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# Determinants of competitiveness in European regions: A test of the emerald model

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# Outline

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1. Objectives
2. Competitiveness and its measurement
3. Theoretical framework
4. Methodology
5. Results
6. Discussion and recommendations



# Objectives

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- Evaluate the impacts of the dimensions of the emerald model on a region's competitiveness
- Identify the more influential determinants of regional competitiveness
- Generate recommendations for policy makers and regional development agencies

# National / Regional Competitiveness - Definitions

Reference	Definition
US Commission (1985) and European Commission (1996)	A nation's competitiveness is the degree to which it can, under free and fair market conditions, produce goods and services that meet the tests of international markets while simultaneously expanding the real incomes of its citizens
Huggins (2004)	The capacity of an economy to attract and maintain firms with stable or rising market shares in an activity, while maintaining stable or increasing standards of living for those who participate in it
Turok (2004)	Competitiveness of a region depends on the local firms' ability of to sell their products in external markets (trade), value of these products and the efficiency with which they are produced (productivity) and the utilization of local human, capital and national resources (employment rate)
Porter et al. (2008)	Competitiveness is what determines the productivity with which a nation's endowments are used to create goods and services
Kao et al. (2008)	National competitiveness is a measure of the relative ability of a nation to create and maintain an environment in which enterprises can compete so that the level of prosperity can be improved
Önsel et al. (2008)	Competitiveness is a field of economic knowledge, which analyzes the facts and policies that shape the ability of a nation to create and maintain an environment that sustains more value creation for its enterprises and more prosperity for its people

# National / Regional Competitiveness - Definitions

Reference	Definition
IMD, World Competitiveness Yearbook (2012)	Competitiveness is defined as the ability of a region to generate, while being exposed to external competition, relatively high income and employment levels. In other words, for a region to be competitive, it is important to ensure both quality and quantity of jobs
World Economic Forum - WEF (2012)	The ability to maintain a steady growth rate of real per capita income, measured by pace of growth in gross domestic product (GDP) per capita at constant prices
Stojčić (2012)	Competitiveness refers to the ability of an economic unit (a firm, an industry, a region or a country) to compete with its rivals. It is associated with rivalry between economic units over markets or access to human and material resources and technology
Kharlamova and Vertelieva (2013)	The national competitiveness is an ability of a state to achieve high rates of economic growth, ensure a steady increase in real wages, promotion of domestic firms on the world market represented by high-performance clusters that improve the quality of products and services that enable the creation of new jobs in the future
Garelli (2014)	Competitiveness of nations is a field of economic theory, which analyzes the facts and policies that shape the ability of a nation to create and maintain an environment that sustains more value creation for its enterprises and more prosperity for its people
OECD, Glossary of Statistical Terms	The ability to produce goods and services which meet the test of international markets, while at the same time maintaining high and sustainable levels of income or more generally, the ability of (regions) to generate, while being exposed to external competition, relatively high income and employment levels



# National / Regional Competitiveness - Definitions

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- Improvement of the living standards
- Prosperity and value creation
- High income with high employment
- Productivity and ability of local firms
- Importance of the policies in creating and maintaining a competitive environment for the enterprises

# National / Regional Competitiveness - Measurements

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- **Global Competitiveness Index (GCI)** by the World Economic Forum (WEF) with 12 pillars including institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labour market efficiency, financial market development, technological readiness, market size, business sophistication and innovation
- **World Competitiveness Yearbook (WCY)** by the Institute for Management Development (IMD) based on 4 competitiveness factors (the economic performance, government efficiency, business efficiency and infrastructure) and 5 sub-factors for each of the factors, totaling to 20 sub-factors and more than 300 criteria
- **Kao et al.'s (2008) methodology**, with 4 primary factors (economy, technology, human resource, and management) and 3–5 secondary factors for each with in total 116 criteria.
- **Önsel et al. 's (2008) methodology** by clustering the nations on the basis of 178 criteria and classifying them through artificial neural networks

# National / Regional Competitiveness - Measurements

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- **The Diamond Model by Porter (1990)** assessing the competitiveness through the quality of factor (input) conditions, the context for firm strategy and rivalry, the quality of local demand conditions, and the presence of the related and supporting industries
- **The double diamond model (Rugman and D’Cruz, 1993)** taking into consideration international activities and thus the foreign diamonds; later used for the Institute for Policy & Strategy (IPS) national competitiveness index
- **The generalized double diamond model (Moon et al, 1995)** incorporating additional features to adapt the analysis for smaller economies
- **Huovari et al.’s (2001)** regional index using four dimensions (human capital, innovativeness, agglomeration and accessibility) with 16 variables and 15 indicators
- **BHI State Competitiveness Index** by the Beacon Hill Institute based on the major indicators of the GCI used for 50 states in the US





# National / Regional Competitiveness - Measurements

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- **Huggins' (2003) 3-factor model** with inputs (business density and proportion of knowledge-based businesses), outputs (productivity), outcomes (average earnings and unemployed individuals)
- **The pyramid model of regional competitiveness by Lengyel (2004)** with basic categories, programming factors and success determinants
- **The Rindex Model by Snieška and Bruneckiene' (2009)** based on the regional diamond
- **Benzaquen et al.'s (2010) model** using 4 pillars (government and institutions, economic development, productive infrastructure, and business efficiency) and 5 factors for each pillar
- **Albayrak and Erkut's (2010) model** based on the principle component analysis (PCA) and the hierarchical clustering analysis using 32 variables

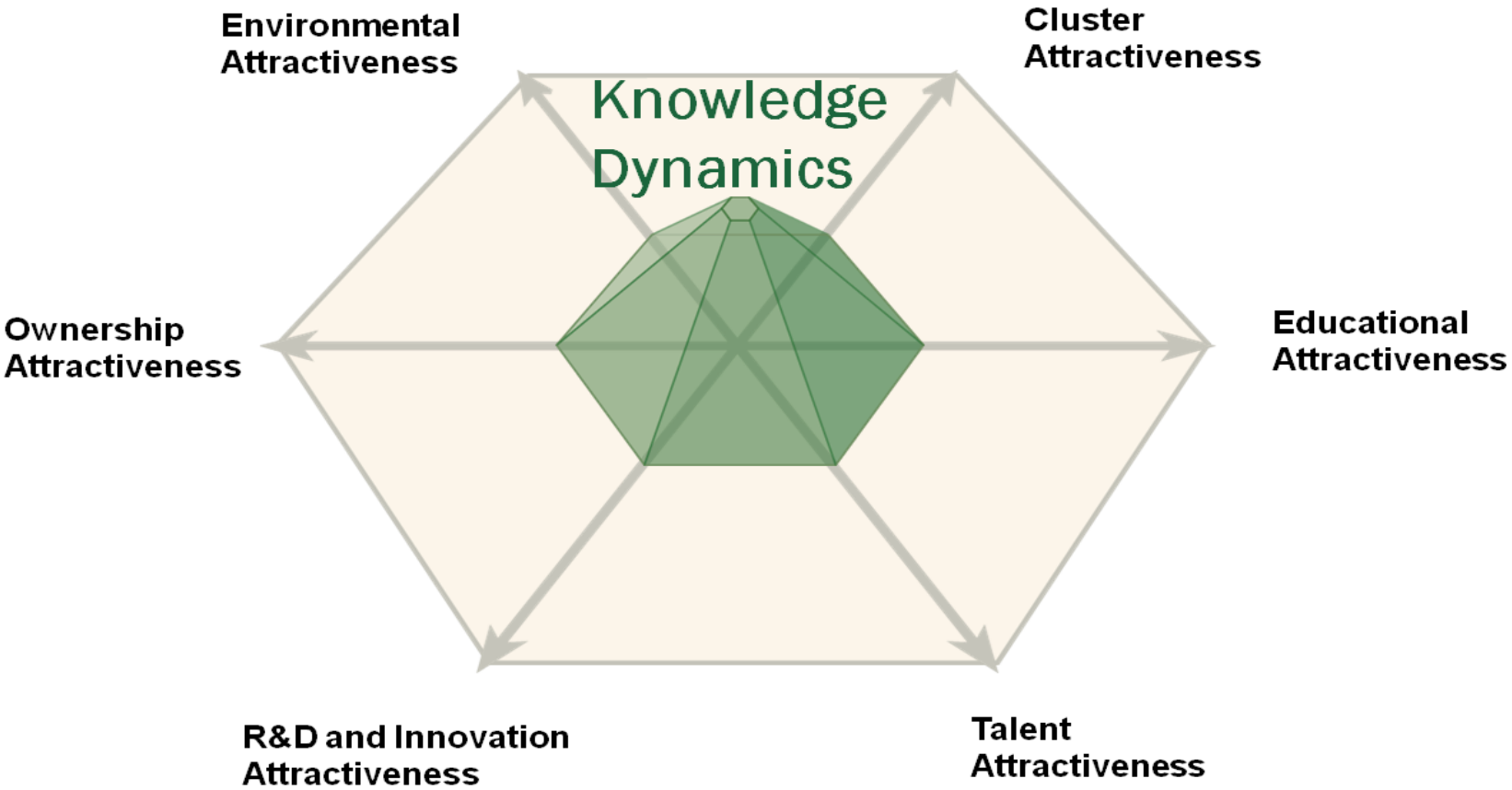


# National / Regional Competitiveness - Measurements

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- **EU Regional Competitiveness Index (RCI)** introduced by Dijkstra et al. (2011) built on the approach of the Global Competitiveness Index (GCI)
- **Ramík and Hančlová's (2012) model** using the Ivanovic deviation and the Data Envelopment Analysis (DEA)
- **Charles and Zegarra's (2014) methodology** based on Data Envelopment Analysis (DEA) with 5 pillars (economy, firms, government, infrastructure and people) and 5 sub pillars for each of these pillars, with a total of 25 sub pillars
- **The World Competitiveness Index of Regions (WCIR) by Huggins, et al. (2014)** using four components, i.e. inputs (4th-wave knowledge capital and 5th-wave knowledge capital), outputs, knowledge sustainability and outcomes, with a set of 19 indicators
- **Emerald Model by Sasson and Reve (2012)** where economic competitiveness is defined in terms of industrial attractiveness through six dimensions

# Emerald Model\*



\* Adapted from Sasson and Reve (2012)

# Educational Attractiveness

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- Popularity of high quality institutions
- Number and growth of local & foreign graduate students in the region
- Productivity / competitiveness directly related to the knowledge level of the human capital
- Defined as a factor condition in the diamond model
- Among the pillars of the Global Competitiveness Index and sub-factors of the World Competitiveness Index

# Talent Attractiveness

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- Ability to attract and hold talented people in the region
- Talented people leading to more competitive firms and industries
- Defined as a factor condition in the diamond model
- Among the sub-factors of the World Competitiveness Index

# R&D and Innovation Attractiveness

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- Existence, number and growth of the R&D personnel
- Existence, number and growth of the R&D investments
- Number and growth of patent registrations
- Role of R&D and innovation in the competitiveness of the firms and economic progress of regions
- Among the pillars of the Global Competitiveness Index

# Ownership Attractiveness

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- Attractiveness of a location's entrepreneurial ecosystem
- Support provided for start-ups and financing provided to mature industries to innovate and generate new projects
- Defined as a factor condition in the diamond model
- Among the pillars of the Global Competitiveness Index and sub-factors of the World Competitiveness Index

# Environmental Attractiveness

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- Abilities for producing environment friendly products and services with environment friendly operations
- A region with the ability to lead the way for environmental solutions and foresee to meet tomorrow's environmental requirements is more competitive than others
- Among the sub-factors of the World Competitiveness Index



# Cluster Attractiveness

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- Clusters: geographic concentrations of firms, suppliers, related industries, and specialized institutions in a particular field in a region
- Level of agglomeration and specialization of clusters in the region
  - A region with strong clusters and high degree of specialization has more potential for generating knowledge and innovation, leading to more competitiveness
  - Determinant of related and supporting industries in the diamond model
  - Articulated in the long term vision of the EU

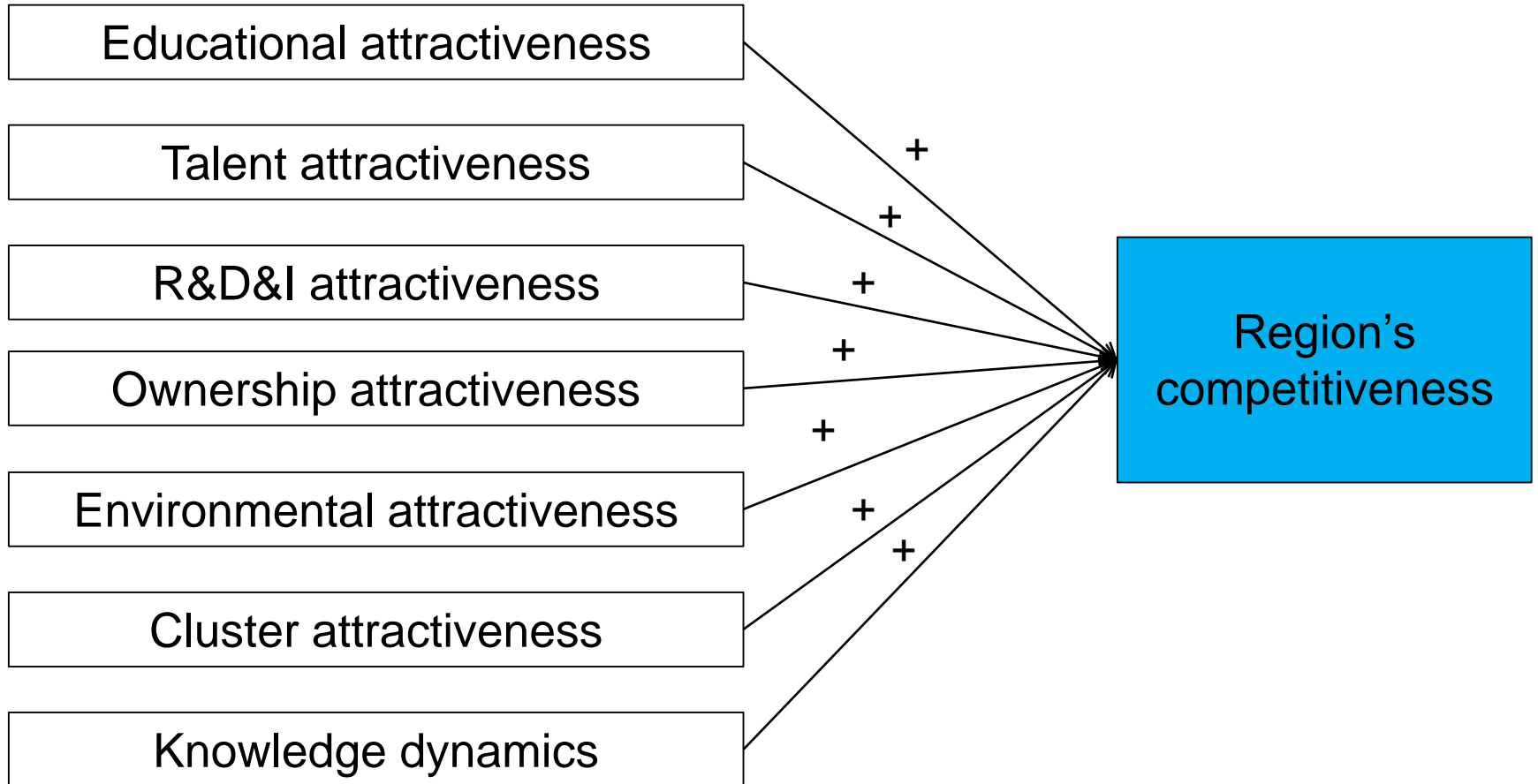
# Knowledge Dynamics

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- Degree at which knowledge flows efficiently in the location
- Leading to interactions and relationships between firms and institutions
- Collective knowledge generation and knowledge spillovers as influential factors in driving innovations and entrepreneurship leading to competitiveness
- Identified as a key task of cluster managers

# Hypotheses

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# Data Collection and Analysis

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- European Cluster Observatory data & OECD Regional Statistics database
- 97 NUTS-1 regions from 30 countries (EU-27 + Iceland, Norway and Switzerland) for 2000 - 2011
- Time-series design with a lag of five years between the dependent variable and the independent variables (N=603)
- Control variables: Regional area, regional population, country
- Correlation analysis
- Check for heteroscedasticity (Durbin-Watson statistic)
- Calculation of robust error terms (Hayes and Cai, 2007) to get heteroscedasticity-consistent results
- Regression analysis run for 5 models



# Variables and Measurement

Variable	Measure(s) of the variable
Region's Competitiveness	Annual regional GDP per capita
Educational attractiveness	Percentage of students in tertiary education among 20-24 year olds
Talent attractiveness	Ratio of human resources in science and technology sectors to all human resources employed in the region
R&D and innovation attractiveness	Ratio of the business R&D expenditure in the region to regional GDP
Ownership attractiveness	Ratio of the business services sector in the region to all economic activities
Environmental attractiveness	Concentration of fine particulate matter (PM2.5) in the air
Cluster attractiveness	<ul style="list-style-type: none"> <li>- Region's European Cluster Observatory star rating for all clusters</li> <li>- Region's star rating for technology and knowledge-based sectors</li> </ul>
Knowledge dynamics	Ratio of patent collaborations with foreign firms to all patent collaborations



# Results - 1

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1. Overall support for the Emerald model. R-square = 0.543
2. Significant impacts of independent variables in descending order of impact:
  - Ownership attractiveness +0.412
  - Talent attractiveness +0.286
  - Environmental attractiveness -0.156
  - Cluster attractiveness (technology and knowledge-based sectors) +0.144
  - Educational attractiveness +0.122
  - R&D and innovation attractiveness +0.080
  - Knowledge dynamics -0.069

# Results - 2

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3. Cluster attractiveness (all clusters) did not have significant impact on regional competitiveness.

4. Significant impacts of control variables:

- Regional population -0.257
- Country -0.230
- Regional area -0.088

# Contributions - 1

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- **Main contribution:** First empirical testing of the Emerald model to understand the varying impacts of its dimensions on regional competitiveness. The model provides a good estimate on regional competitiveness except in the dimensions of cluster attractiveness and knowledge dynamics.
- **Contributions to cluster literature:**
  1. All clusters do not contribute to regional competitiveness, but clustering in technology and knowledge-based sectors does.

Earlier literature on clusters showed contradictory results. Our findings support Franco et al. (2014) who found positive correlation only in the context of emerging sectors. It also supports Beaudry and Breschi (2003) and Folta et al. (2006) who found out that only co-location of innovative firms improves innovation performance.

Further research is recommended to understand differences in impacts of clustering in different sectors.



# Contributions - 2

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- **Contributions to cluster literature:**

2. The negative impact of knowledge dynamics on regional competitiveness contradicts with most of cluster literature.

Proximity → knowledge dynamics → innovations → regional competitiveness

What kind of knowledge spillover contributes to competitiveness? What type of knowledge? Between which actors in the cluster?

Our findings is based on knowledge dynamics between local and foreign actors. It can be that powerful multinationals appropriate most of the value from patents and commercialize them outside the region / country.

Future research is recommended to use other variables that reflect knowledge dynamics between local actors.



# Recommendations for Policy Makers

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- Prioritize the allocation of resources to dimensions in the order of their impacts on competitiveness.
  1. Create a supportive environment for business. Services to support new business development.
  2. Develop policies to attract talent.
  3. Take care of the environment.
  4. Promote clusters in technology and knowledge-based sectors.
  5. Higher education possibilities to a higher share of the population.
  6. Support R&D activities.

# THANK YOU!

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Your ideas, comments and questions??

Want to conduct joint research in this area,  
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