Changing innovation processes models: a chance to break out of path dependency for less developed regions

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Gateway | Empirical and conceptual understandings of how regions are mobilised

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Changing innovation processes models: a chance to break out of path dependency for less developed regions

Presentation structure

- Research purpose
  - where we are?
  - is it possible?
  - what did we measure?
- Introduction
  - can we change?
  - what can we do?
  - what is next?
- Methodology
  - how did we measure?
- Main findings
  - who can change?
  - when and how?
- Further research
  - can we change?
  - what can we do?
The purpose of the research

if and how
less developed regions can change innovation processes models

TO

break out of path dependency

[...and become rich]
So, could it look like on this graph?

Source: own elaboration
From the very beginning differences in prosperity were increasing dramatically.

Europe’s GDP per capita was twice that much of the world:
- Great Britain – $1,706
- USA, Canada – $1,100-1,200
- The rest of the world – $500-700
- Africa – $415

The income gaps have expanded with only few exceptions. The richest countries in 1820 have grown the most.


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The exceptions are...

What is path dependency?

- continued behaviour similar to past behaviour, even in settings where conditions of the business environment have changed dramatically

- a mechanism that drives one product to be dominant over others, even when a superior substitute is introduced at a later stage (i.e. QWERTY keyboard)

SO:

- initial conditions establish a trajectory

REFERS TO:

But how locked-in regions can be unlocked?

an event
a shock
coincidences

co-evolution
in motion

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Concept of co-evolution in motion process

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Distribution of region groups due to the level of availability, absorption and diffusion of knowledge and technology

<table>
<thead>
<tr>
<th>Availability</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
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</thead>
<tbody>
<tr>
<td>Absorption:</td>
<td>low</td>
<td>Traditional Southern regions</td>
<td>Skilled industrial Eastern EU regions</td>
</tr>
<tr>
<td>Diffusion:</td>
<td>low</td>
<td>Knowledge absorbing regions</td>
<td>Public knowledge centres</td>
</tr>
<tr>
<td>Absorption:</td>
<td>medium</td>
<td>Skilled technology regions</td>
<td></td>
</tr>
<tr>
<td>Diffusion:</td>
<td>medium</td>
<td>Metropolitan knowledge intensive services regions</td>
<td></td>
</tr>
<tr>
<td>Absorption:</td>
<td>high</td>
<td>High-tech regions</td>
<td></td>
</tr>
<tr>
<td>Diffusion:</td>
<td>medium</td>
<td></td>
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Developing region

Existing technologies new to the market or to companies (technological frontier)

Exposition

Absorption

Multiplier effects

Economies of scale

Technological hybridization

Related variety

New technologies

Technological diversification

Related variety

New technologies

Ability to exploit knowledge

Growth of absorptive capacity of the region

Policies supporting competencies, infrastructure and innovation-friendly environment

Policies supporting smart specializations

Absorptive capacity of the region

Good governance and business climate

Basic technological literacy

The financing of innovative companies

Pro-active policies

Entrepreneurial discovery of specializations

Performance of the region

Concept of co-evolution in regional innovation systems

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Research questions
The subject of the research
The phases of the research
The method and techniques
Research questions

Is path dependency imminent, or whether it is possible to implement the development paths in accordance with the evolutionary approach? In particular:

1. Is it possible to change the model of innovation processes taking place in a region (is it possible for a region to switch between models)? Is it possible for a region to break out of path dependency?

2. If so, what development paths can be identified in the period 1995-2011 in the studied regions (what transitions between the groups are possible)?
Innovation process model definition
OECD approach

- Gross Domestic Product (GDP) per capita (millions of USD PPP, current prices)
- Gross Domestic Expenditure on R&D (GERD) as share of GDP (percentage points)
- Business R&D Expenditure as a Share of Total R&D Expenditure (percentage points)
- Unemployment Rate (number of unemployed persons as a share of the labour force)
- Percentage of the Labour Force with Tertiary Education (persons with tertiary education – ISCED 5 and 6 – as a percentage of the total labour force)
- Share of Employment in the Primary Sector (number of employees in Agriculture, Hunting, Forestry and Fishing as a share of total employment)
- Share of Employment in Manufacturing (Manufacturing, Mining and Quarrying, Electricity, Gas and Water Supply employees as a share of total employment)
- Share of Employment in the Public Sector (number of employees in Public Administration and Defence, Compulsory Social Security, Education, Health, and Social Work, Other Community, Social and Personal Service Activities, and Private Households with Employed Persons as a share of total employment)
- High and Medium-High Technology (HTM) Manufacturing as a % of Total Manufacturing (number of persons employed in high and medium-high technology manufacturing sectors as a percentage of employment in the manufacturing sector)
- Knowledge-Intensive Services (KIS) as a Percentage of Total Services (number of persons employed in knowledge-intensive service sectors as a percentage of employment in the service sector)
- PCT Patent Applications per Million Inh. (annual average over the last three years)
- Population Density (persons per square km)

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The subject of the study

- a set of **12 indicators** (selected by OECD) that differentiate regions as per their innovation processes.
- The survey covered **240 regions** (from 23 countries).
- The analysed **period of time** covered **17 years** from 1995 to 2011.
The scientific approach

The regional **groupings**

**Unifying** the groups

17 compilations (for each year separately)

7 same models (in each compilation)

Analyse of the **transitions** of all regions

Development paths

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The method and techniques

• For the regional groupings we used a **hierarchical agglomeration method**.

• In this case, the classification process of $n$ objects began with the creation of $n$ single-element cluster that in the next $(n-1)$ steps were combined in another concentration, until one cluster containing all objects was achieved.

• The result of clustering could be represented by a **dendrogram**.

• Distances between the objects were measured using a **Euclidean metric**, and for creating clusters the **Ward's method** was used.

• It involves minimizing the variance of the intragroup and is recommended as a method to extract the **most homogeneous** concentration. The values of variables describing the regions have been **standardized** in order to compensate the classifying impact of each variable.
Innovation processes groups and models

Transitions between models

Conclusions

Further research
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Relative performance of the models
MAN.1 | Knowledge-intensive city/capital districts

- Population Density
- Gross Domestic Product (GDP) per capita
- Gross Domestic Expenditure on R&D (GERD) as share of...
- Business R&D Expenditure as a Share of Total R&D...
- Unemployment Rate
- Percentage of the Labour Force with Tertiary Education
- Share of Employment in the Public Sector
- Share of Employment in the Primary Sector
- Share of Employment in Manufacturing
- High and Medium-High Technology (HTM) Manuf. as % of Total...
- Knowledge-Intensive Services (KIS) as a Percentage of Total...
- PCT Patent Applications per Million Inhabitants
- Business R&D Expenditure as a Share of Total R&D...

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Relative performance of the models

TNS.2 | Average performance regions

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- Population Density
- Gross Domestic Product (GDP) per capita
- Business R&D Expenditure as a Share of Total R&D Expenditure
- High and Medium-High Technology (HTM) Manuf. as %
- Knowledge-Intensive Services (KIS) as a Percentage of Total Services
- PCT Patent Applications per Million Inhabitants
- Share of Employment in Manufacturing
- Share of Employment in the Primary Sector
- Share of Employment in the Public Sector
- Unemployment Rate
- Percentage of the Labour Force with Tertiary Education
- Share of Employment in Manufacturing
- Gross Domestic Expenditure on R&D (GERD) as share of GDP

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Regional innovation models’ changes
existing development paths in 1995-2011

Towards knowledge intensive services-driven models

KIS Group
Knowledge intensive services-driven regions

TNS Group
Transition regions

MAN Group
Manufacturing-driven regions

KIS.1 Knowledge-intensive city/capital districts
KIS.2 Knowledge and technology hubs
KIS.3 Knowledge and technology pretenders
KIS.4 Knowledge and technology hubs
TNS.1 High education driven transition regions
TNS.2 Average performance regions
MAN.1 High and Medium High Technology (HTM)-driven regions
MAN.2 Primary-sector based manufacturing regions

Coloured numbers mean the number of the path changing cases
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existing development paths in 1995-2011

Towards high and medium high technology-driven models
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Percentage of in-coming and out-going regions to/out the models from group TNS

**Given model**

1. **KIS.2** Knowledge and technology hubs
2. **KIS.3** Knowledge and technology pretenders
3. **TNS.2** Average performance regions
4. **MAN.2** Primary-sector based manufacturing regions
5. **MAN.1** High and Medium High Technology-driven regions
6. **TNS.1** High education-driven transition regions
7. **KIS.2** Knowledge and technology hubs
8. **KIS.3** Knowledge and technology pretenders
9. **MAN.2** Primary-sector based manufacturing regions

**Legend:**
- Knowledge intensive services (KIS)-driven regions
- Transition regions (TNS)
- Manufacturing-driven regions (MAN)

Region groups:
- 1% (0-5%)
- 6-10%
- 11-16%

**Percentage of all passing regions**
- Group KIS
  - KIS.2: 1%
  - KIS.3: 7%
  - TNS.2: 9%
  - MAN.2: 3%

**Percentage of all outgoing regions**
- Group KIS
  - KIS.2: 3%
  - KIS.3: 16%
  - MAN.2: 12%

[All passing regions to all the models = 100%]
[All outgoing regions from all the models = 100%]
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Percentage of in-coming and out-going regions to/out the models from group MAN

Given model

- **MAN.1** High and Medium High Technology-driven regions
- **MAN.2** Primary-sector based manufacturing regions
- **MAN.3** Knowledge and technology pretenders

Legend:

- Knowledge intensive services (KIS)-driven regions
- Transition regions (TNS)
- Manufacturing-driven regions (MAN)

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<tbody>
<tr>
<td>KIS.3</td>
<td>1%</td>
</tr>
<tr>
<td>TNS.2</td>
<td>2-5%</td>
</tr>
<tr>
<td>MAN.1</td>
<td>6%</td>
</tr>
<tr>
<td>MAN.2</td>
<td>6-10%</td>
</tr>
<tr>
<td>MAN.3</td>
<td>11-16%</td>
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[All outgoing regions from all the models = 100%]
Conclusions

• Results indicate that half of analysed regions experience path dependency break-throughs, which are both positive and negative.
• The poorest regions have real problems to phase into better models, so it is really difficult to breakthrough a path dependency, but they still have a possibility (by tertiary education or high tech).
• While research indicates that the reasons for growth in the different models are different and hence there should be encouraged other factors in different stages of regional development.
• The study also indicates that there might be an evolutionary staged process that might be worth researching further, especially when there is so much risk in the relevant conducting of the process.
Regional innovation models’ changes
eexisting development paths in 1995-2011

Towards knowledge intensive services-driven models

KIS Group
Knowledge intensive services-driven regions

KIS.3 Knowledge and technology pretenders
KIS.2 Knowledge and technology hubs
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TNS Group
Transition regions

TNS.2 Average performance regions
TNS.1 High education driven transition regions

MAN Group
Manufacturing-driven regions

MAN.2 Primary-sector based manufacturing regions
MAN.1 High and Medium High Technology (HTM)-driven regions

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Further research

• analyse separately **policy for less developed** regions (concepts developed for the growth of one region may not fit into other regions and even in the same region, but in a different period)

• discover a **sparkle** that initiated changes

• discover some macro and micro **conditions** that favoured changing the models

• identify **key elements** behind a successful policy oriented to change models

• analyse if and how **specialisations** influence changing the models

• analyse **roles** expected from each axe of the regional quadruple helix

• develop the **context’s conditionalities** that have made possible new business models, especially regarding the role of regional public policy
Thank you for your attention!

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