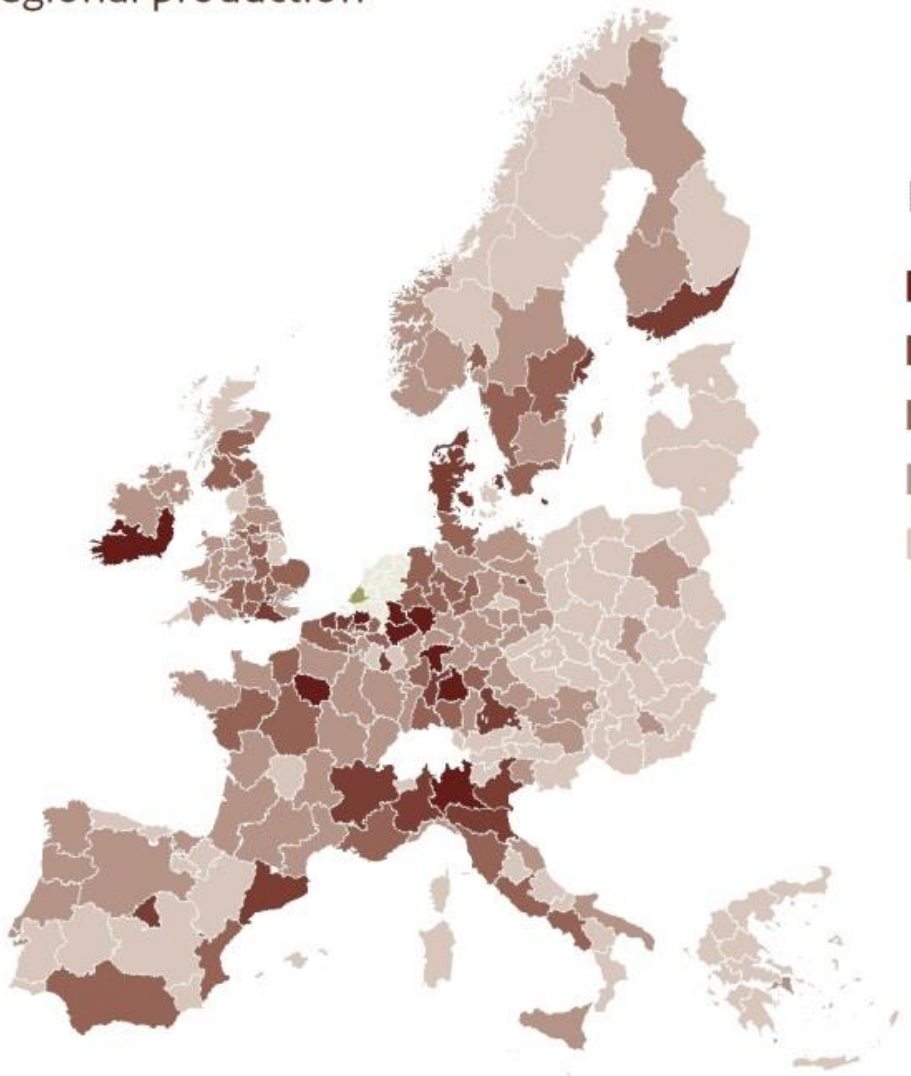


Figure 5.2: Ranking of competitive position of each region in Europe.

European competitors of Rotterdam - The Hague, 2000

Regional production



Rank

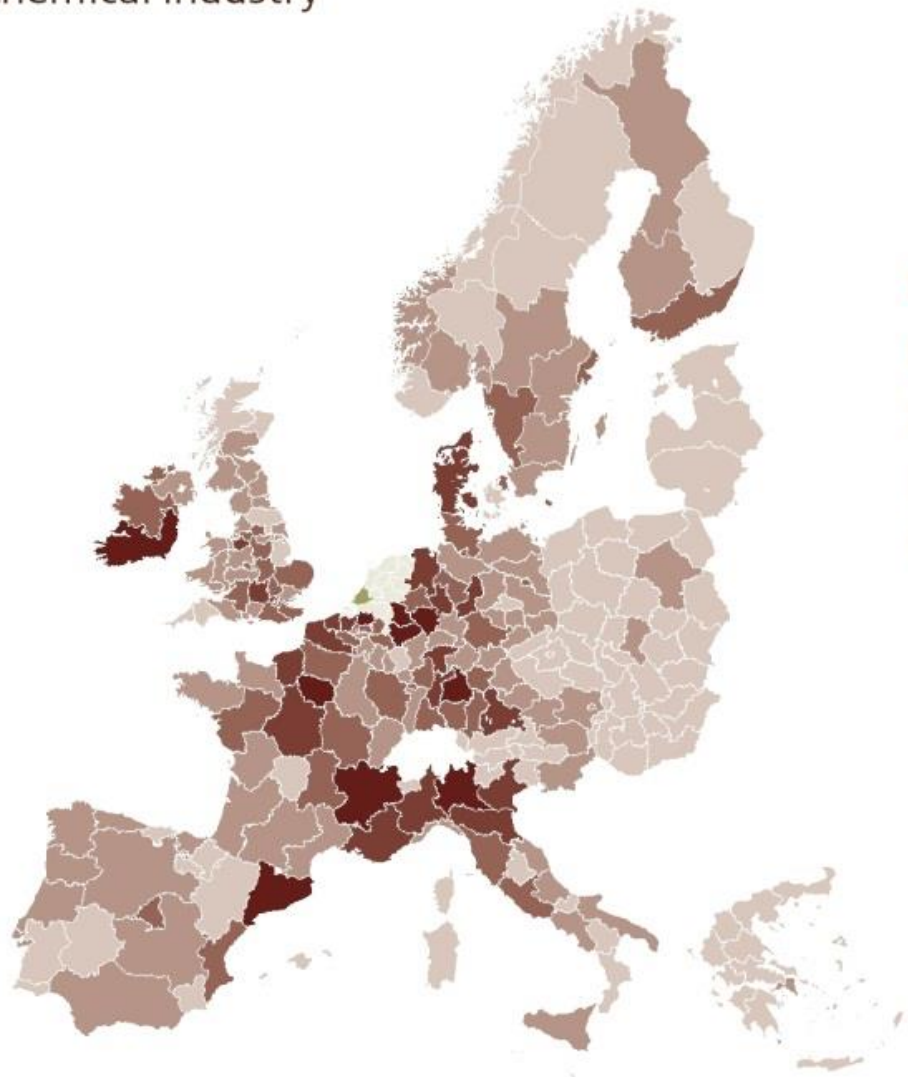
- 1 - 10
- 11 - 30
- 31 - 70
- 71 - 150
- > 150

- Rotterdam - The Hague
- Regions in the same country

1. Île de France
2. Inner London
3. Lombardia
4. Antwerpen
5. Düsseldorf
6. Southern and Eastern
7. Darmstadt
8. Stuttgart
9. Köln
10. Arnsberg

European competitors of Rotterdam - The Hague, 2000

Chemical industry



Rank

- 1 - 10
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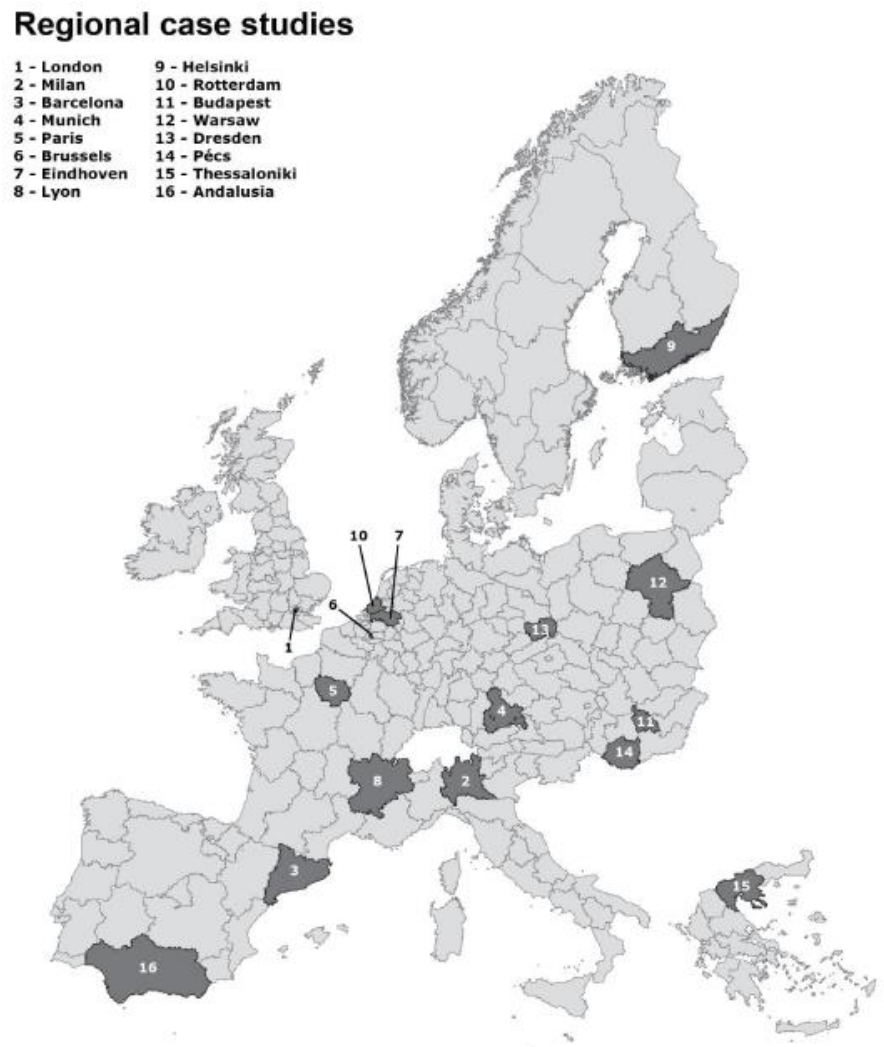
- Rotterdam - The Hague
- Regions in the same country

1. Antwerpen
2. Lombardia
3. Île de France
4. Southern and Eastern
5. Düsseldorf
6. Stuttgart
7. Arnsberg
8. Köln
9. Rhône-Alpes
10. Cataluña

Case-studies

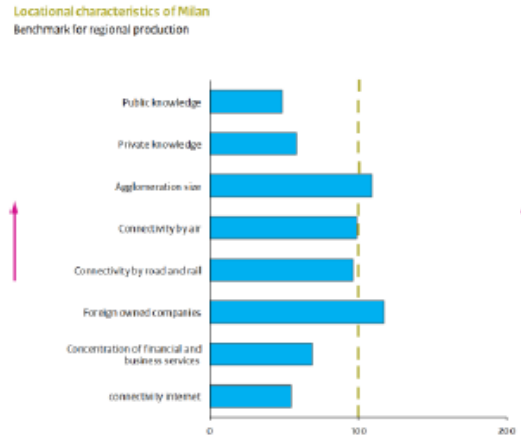


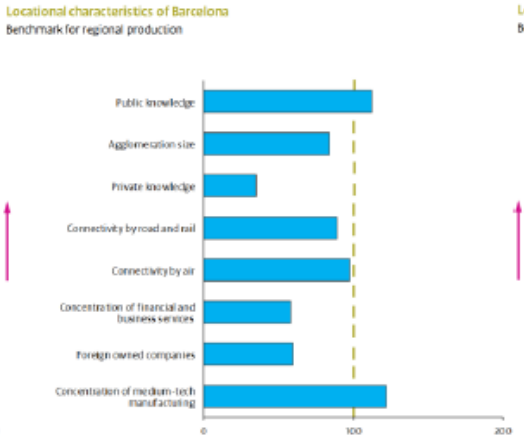
Network determinants and benchmarks

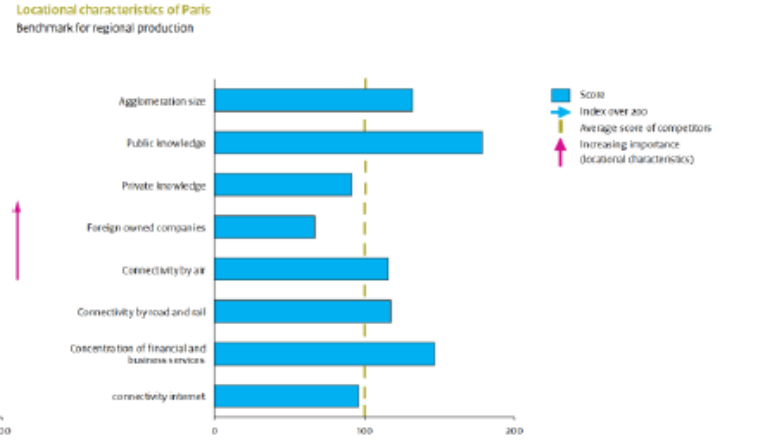
Innovation	Region Size
R&D business (Eurostat)	Population (Eurostat)
number of patents per inhabitant (Eurostat)	Active population (Eurostat)
R&D public (Eurostat)	Population density (Eurostat)
Ranking university (The 2008 QS university ranking 600)	**Infrastructure**
percentage company access broadband internet (Eurostat)	accessibility by air index (Espon)
	accessibility by road & rail index (Espon)
Supply chain Specialization in:	**Specialization (location quotients) in:**
agriculture	Agriculture
knowledge intensive manufacturing	knowledge intensive manufacturing
knowledge intensive manufacturing - high tech	knowledge intensive manufacturing - high tech
knowledge intensive manufacturing - medium high tech	knowledge intensive manufacturing - medium high tech
knowledge intensive manufacturing - medium low tech	knowledge intensive manufacturing - medium low tech
knowledge intensive financial services	knowledge intensive financial services
knowledge intensive services	knowledge intensive services
financial & business services	financial & business services
Input openness in:	**Labour market**
agriculture	percentage employment 55+ (Eurostat)
knowledge intensive manufacturing	Participation - percentage employment women (Eurostat)
knowledge intensive manufacturing - high tech	percentage unemployment* (Eurostat)
knowledge intensive manufacturing - medium high tech	percentage long term unemployment* (Eurostat)
knowledge intensive manufacturing - medium low tech	
knowledge intensive financial services	**Regional specialization**
knowledge intensive services	Product specialization
financial & business services	Supply chain specialization

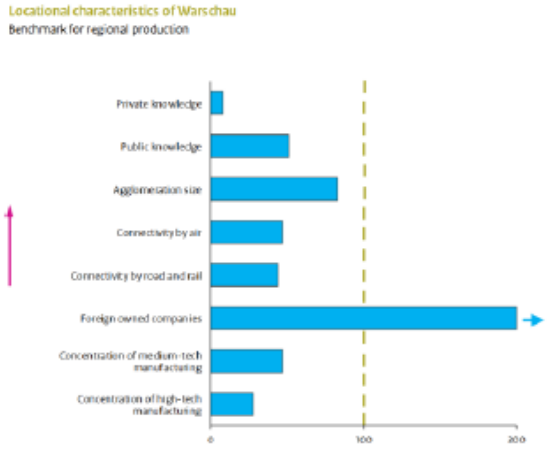
* The inverse of the indicator was taken.

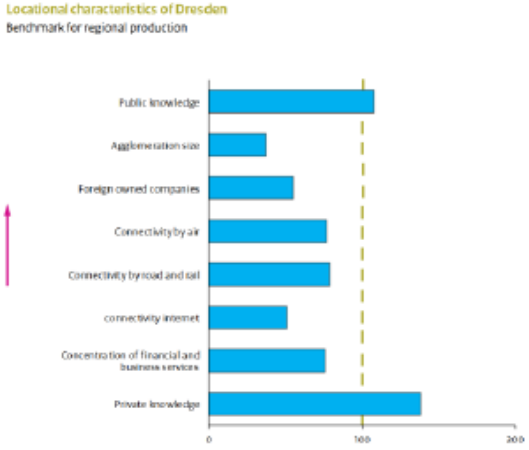
Network determinants and benchmarks

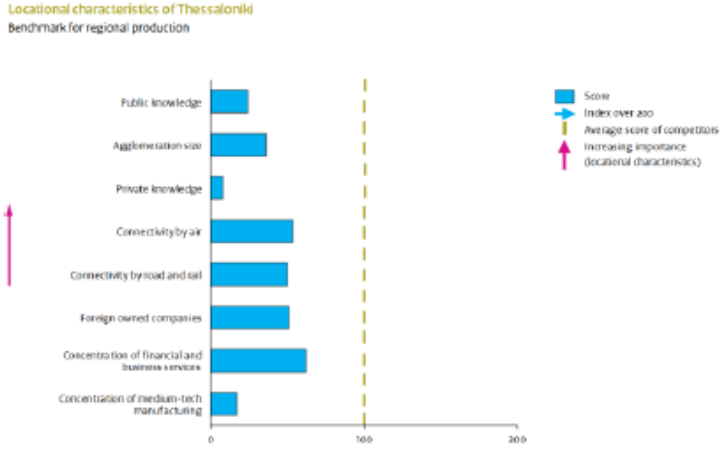






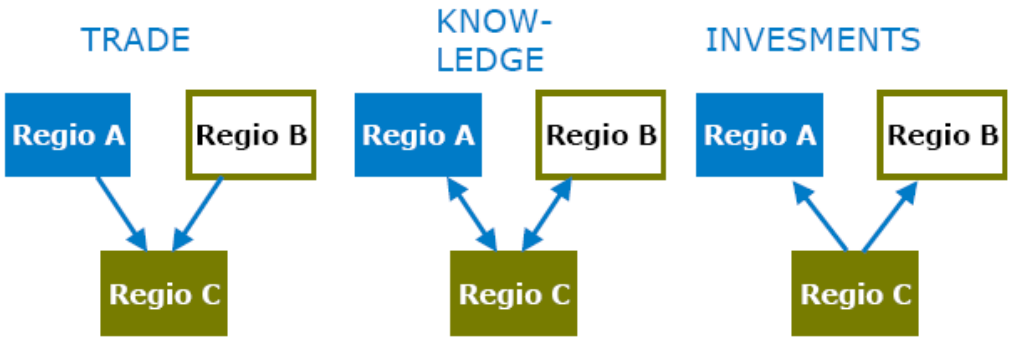






Conclusions and implications

1. A new measure for revealed competitiveness
2. Valuable input for EU-cohesion policy
3. Valuable input for regions (smart specialization)
4. Work in progress: knowledge networks and FDI-networks



5. Work in progress: spatial econometric estimation of growth equations (stochastic frontier analysis) with 3 network and proximity matrices in W-definitions
6. Other networks than knowledge are probably more determining for regional development than knowledge networks
7. Evolutionary economic geography links to elated research fields

Related variety, unrelated variety and regional economic growth in a cross-section of European regions

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Related variety on a European scale: beyond the agglomeration ambiguity?

- Burgeoning agglomeration discussion starting with Glaeser (1992) finds no conclusive answers
- This is shown in - by now three - meta-studies: Melo et al. (2009), De Groot et al. (2009) and Beaudry & Schiffaurova (2009)
- Conflicting empirical outcomes: measurement issues and/or conceptual weakness?
- Related variety has been proposed as a new conceptual theme potentially pulling agglomeration beyond this ambiguity
- Embedded in Evolutionary Economic Geography
- Until now especially regional studies on country level, starting with Frenken cs. (2007); little evidence on a pan-European scale. Same processes and conclusions?
- Place-based development strategies and medium-sized cities in Europe

Hypotheses

Hypothesis 1: *Regions with a sector structure of related variety experience an increased rate of product innovation, which leads to higher employment on the short run and to both higher employment and higher productivity in the long run*

Hypothesis 2: *Regions with a sector structure of unrelated variety experience less job losses from asymmetric shocks which leads to lower unemployment, more so in the long run than in the short run*

Hypothesis 3: *Regions with a sector structure of specialization experience an increased rate of process innovation and reduced production costs which leads to higher productivity, more so in the short run than in the long run. To the extent that process innovation is labor saving, it will lead to lower employment in both the short and long run.*

Hypotheses (simplified for testing)

Hypothesis 1: *In the short run employment growth is positively related to related variety, negatively related to specialization*

Hypothesis 2: *In the short run labor productivity growth is positively related to specialization*

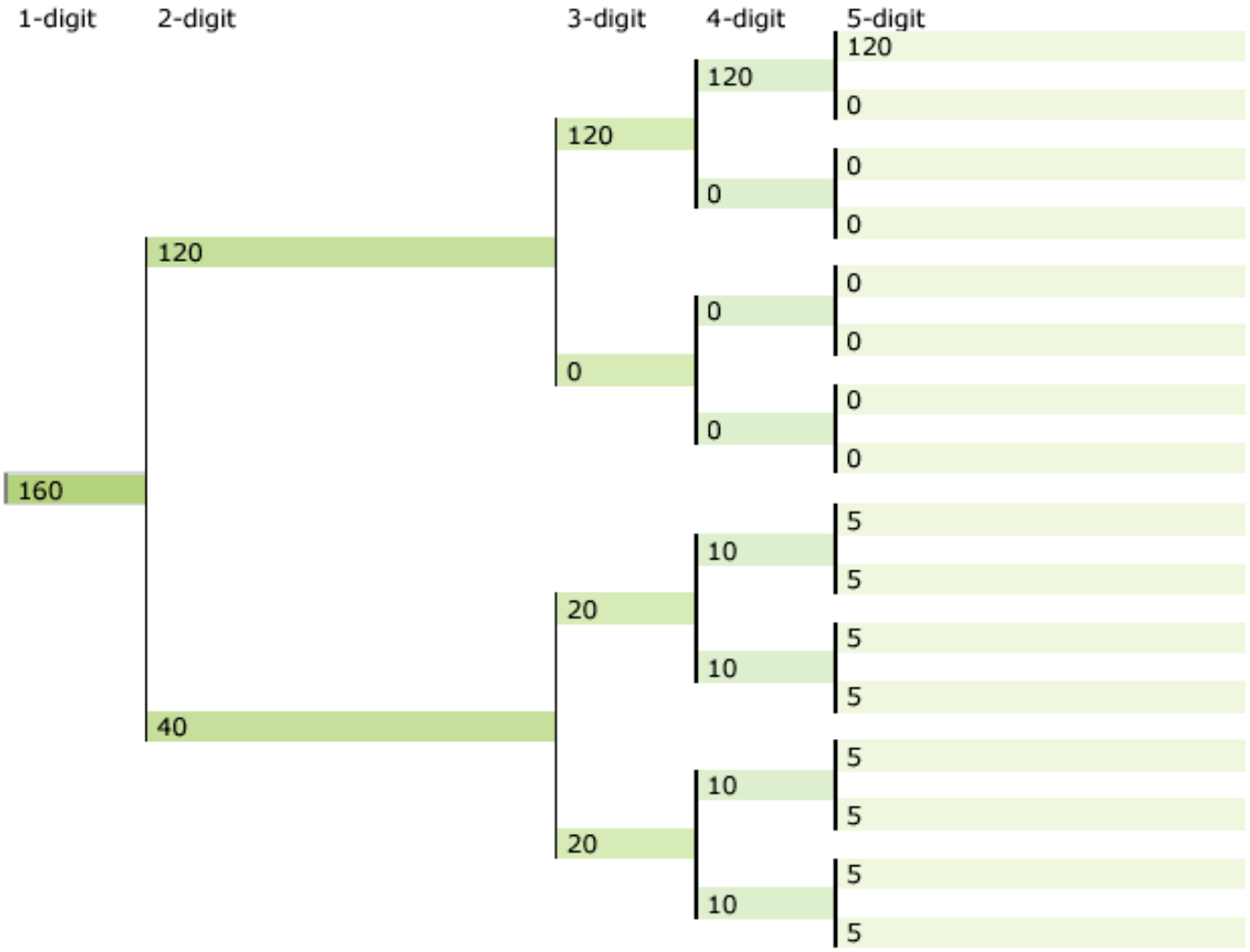
Hypothesis 3: *In the short run unemployment growth is negatively related to unrelated variety*

Dogaru et al (2011, 2013): employment growth, productivity growth, old- versus new Europe – spatial heterogeneity, spatial correlation (size, objective-1).

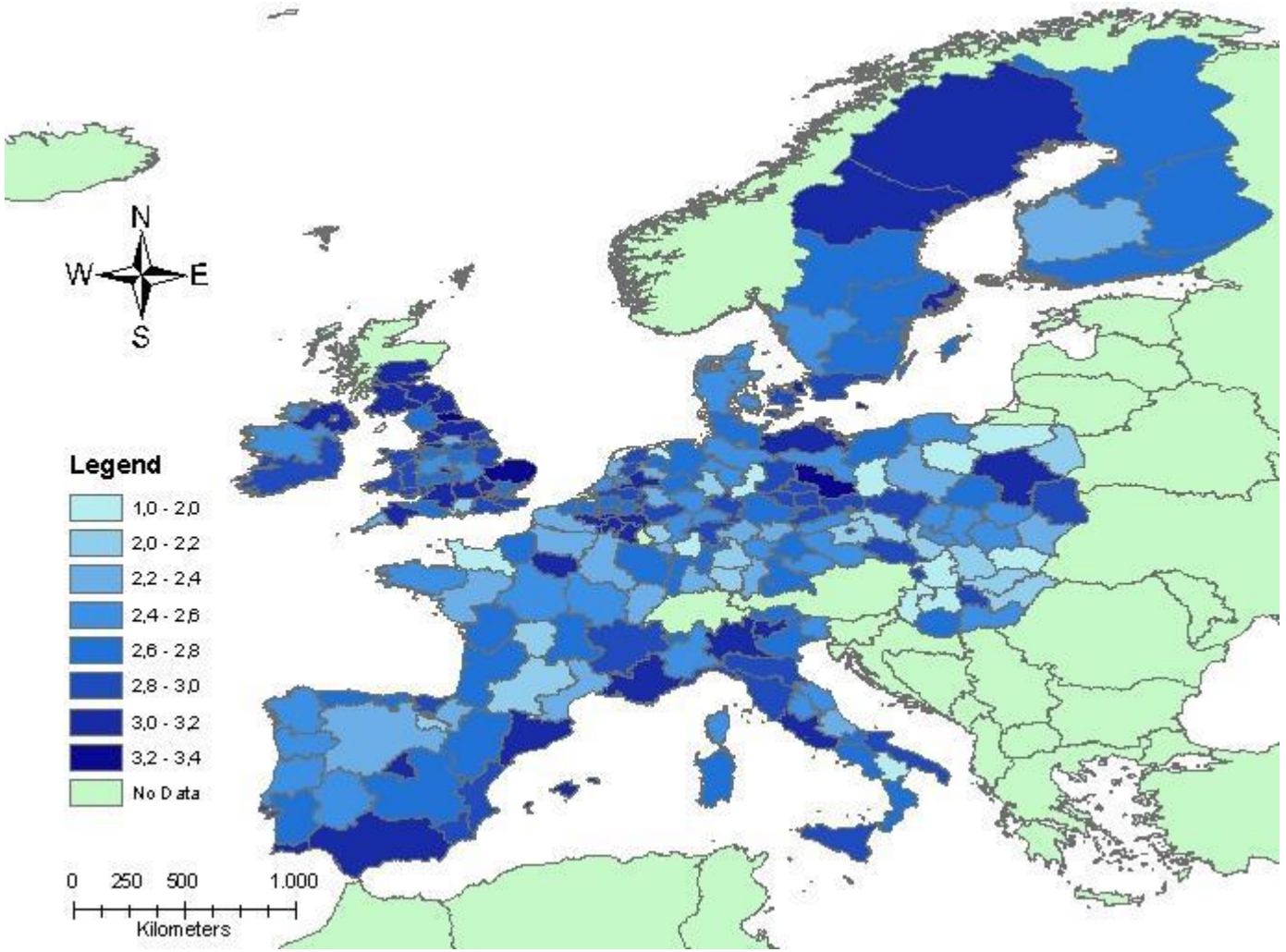
Data

1. Variety and specialization measures: AMADEUS-dataset (Bureau van Dijk), firm-level (n=9,837,479) for the period 1999-2009, aggregation to NUTS2-level and framed in CE sectoral employment data.
2. NUTS2-regions in: Belgium, Danmark, Finland, France, Ireland, Italy, Portugal, The Netherlands, Spain, Sweden, United Kingdom, and new member states: Czech Republic, Hungary, Poland, Slowakia.
3. Productivity (growth), Employment (growth), wages: Cambridge Econometrics, 2 periods.
4. Unemployment (growth) and control variables: EUROSTSAT and Netherlands Environmental Assessment Agency (PBL), Dogaru et al (2013).
5. Present controls: initial levels, population density, human capital (education), investments, R&D, wages, accesssibility/market potential, new member state, spatial regimes
6. Explain growth from level beginning period (cross-sectional)
7. Spatial dependence and spatial heterogeneity

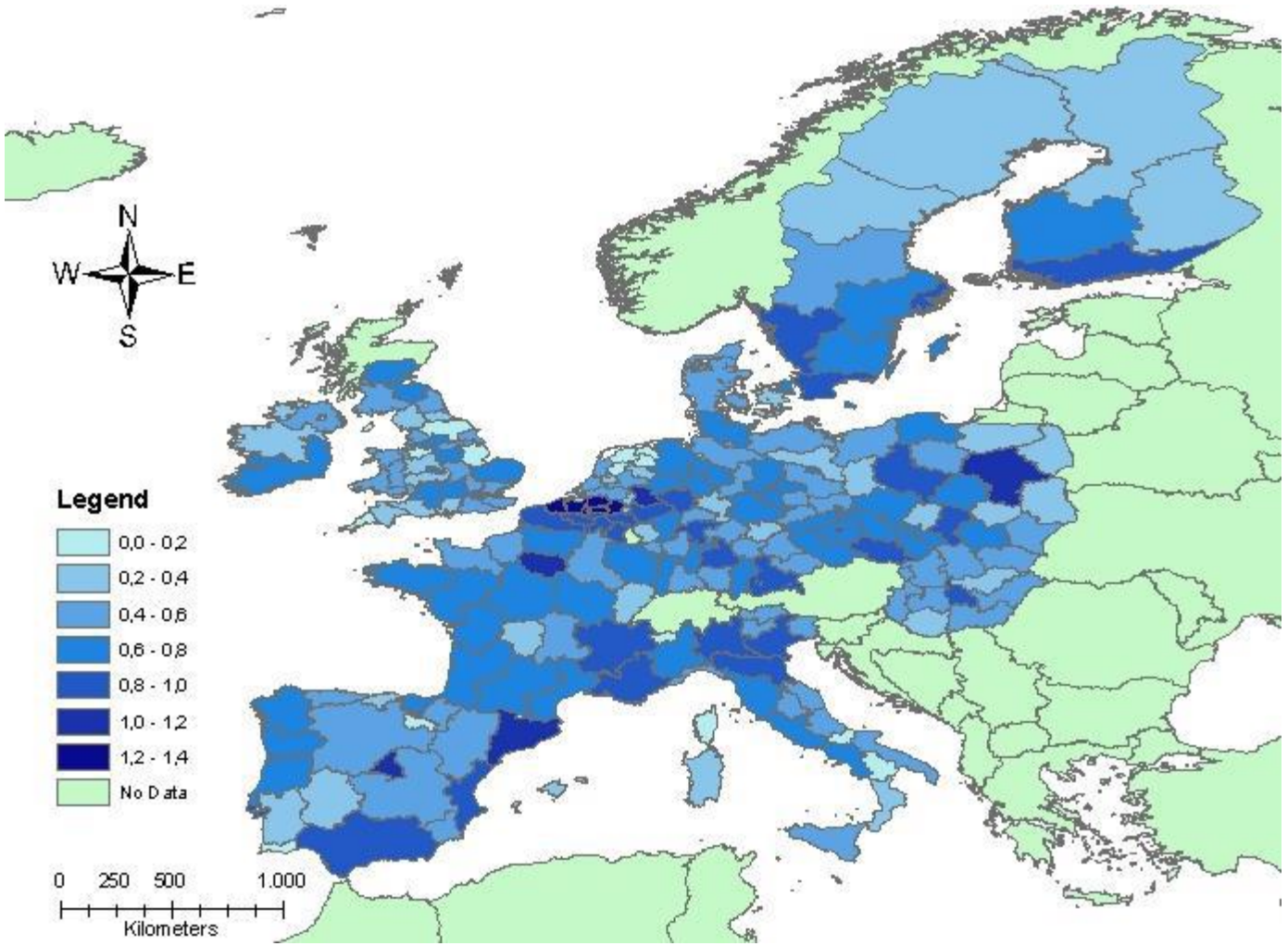
(Un)related variety



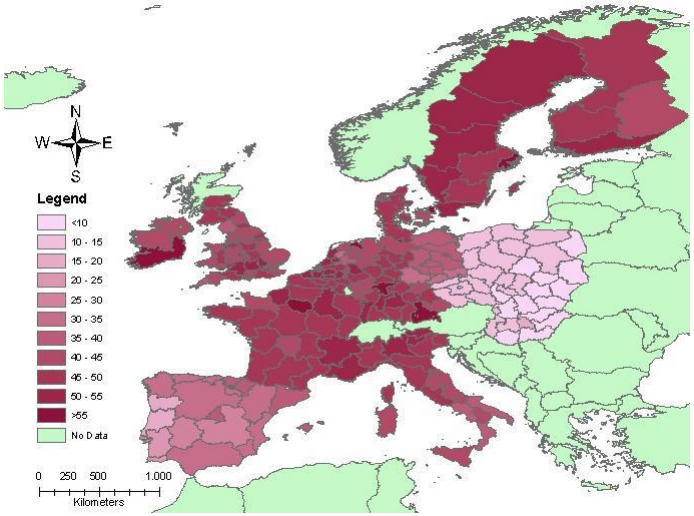
Unrelated variety (1 digit sector entropy)

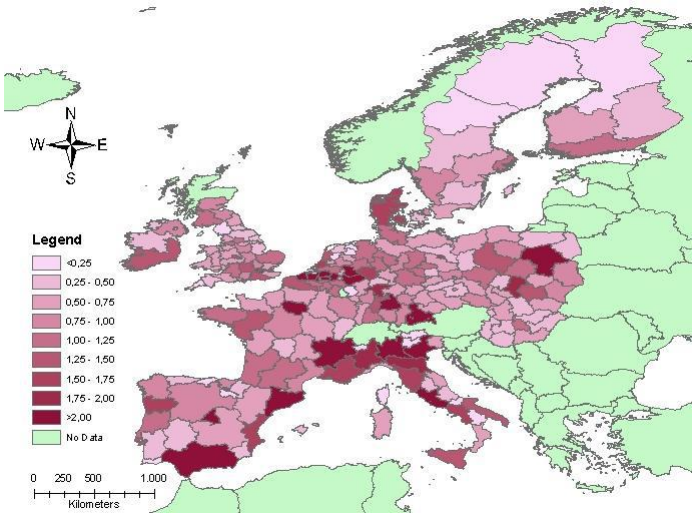


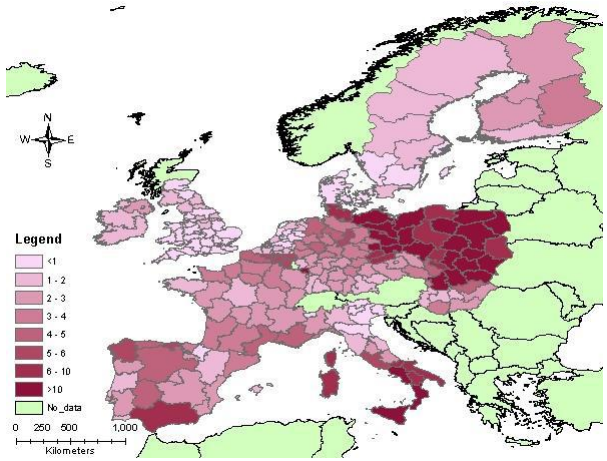
Related variety (Δ 2-4 digit sector entropy)



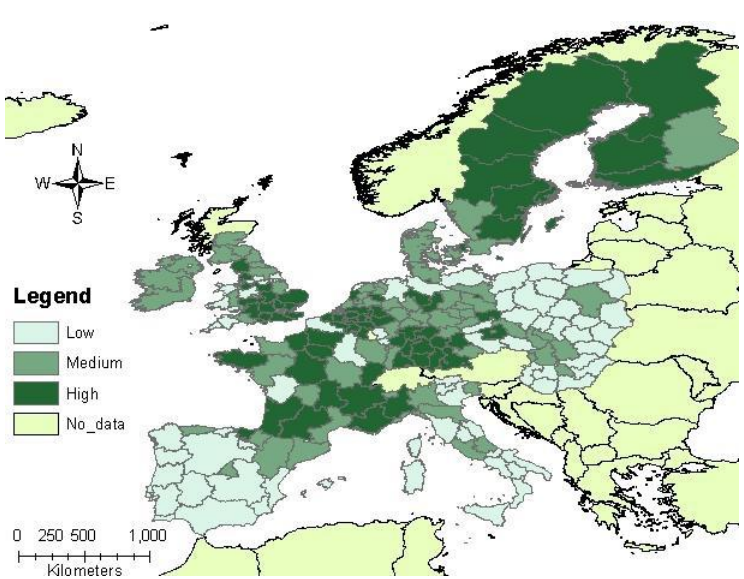
Controls (prod., empl., unempl. 2000)

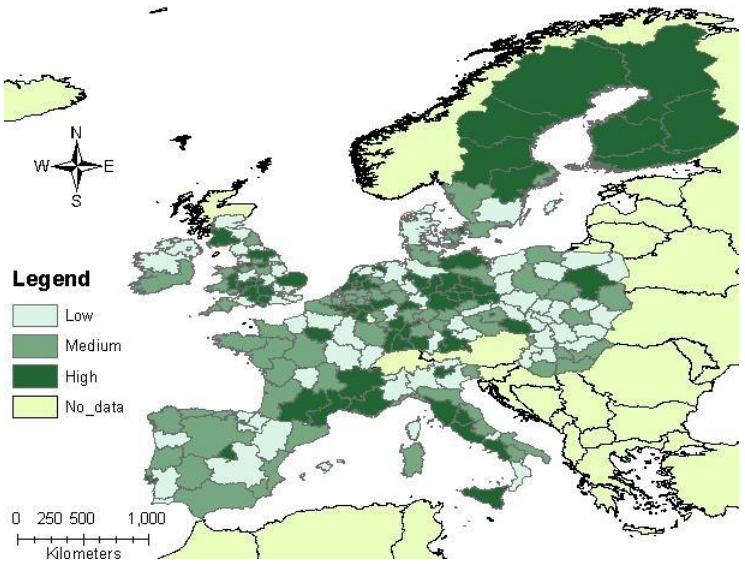






Controls (private R&D, public R&D 2000)





Employment growth models
(hypothesis: related variety +, specialization-)

Table 2a: Employment Growth

Explanatory Variables	(1) OLS Model		(2) Spatial Model with Power 1		(3) Spatial Model with Power 2	
(Constant)	0,300	*0,216*	0,303	*0,189*	0,312	*0,164*
Employment 2000	-0,025	*0,013*	-0,028	*0,011*	-0,027	*0,010*
Private R&D	-0,005	*0,006*	-0,003	*0,005*	0,000	*0,005*
Public R&D	-0,006	*0,006*	-0,003	*0,005*	0,000	*0,005*
Openness Economy	0,052	*0,017*	0,048	*0,015*	0,032	*0,013*
Market Potential	-0,092	*0,021*	-0,069	*0,018*	-0,047	*0,016*
Education	0,024	*0,015*	0,020	*0,013*	0,012	*0,011*
Population Density	0,005	*0,006*	0,005	*0,005*	0,005	*0,005*
Wages	0,043	*0,011*	0,030	*0,010*	0,017	*0,009*
Related Variety	0,078	*0,040*	0,088	*0,035*	0,084	*0,030*
Unrelated Variety	0,035	*0,015*	0,029	*0,013*	0,024	*0,011*
Specialization	-0,368	*0,120*	-0,274	*0,105*	-0,194	*0,091*
W_Employment Growth			0,950	*0,035*	0,919	*0,041*
Summary Statistics:						
N	205		205		205	
R^2	0,265		0,291		0,402	
BP (heteroskedasticity)			42,002	*0,000*	45,915	*0,000*
LR (spatial lag)			37,583	*0,000*	80,966	*0,000*
LM (spatial error)			48,364	*0,000*	2,484	*0,115*

Employment growth models
(hypothesis: related variety +, specialization-)

Table 2c: Employment Growth (regimes)

	(1) Regime Objective 1				(2) Regime Top 75 University				(3) Regime Capital Region			
Explanatory Variables	Obj 1		No Obj1		Top University		No Top University		Capital		No Capital	
(Constant)	0,637	*0,244*	0,093	*0,281*	0,519	*0,215*	0,687	*0,426*	0,706	*0,212*	-0,146	*0,536*
Employment 2000	-0,020	*0,012*	-0,028	*0,017*	-0,032	*0,011*	0,018	*0,030*	-0,038	*0,011*	0,030	*0,046*
Private R&D	-0,004	*0,006*	0,000	*0,008*	-0,001	*0,005*	-0,008	*0,011*	0,000	*0,005*	-0,010	*0,025*
Public R&D	0,006	*0,005*	-0,040	*0,011*	-0,001	*0,005*	0,004	*0,014*	0,002	*0,005*	-0,017	*0,017*
Openness Economy	0,021	*0,023*	0,030	*0,018*	0,032	*0,015*	0,000	*0,042*	0,024	*0,014*	0,065	*0,063*
Market Potential	-0,049	*0,023*	-0,076	*0,025*	-0,049	*0,017*	-0,065	*0,038*	-0,050	*0,017*	-0,043	*0,060*
Education	0,003	*0,014*	0,040	*0,019*	0,015	*0,011*	-0,084	*0,058*	0,010	*0,011*	0,035	*0,070*
Population Density	0,007	*0,006*	0,008	*0,008*	0,009	*0,005*	-0,005	*0,010*	0,008	*0,005*	-0,019	*0,021*
Wages	-0,010	*0,012*	0,065	*0,014*	0,019	*0,010*	-0,004	*0,023*	0,014	*0,009*	0,008	*0,033*
Related Variety	0,062	*0,036*	0,186	*0,056*	0,096	*0,035*	0,069	*0,071*	0,108	*0,033*	-0,069	*0,120*
Unrelated Variety	0,026	*0,013*	0,000	*0,020*	0,033	*0,013*	0,002	*0,022*	0,018	*0,011*	0,068	*0,084*
Specialization	-0,103	*0,165*	-0,137	*0,114*	-0,202	*0,101*	0,184	*0,293*	-0,244	*0,096*	-0,217	*0,370*
W_Employment Growth	0,865	*0,059*			0,920	*0,041*			0,924	*0,039*		
Summary Statistics:												
N	205				205				205			
R^2	0,527				0,437				0,447			
Chow-Wald	40,2	*0,000*			13,2	*0,355*			18,6	*0,100*		
BP (heteroskedasticity)	18,958	*0,000*			12,812	*0,000*			3,565	*0,059*		
LR (spatial lag)	65,9	*0,000*			79,6	*0,000*			83,4	*0,000*		
LM (spatial error)	0,457	*0,499*			2,072	*0,150*			1,042	*0,307*		

See notes below table 1. Coefficients that differ significantly with an alpha of 0,05 are boxed.

Productivity growth models (hypothesis: specialization +)

Table 3a: Productivity Growth

Explanatory Variables	(1) OLS Model		(2) Spatial Model with Power 1		(3) Spatial Model with Power 2	
(Constant)	0,463	*0,167*	0,048	*0,140*	-0,036	*0,121*
Productivity 2000	-0,223	*0,018*	-0,168	*0,015*	-0,092	*0,014*
Private R&D	0,024	*0,005*	0,017	*0,004*	0,007	*0,004*
Public R&D	-0,006	*0,005*	-0,005	*0,004*	-0,001	*0,004*
Openness Economy	-0,032	*0,016*	-0,025	*0,013*	-0,022	*0,011*
Market Potential	0,079	*0,018*	0,075	*0,015*	0,055	*0,013*
Education	0,066	*0,012*	0,054	*0,010*	0,030	*0,009*
Population Density	-0,003	*0,005*	-0,004	*0,004*	-0,004	*0,004*
Wages	0,007	*0,014*	0,008	*0,012*	0,004	*0,010*
Related Variety	-0,028	*0,021*	-0,026	*0,018*	-0,018	*0,015*
Unrelated Variety	0,005	*0,013*	0,004	*0,011*	0,000	*0,009*
Specialization	0,560	*0,103*	0,414	*0,086*	0,268	*0,074*
W_Productivity Growth			0,960	*0,027*	0,899	*0,043*
Summary Statistics:						
N	205		205		205	
R^2	0,759		0,781		0,837	
BP (heteroskedasticity)			55,010	*0,000*	78,453	*0,000*
LR (spatial lag)			57,061	*0,000*	113,714	*0,000*
LM (spatial error)			39,490	*0,000*	0,051	*0,821*

See the notes below table 1.

Productivity growth models (hypothesis: specialization +)

Table 3c: Productivity Growth (other regimes)

	(1) Regime Objective 1				(2) Regime Top 75 University				(3) Regime Capital Region			
Explanatory Variables	No Obj 1		Obj1		No Top University		Top University		No Capital		Capital	
(Constant)	0,033	*0,190*	0,232	*0,191*	-0,024	*0,139*	-1,071	*0,302*	-0,230	*0,123*	-1,156	*0,392*
Productivity 2000	-0,127	*0,027*	0,017	*0,029*	-0,098	*0,016*	0,103	*0,075*	-0,102	*0,013*	-0,153	*0,058*
Private R&D	0,003	*0,005*	0,022	*0,006*	0,015	*0,004*	-0,019	*0,009*	0,010	*0,003*	-0,029	*0,025*
Public R&D	0,003	*0,004*	-0,020	*0,009*	0,000	*0,004*	-0,010	*0,011*	-0,004	*0,003*	0,035	*0,012*
Openness Economy	-0,047	*0,020*	-0,020	*0,014*	-0,040	*0,012*	-0,021	*0,034*	-0,041	*0,010*	0,035	*0,036*
Market Potential	0,051	*0,019*	0,086	*0,019*	0,044	*0,013*	0,065	*0,029*	0,048	*0,012*	0,120	*0,033*
Education	0,050	*0,011*	-0,010	*0,015*	0,024	*0,009*	-0,022	*0,044*	0,026	*0,008*	0,099	*0,050*
Population Density	-0,002	*0,005*	-0,019	*0,006*	-0,005	*0,004*	-0,011	*0,008*	-0,002	*0,004*	-0,037	*0,013*
Wages	0,009	*0,010*	-0,096	*0,027*	-0,006	*0,011*	0,011	*0,018*	0,009	*0,009*	0,026	*0,049*
Related Variety	-0,020	*0,016*	-0,007	*0,027*	-0,028	*0,016*	-0,015	*0,034*	-0,025	*0,014*	-0,095	*0,079*
Unrelated Variety	-0,009	*0,010*	0,042	*0,015*	-0,010	*0,010*	0,017	*0,017*	-0,010	*0,008*	0,094	*0,071*
Specialization	0,268	*0,146*	0,156	*0,088*	0,153	*0,077*	0,334	*0,296*	0,188	*0,068*	0,965	*0,260*
W_Productivity Growth	0,937	*0,032*			0,895	*0,044*			0,890	*0,043*		
Summary Statistics:												
N	205				205				205			
R^2	0,861				0,864				0,887			
Chow-Wald	49,6	*0,000*			39,3	*0,000*			85,8	*0,000*		
BP (heteroskedasticity)	5,520	*0,019*			0,270	*0,603*			0,033	*0,857*		
LR (spatial lag)	129,3	*0,000*			115,5	*0,000*			127,6	*0,000*		
LM (spatial error)	2,885	*0,089*			0,222	*0,638*			0,742	*0,389*		

See notes below table 1. Coefficients that differ significantly with an alpha of 0,05 are boxed.

Unemployment growth models (hypothesis: unrelated variety -)

Table 4a: Unemployment Growth

Explanatory Variables	(1) OLS Model		(2) Spatial Model with Power 1		(3) Spatial Model with Power 2	
(Constant)	1,289	*1,069*	1,536	*0,847*	1,393	*0,788*
Unemployment 2003	-0,561	*0,034*	-0,453	*0,027*	-0,371	*0,030*
Private R&D	-0,105	*0,035*	-0,076	*0,028*	-0,053	*0,026*
Public R&D	-0,032	*0,033*	0,008	*0,026*	0,008	*0,025*
Openness Economy	0,500	*0,099*	0,517	*0,078*	0,428	*0,073*
Market Potential	-0,592	*0,114*	-0,430	*0,090*	-0,324	*0,086*
Education	-0,064	*0,081*	-0,129	*0,064*	-0,118	*0,060*
Population Density	0,083	*0,033*	0,042	*0,026*	0,034	*0,025*
Wages	0,225	*0,065*	0,124	*0,052*	0,078	*0,049*
Related Variety	0,138	*0,137*	0,206	*0,109*	0,191	*0,102*
Unrelated Variety	0,134	*0,084*	0,051	*0,067*	-0,006	*0,063*
Specialization	-4,238	*0,666*	-3,101	*0,528*	-2,305	*0,501*
W_Unemployment Growth			0,961	*0,027*	0,758	*0,058*
Summary Statistics:						
N	205		205		205	
R^2	0,717		0,766		0,814	
BP (heteroskedasticity)			24,087	*0,012*	23,267	*0,016*
LR (spatial lag)			77,163	*0,000*	101,389	*0,000*
LM (spatial error)			21,683	*0,000*	1,992	*0,158*

See the notes below table 1.

Unemployment growth models (hypothesis: unrelated variety -)

Table 4c: Unemployment Growth (other regimes)

	(1) Regime Objective 1				(2) Regime Top 75 University				(3) Regime Capital Region			
Explanatory Variables	No Obj 1		Obj1		No Top University		Top University		No Capital		Capital	
(Constant)	-0,142	*1,212*	0,613	*1,253*	0,546	*0,876*	4,793	*2,063*	2,517	*0,840*	-1,119	*2,120*
Unemployment 2003	-0,346	*0,038*	-0,410	*0,058*	-0,382	*0,030*	-0,286	*0,073*	-0,385	*0,029*	-0,072	*0,103*
Private R&D	-0,040	*0,033*	-0,058	*0,044*	-0,078	*0,028*	-0,024	*0,062*	-0,047	*0,025*	0,494	*0,138*
Public R&D	0,014	*0,026*	-0,038	*0,065*	0,015	*0,027*	0,061	*0,075*	0,031	*0,024*	-0,124	*0,090*
Openness Economy	-0,080	*0,123*	0,586	*0,117*	0,497	*0,078*	-0,116	*0,222*	0,413	*0,071*	1,039	*0,282*
Market Potential	-0,089	*0,121*	-0,377	*0,138*	-0,293	*0,093*	-0,315	*0,176*	-0,367	*0,090*	-0,564	*0,257*
Education	-0,051	*0,076*	-0,086	*0,104*	-0,116	*0,059*	-0,337	*0,314*	-0,164	*0,058*	-0,426	*0,346*
Population Density	-0,006	*0,031*	0,089	*0,045*	0,055	*0,028*	0,006	*0,054*	0,012	*0,027*	0,259	*0,094*
Wages	-0,038	*0,067*	0,178	*0,082*	0,132	*0,052*	-0,238	*0,123*	0,027	*0,048*	0,447	*0,171*
Related Variety	0,228	*0,127*	0,047	*0,189*	0,159	*0,110*	0,469	*0,276*	0,229	*0,101*	-0,476	*0,480*
Unrelated Variety	0,055	*0,078*	-0,012	*0,108*	-0,036	*0,071*	0,132	*0,126*	0,003	*0,059*	0,936	*0,440*
Specialization	0,105	*0,933*	-2,606	*0,628*	-2,232	*0,536*	1,183	*1,544*	-2,953	*0,502*	-3,224	*1,928*
W_Unemployment Growth	0,714	*0,063*			0,784	*0,058*			0,767	*0,056*		
Summary Statistics:												
N	205				205				205			
R^2	0,840				0,832				0,844			
Chow-Wald	30,1	*0,003*			24,7	*0,016*			40,6	*0,000*		
BP (heteroskedasticity)	0,243	*0,622*			2,099	*0,147*			0,016	*0,899*		
LR (spatial lag)	86,1	*0,000*			108,7	*0,000*			107,3	*0,000*		
LM (spatial error)	0,026	*0,872*			1,005	*0,316*			5,239	*0,022*		

See notes below table 1. Coefficients that differ significantly with an alpha of 0,05 are boxed.

Conclusions and further research

1. First estimations in growth models with related variety in a European context. Important for EU (cohesion and conpetitiveness) policies.
2. Hypotheses employment and productivity growth confirmed (related variety hypothesis is more universal), but unemployment growth rejected - testing for robustnes needed!
3. Period dependence (resilience!). Fixed effects, panel model
4. The measurement issues in meta-studies remain in our complementarity approach – more robustness tetst needed by estimation strategies that capture spatial dpenedence and sptial heterogeneity, in EU even more so than in countries
5. Work in progress: panel estimation, **network positions** (trade, FDI, knowledge) in flows as proximities
6. Work in progress: continuous space modeling (Duranton & Overman 2005) to avaid MAUP and conceptual base: aggloomeration forces are microeconomic in character
7. Work in progress: causality issues (variety <-> agglomeration)