“Smart specialisation and societal innovation can only work if choices are based on real knowledge of local potential and if the right actors are involved.”

Markku Markkula (Parliament Magazine, October 2015, p.50)

Local knowledge is the foundation for regional competitive advantage, but little attention has been given to the actual type of knowledge produced by the variety of actors within specific places...
...universal best-practice prescribed to unique regional settings...
Local Socio-Economic Indicators

Prosperity & Economic Growth

Best-Practice Development

Capturing Local Knowledge Production

Opportunities in Knowledge Space

Developing Local Potential

Prosperity & Economic Growth

Current Approach | Top Down

Advanced Approach | Bottom Up

Dieter F. Kogler | ERC TechEvo
1. Tracking the Evolution of Local Technologies
2. Knowledge Re-combination & Diversification Opportunities
3. Valuing Knowledge and Creating Development Paths
4. Investing Based on Local Capability

**Prosperity & Economic Growth**

**Developing Local Potential**

**Opportunities in Knowledge Space**

**Capturing Local Knowledge Production**

Advanced Approach | Bottom Up
Knowledge production is a 
- cumulative, 
- path-dependent, and 
- interactive process.

Knowledge [in] space
- Knowledge accumulates 
- Knowledge relatedness

Knowledge in the past
- Provides opportunities, and sets limits 
- Entry, exit, selection
The Knowledge Space

Domain & Connectedness

A power transfer device

Described is an electrical power transfer device for transferring power between two coaxial relatively rotatable components, comprising: an outer core having a magnetic flux guide, an outer electrical winding and a cavity for receiving an inner core; an inner core located at least partially within the cavity, the inner core having a magnetic flux guide and an inner winding, wherein the inner and outer core are arranged to be movable between a first configuration in which the magnetic flux guides of the inner and outer cores separated by a first distance in which power is transferred in use, and a second configuration in which the inner and outer cores are separated by a second distance, in which relative rotation of the inner and outer cores is possible in the second configuration, wherein in the first configuration the magnetic flux guides of the inner and outer cores abut one another.
Fitness (Innovation)

Technology Recombination
"Search Space"

Crowded Space
Productivity $\uparrow$
Potential $\downarrow$

Adventurous Space
Diffusion $\uparrow$
Risk/Potential $\approx$

"Crazy Space"

Potential $\uparrow$
Risk $\uparrow$

Breakthrough/Disruptive Innovation?

Node 645
Edge 25,863
Network Density 0.882
Ave. CC 0.371
Ave. Path length 1.99

Chemistry and Metallurgy
Electricity
Textiles, Paper
New, Cross-over Technologies
Construction
Physics
Transport and Operations
Consumer goods
Mechanical Engineering
<table>
<thead>
<tr>
<th>NUTS 2 Region</th>
<th>01-05</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  FR10</td>
<td>Ile de France</td>
</tr>
<tr>
<td>2  DE11</td>
<td>Stuttgart</td>
</tr>
<tr>
<td>3  DE21</td>
<td>Oberbayern</td>
</tr>
<tr>
<td>4  NL41</td>
<td>Noord-Brabant</td>
</tr>
<tr>
<td>5  DE71</td>
<td>Darmstadt</td>
</tr>
<tr>
<td>6  DEA2</td>
<td>Koln</td>
</tr>
<tr>
<td>7  ITC4</td>
<td>Lombardia</td>
</tr>
<tr>
<td>8  DEA1</td>
<td>Dusseldorf</td>
</tr>
<tr>
<td>9  DE12</td>
<td>Karlsruhe</td>
</tr>
<tr>
<td>10 FR71</td>
<td>Rhone-Alpes</td>
</tr>
<tr>
<td>11 DE13</td>
<td>Freiburg</td>
</tr>
<tr>
<td>12 DE14</td>
<td>Tubingen</td>
</tr>
<tr>
<td>13 DEB3</td>
<td>Rheinhessen-Pfalz</td>
</tr>
<tr>
<td>14 FI18</td>
<td>Etela-Suomi</td>
</tr>
<tr>
<td>15 DE25</td>
<td>Mittelfranken</td>
</tr>
<tr>
<td>16 ITD5</td>
<td>Emilia-Romagna</td>
</tr>
<tr>
<td>17 DEA5</td>
<td>Arnsberg</td>
</tr>
<tr>
<td>18 SE11</td>
<td>Stockholm</td>
</tr>
<tr>
<td>19 DE30</td>
<td>Berlin</td>
</tr>
<tr>
<td>20 DK01</td>
<td>Hovedstaden</td>
</tr>
</tbody>
</table>
...the correlation coefficient between patent counts by region for the two periods is 0.93
...the median number of patents produced across EU15 regions increased from 161 to 521
...the coefficient of variation has declined from 2.07 to 1.73 between the two time periods

...the regions that dropped the most are all located within the UK
...regions that moved up in rankings most sharply, incl. West Finland, Catalonia, Thüringen, Dresden and Brandenburg
International Collaborations

**Local** = Patents developed by inventors residing in one country

**Non-local** = Patents developed by inventors residing in two or more countries

<table>
<thead>
<tr>
<th>Period</th>
<th>Local</th>
<th>Non-local</th>
<th>% of Intern. Patents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980-1984</td>
<td>33,671</td>
<td>2,728</td>
<td>7.5%</td>
</tr>
<tr>
<td>1985-1989</td>
<td>55,707</td>
<td>5,883</td>
<td>9.6%</td>
</tr>
<tr>
<td>1990-1994</td>
<td>70,435</td>
<td>9,836</td>
<td>12.3%</td>
</tr>
<tr>
<td>1995-1999</td>
<td>112,678</td>
<td>21,786</td>
<td>16.2%</td>
</tr>
<tr>
<td>2000-2004</td>
<td>168,037</td>
<td>38,505</td>
<td>18.6%</td>
</tr>
<tr>
<td>2005-2009</td>
<td>213,413</td>
<td>52,039</td>
<td>19.6%</td>
</tr>
<tr>
<td>2010-2014</td>
<td>218,198</td>
<td>50,551</td>
<td>18.8%</td>
</tr>
</tbody>
</table>
### Inter-Regional Collaborations

**Local** = Patents developed by inventors residing in one single NUTS2 region

**Non-local** = Patents developed by inventors residing in two or more NUTS2 regions

<table>
<thead>
<tr>
<th>Period</th>
<th>Local</th>
<th>Non-local</th>
<th>% of Inter-NUTS2 Patents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980-1984</td>
<td>21,149</td>
<td>15,250</td>
<td>41.9%</td>
</tr>
<tr>
<td>1985-1989</td>
<td>33,859</td>
<td>27,731</td>
<td>45.0%</td>
</tr>
<tr>
<td>1990-1994</td>
<td>44,541</td>
<td>35,730</td>
<td>44.5%</td>
</tr>
<tr>
<td>1995-1999</td>
<td>78,782</td>
<td>55,682</td>
<td>41.4%</td>
</tr>
<tr>
<td>2000-2004</td>
<td>121,555</td>
<td>84,987</td>
<td>41.1%</td>
</tr>
<tr>
<td>2005-2009</td>
<td>159,577</td>
<td>105,875</td>
<td>39.9%</td>
</tr>
<tr>
<td>2010-2014</td>
<td>171,043</td>
<td>97,706</td>
<td>36.4%</td>
</tr>
</tbody>
</table>
Source: USPTO, Authors’ own calculation.

Note: Sample is restricted to the patents having two or more collaborators and at least one inventor who resided in a Metropolitan Statistical Area (MSA) in the US or a Census Metropolitan Area (CMA) in Canada at the time of invention.
Inter-regional collaborations in the development of novel products and processes

Average number NUTS2 regions in the portfolio of regions’ patents in two time periods
Is it possible to “predict” the regional technological future (fortune)?
“The proposed [knowledge space] methodology that allows mapping and analyzing regional knowledge spaces provides the opportunity to identify the science and technology domains that are present in a place or even in firms, and then to analyze their properties in terms of size and connectedness as suggested in the smart specialization literature.”

(Kogler et al., 2017: 369)
Policy Insights for Smart Specialization Strategies

“This in turn opens up the opportunity to engage in direct planning initiatives where domains that display a high connectivity level can be attributed special support, or investments are made aiming at the addition of new domains. In this regard, the present study provides unique insights into the evolutionary patterns of regional knowledge production and provides a new window into the ‘black box’ of innovation and technological change.” (Kogler et al., 2017: 369)
The Evolution of Regional Knowledge Spaces

Policy Insights for Smart Specialization Strategies

Dieter F. Kogler

dieter.kogler@ucd.ie

@dfkogler

www.ucd.ie/sdl

Spatial Dynamics Lab

EWRC Session – Global Linkages and Territorial Imbalances in Europe and Beyond – Brussels, Belgium, October 9th, 2018.
ERC TechEvo
Database Architecture