Training for SME & SME Partners (HEI)

Module 4: Regional Innovation Systems and Intellectual Capital Reporting

Session 1: Theoretical background on regional innovation systems

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Overview Module 4

- Session 1: Theoretical background on regional innovation systems
- Session 2: University-Business Cooperation to foster regional relational capital
- Session 3: Key Driving Factors, Regional Innovation Systems and intellectual capital reporting
- Session 4: Regional Innovation System Policies to foster innovation and R&D
- Session 5: Interdisciplinary Intellectual Café
- Session 6: Wrap-Up and Conclusion

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Agenda

- The concept of Regional Innovation Systems (RIS)
- Universities and Regions
- Foundations, instruments and effects of regional innovation policy

Session 2

THE CONCEPT OF REGIONAL INNOVATION SYSTEMS (RIS)

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The concept of Regional Innovation Systems (RIS): Overview

- Definition of Innovation
- Origin of the Innovation Systems concept: National Innovation System (NIS) & Regional Innovation System (RIS)
- Elements & Activities of an (Regional) Innovation System
- Analytical Framework to analyse Innovation Systems
- Political governance in RIS
- Modeling of Innovation Systems and analytical layers

Questions towards the concept of Innovation Systems

- What is an Innovation System?
- Which elements are attributed to it?
  - Size
  - National / Regional / Sectoral elements
- What influences Innovation Systems?
  - Socio-economic influences: Industries, Culture, Science
  - International labor-division
- Innovative Regions = Regional Innovation Systems?
- Special characteristics of RIS?

Source: Fraunhofer, ISI, Koschatzky, Innovationssystem_und_Messung, 2011.

What is Innovation?

- An interactive process of information transfer
- Includes Implicit & Explicit knowledge concerning improvements and innovation
  - Technical, Organizational, Social character

- Process: Creativity and learning processes >>>
  Invention -> Introduction to the market -> Innovation

- Small steps or complete process

- Diffusion of innovation: imitation or adoption

Source: Fraunhofer, ISI, Koschatzky, Innovationssystem_und_Messung, 2011.

Origin of the concept of Innovation Systems

- **1970ies**: Increased knowledge-gain in innovation economy
- New concepts concerning complexity and non-linearity of innovative processes (**Nelson & Winter 1977, Freeman 1982, Dosi 1982, 1988**)
- From the 1970s: Critical reflection of classical models (**Krugman 1979**)
- Conception of technical advancement (= innovation) as an endogenous growth factor (**Romer 1986** and other representatives)
- Implementation of basic approaches of innovation research/sciences (Eg.: interactive innovation model of **Kline & Rosenberg 1986**)

Source: Fraunhofer, ISI, Koschatzky, Innovationssystem_und_Messung, 2011.

Formation of a concept for National Innovation Systems (NIS)

- List (1789 – 1846): Concept/Founder of National System of Production
  - Creating national institutions & infrastructure
  - Optimizing production
- Freeman (1987): Idea of „National System of Innovation“
  - Promotion of advancement of technological infrastructure
- Bengt-Ake: Combines NIS and interactive learning
  - Innovation as inherent part of regular economical activities

Source: Fraunhofer, ISI, Koschatzky, Innovationssystem_und_Messung, 2011.

Definition „National Innovation System“

Definitions by Lundvall 1992, Edquist/Lundvall 1993, Galli/Teubal 1997.

Definition by OECD, 1999:

“The international understanding of Research and Innovation Systems is based on all institutions, which operate scientific research, accumulate and impart knowledge, educate workers (personnel, laborers), develop technologies, produce and distribute innovative products and procedures.”

Source: Fraunhofer, ISI, Koschatzky, Innovationssystem_und_Messung, 2011.

Further characteristics of the concept

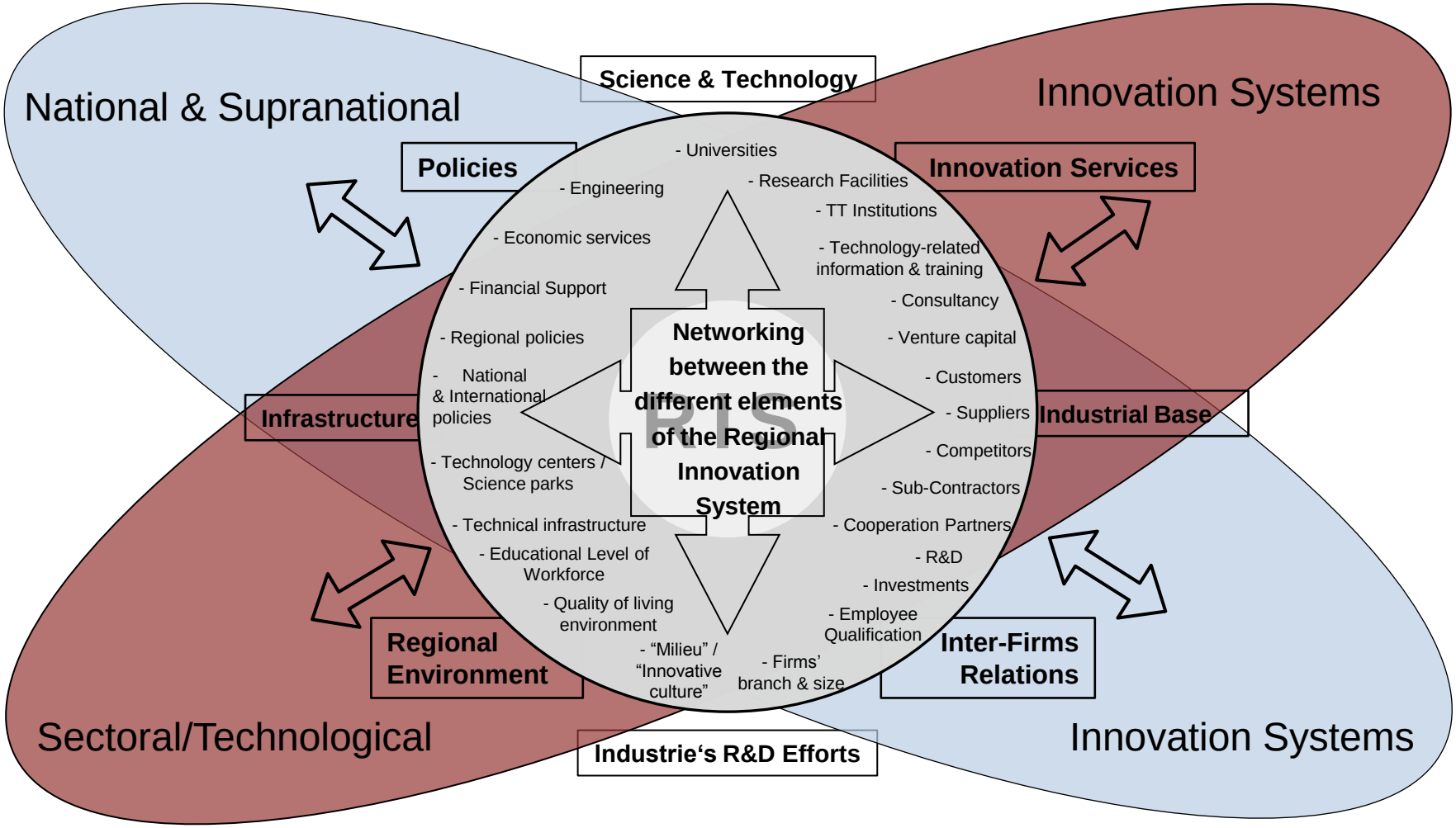
- Regional Innovation System
- Sectoral / Technological Innovation System

➢ influence on innovation by specific premises

- Regional and national Innovation Systems are composed by Sectoral/Technological Innovation Systems

Source: Fraunhofer, ISI, Koschatzky, Innovationssystem_und_Messung, 2011.

Regional Innovations Systems (RIS) as part of a superior Innovation System



Source: Adapted from Fraunhofer, ISI, Koschatzky, Innovationssystem_und_Messung, 2

Elements of an Innovation System

Parts

- Institutions, Organizations

Relation of parts

- Competition, Transaction, Networks

Function (eg. to generate innovations)

Specificity (distinguishable, differentiable)

Source: Fraunhofer, ISI, Koschatzky, Innovationssystem_und_Messung, 2011.

Activities within an Innovation System

- Research & Development (R&D)
- Acquisition & Expansion of competencies and skills
- Formation of new product markets
- Development based on markets
- Establishment & Adaption of Institutions
- Creation & Adaption of Laws & Regulations
- Learning, Consulting & Networking activities
- Start-up activities
- Financial support & funding
- Consulting and knowlegde transfer

Source: Fraunhofer, ISI, Koschatzky, Innovationssystem_und_Messung, 2011.

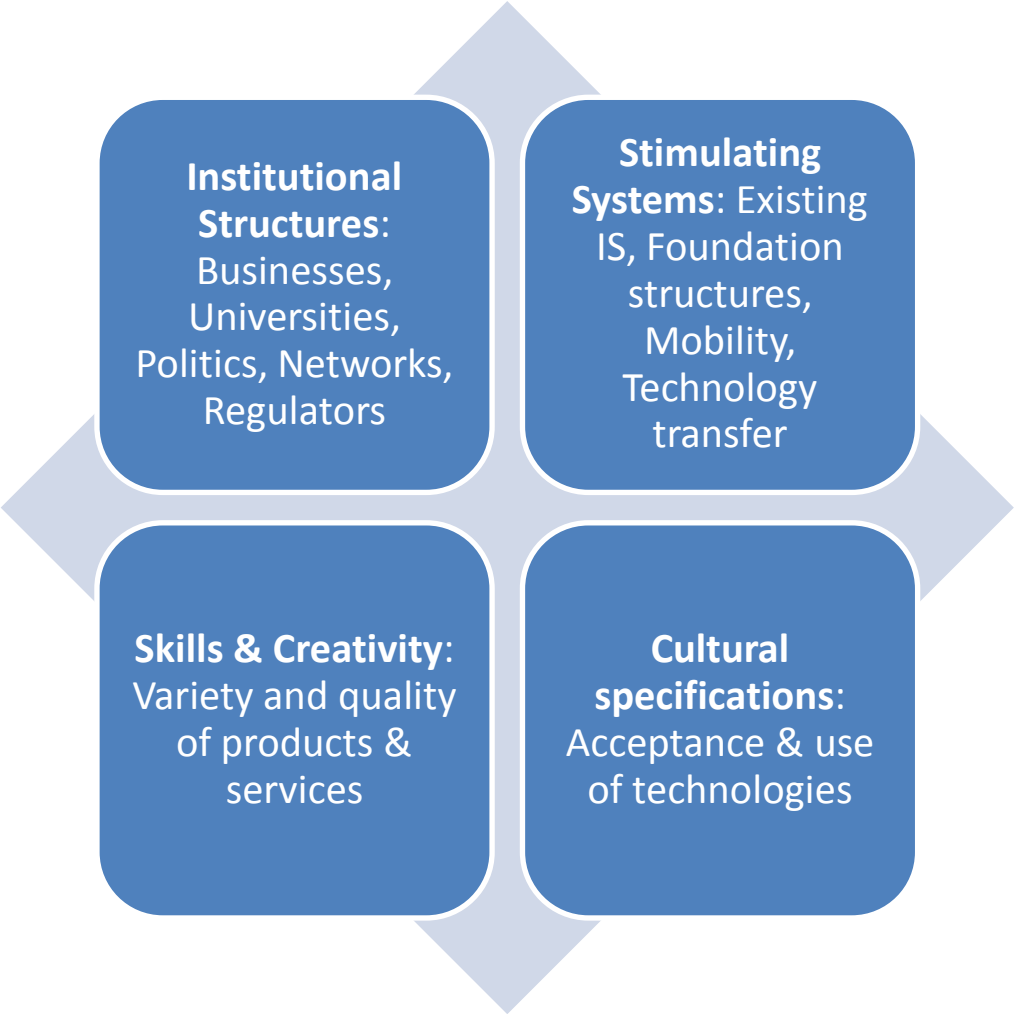
Sectoral Innovation systems

Basic elements (Malerba 2002):

- Products
- Agents
- Knowledge & Learning processes
- Technologies, Inputs, Demand, Complementarities
- Interactions & Networks
- Competition & Selection processes
- Institutions – standards, regulations

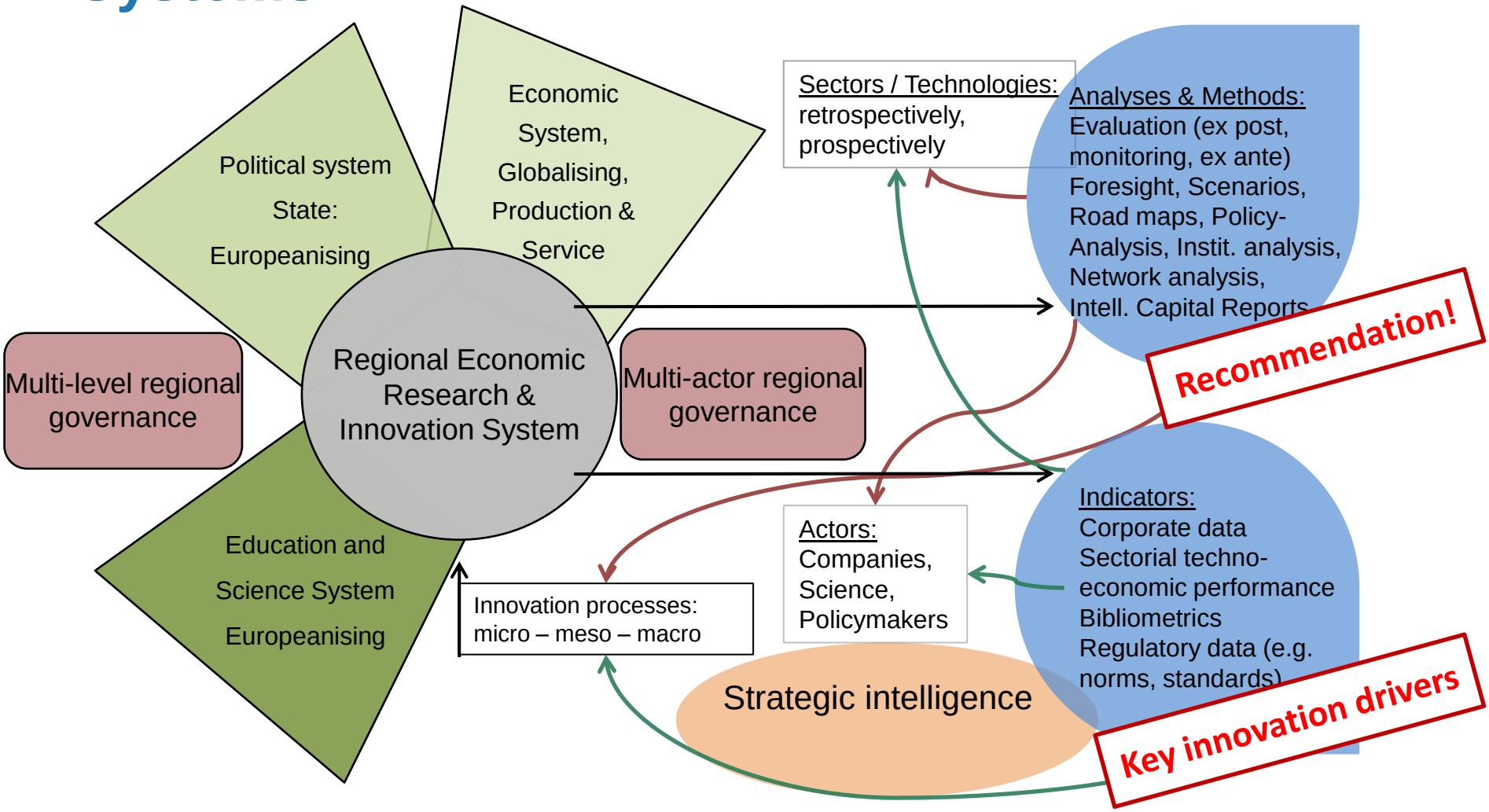
Source: Fraunhofer, ISI, Koschatzky, Innovationssystem_und_Messung, 2011.

Elements of a Regional Innovation System



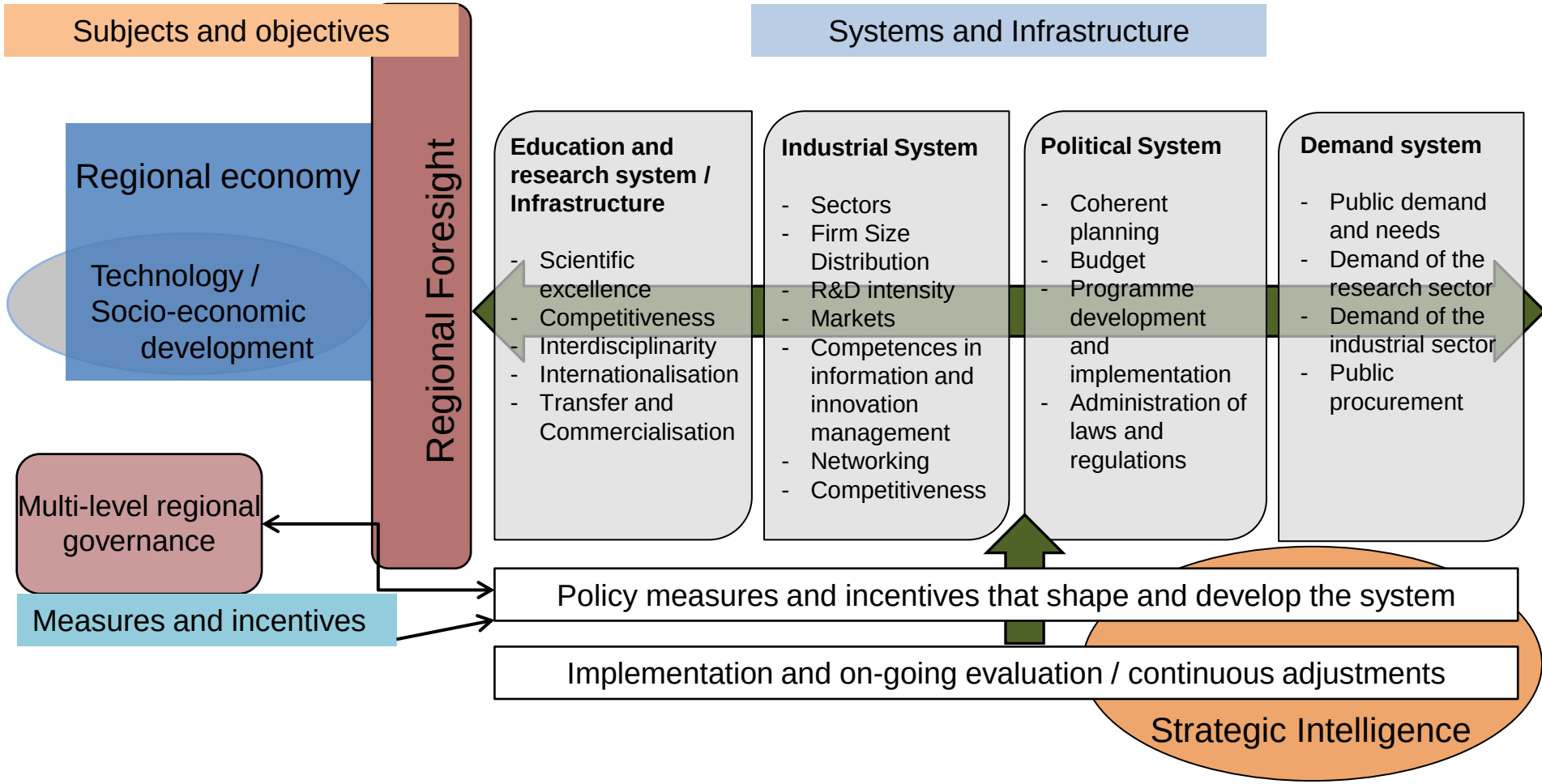
Source: Adapted from Fraunhofer, ISI, Koschatzky, Innovationssystem_und_Messung, 2

Analytical Outline to analyze Innovation Systems



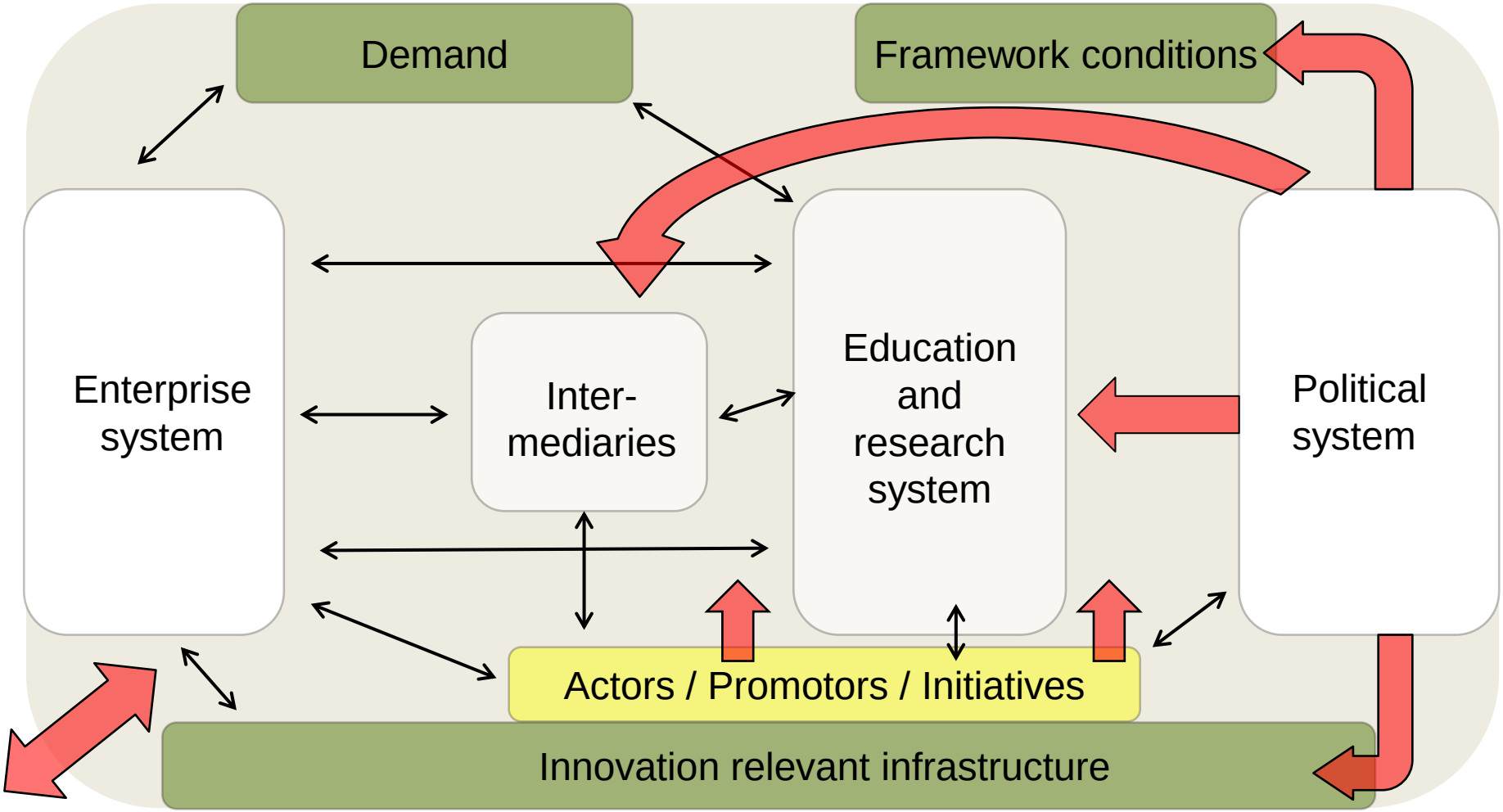
Source: Adapted from Fraunhofer, ISI, Koschatzky, Innovationssystem_und_Messung, 2011.

Political governance in (Regional) Innovation Systems



Source: Adapted from Koschatzky, 2005.

Modelling of Innovation Systems



Source: Adapted from Koschatzky, 2005.

Analytical layers: sectoral, regional/national, international (part I)

Innovation Systems			
Elements	**Territorial Dimension**		**Sectoral dimension**
	Regional	National	Sector/Technology field
Agents and organizations	Regional governance bodies Regional educational institutions	National governance bodies National educational institutions National IPR administration	MNEs and other firms International norming and standardization bodies International IPR administration (international) branch associations
Interactions	Local cross-sectoral networks	National cross-sectoral networks	International intra-MNE and other firm interactions Communities of practice
Knowledge base	Localized tacit knowledge (specific application related, cross-sectoral)	Codified knowledge (general, basic research related, cross-sectoral)	Codified knowledge tacit knowledge in intra-MNE and other firm networks Tacit knowledge communities of practice
Human Capital	Regional labour pool	National labour pool Mobility of labour force	Specialized labour market Cross-sectoral mobility of labour force

Analytical layers: sectoral, regional/national, international (part II)

Innovation System			
Elements	**Territorial Dimension**		**Sectoral Dimension**
	Regional	National	Sector/Technology field
Institutions	Regional laws Regional governance	National laws and regulations National governance	National and International treaties National and International norms and standards
Policies	Regional innovation policies Education pollicies	Innovation policy Education policy	National and transnational sector oriented policies
Technologies & Demand	Regional laws on technology Regional acceptance of technology Regional buying power Regional demand caused by industry structure	National laws on technology Acceptance of technology in society Position to lead markets	Factual trends in leading edge technology development
Competition & Selection	Regional economic characteristcs: Presence of competitors in the field Spirit of competition Entrepreneurial/Foundation spirit	National econocmic characteristics: Antitrust legislation Bankruptcy legislation	Sectoral specifities Firm size Position in product/service life cycle Mobility of product/service Degree of specialisation

Typology of RIS

- Background:
  - Integration of evolutionary economics into regional sciences
  - Policy tool for monitoring the development of specific RIS

- Development of a two dimensional classification structure (Braczyk et al., 1998, Cook, 2004) defined by
  - a governance dimension - providing the soft infrastructure for innovation support - with three modalities: *grassroots RIS, network RIS, dirigiste RIS*
  - a business innovation dimension – describes the posture of firms towards each other, the outside world, relations to conumers & producers in the amrket place

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Governance dimension – Grassroots RIS

- Features:
  - Initiation Process of the RIS is locally organized
  - Funding comprises a mix of grants, loans of local origin (banks, local government, local chamber of commerce)
  - Research competence is highly applied, near-market.
  - Level of technical specialisation is low
  - Supra-local coordination is low

- Examples:
  - Tuscany (Italian industrial districts) in the 90ies

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Governance dimension – Network RIS

- Features:
  - Initiation of tech-transfer actions are multilevel
  - Funding is guided by agreements amongst stakeholders
  - Research competence is mixed, pure & applied activities
  - System coordination is high (many stakeholders)
  - Specialisation is flexible due to a wide range of demands from global to small-firm scale

- Examples:
  - Baden Württemberg

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Governance dimension – Dirigiste RIS

- Features:
  - Initiation of action is a central government policy product
  - Tech transfer activities are animated from outside
  - Research is rather basic, fundamental relating to the needs of (stately owned) firms in or beyond the region
  - High level of coordination and specialisation

- Examples:
  - metropolitan research labs in France (Rhône-Alpes, Midi-Pyrénées, Brittany) followed by a technopol policy

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Business innovation dimension - localist

- Features:
  - A few or no large indigenous firms, few branches of externally controlled fimrs
  - Research reach of firms is not great
  - Few major public R&D resources, more smaller private ones
  - High degree of associationalism amongst entrepreneurs and regional policy makers

- Example:
  - Finnish region around Tampere

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Business innovation dimension - interactive

- Features:
  - Reasonable balance between small & large firms (indiginous as well as foreign directed)
  - Widespread access of regional research to foreign innovation sourcing
  - Balanced mix of public & private research stakeholders (headquarter of large firms, regional government)
  - Highly associative, many industry networks etc.

- Example:
  - Baden-Württemberg, Catalonia

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Business innovation dimension - globalized

- Features:
  - Domination by global corporations, supply chains of dependent SME
  - Research reach is internal and highly privatistic
  - Interests of large firms governs the regional cooperation activities

- Examples:
  - North-Rhine Westphalia, Singapore

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Matrix of RIS – typology and evolution

	Grassroots	Network	Dirigiste
Localist	Tuscany →	Tampere ↙ Denmark ↙	← Slovenia Tohoku ↙
Interactive	Catalonia → ↓	Baden-Württemberg ↙	← Gyeonggi
Globalized	Brabant →	North-Rhine Westphalia Wales →	Singapore

Examples of different RIS; arrows indicate direction of RIS movement 1995 - 2005

Source: Cook et al., 2004, Fig. 0.1

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Conclusion RIS

- Analysis of systemic innovation suggests rather a use of regional than national innovation system approaches. Spatial proximity and personal communication play an important role in innovation processes.
- Due to globalisation, the rise of knowledge intensive industry & clustering RIS are evolving and changing their shapes.
- Classification scheme helps to analyse and compare key drivers and identify potential successful policy strategies.
- Several methods & tools are available to analyse a RIS and certain functions and draw conclusions for policy makers.
- ICR is considered as one of them focused on knowledge based items.

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UNIVERSITIES AND REGIONS

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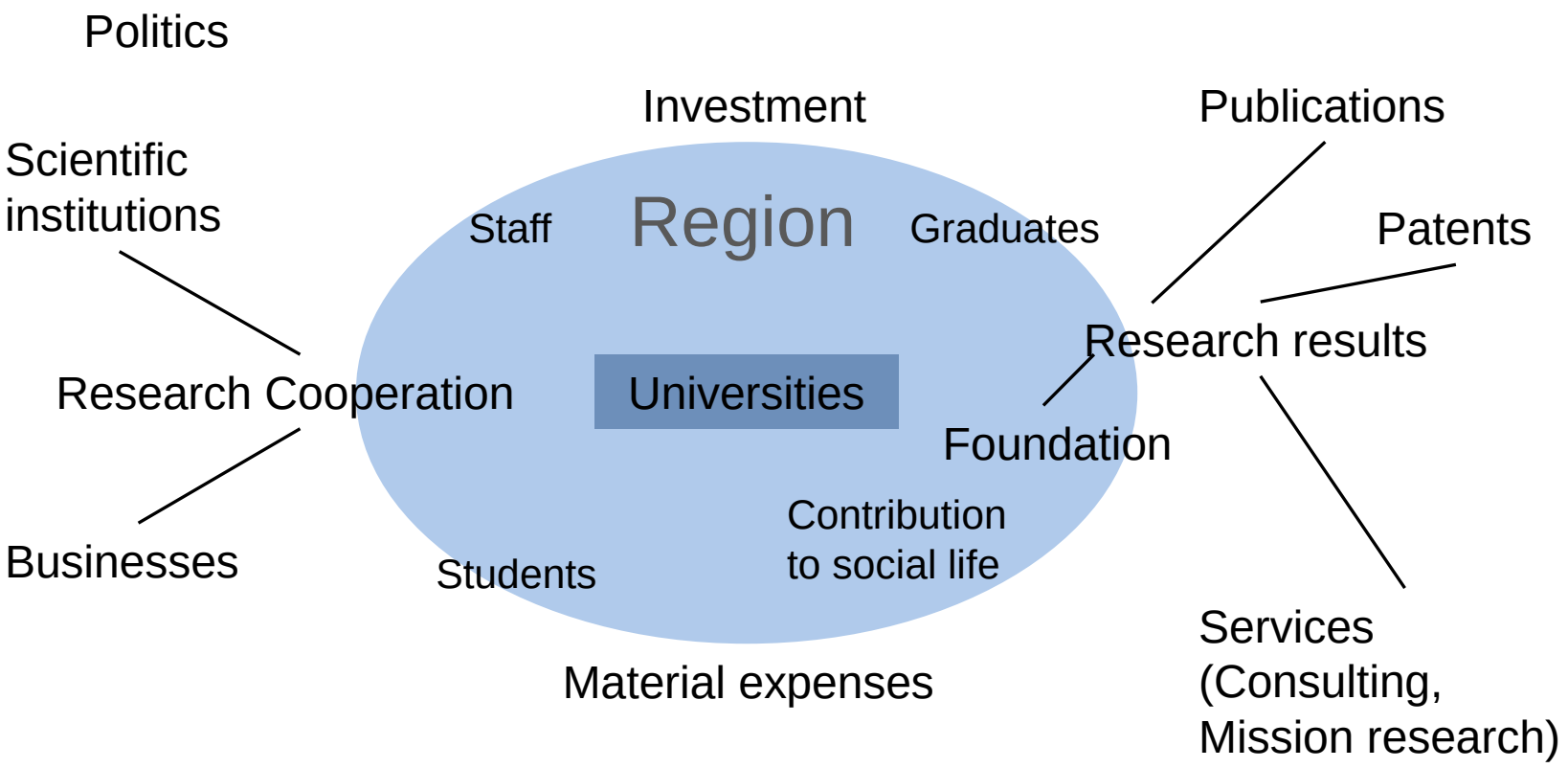
Manifold relations between University and Regions



Source: Adapted from Fraunhofer, ISI, Schricke, Hochschulen und Regionen, 2012

Models to conceptualize Universities and their regional relations

- Knowledge factory
  - Regional innovation output
- Relational University
  - Regional cooperation with industry
- Entrepreneurial University
  - Application of academical knowledge
- Systemic University
  - Networks including Universities
- Engaged University
  - Universities' role in regional development

Source: Adapted from Fraunhofer, ISI, Schricke, Hochschulen und Regionen, 2012

Conclusion: Universities and Regions

- Universities play a considerable role regarding RIS

- Tensions/Conflicts can occur depending on the institution‘s orientation

  -> international reputation vs. regional activities

  focus of individual professors & universities

  -> research excellence vs. support of regional industries

  focus on regional surroundings

Source: Adapted from Fraunhofer, ISI, Schricke, Hochschulen und Regionen, 2012

FOUNDATIONS, INSTRUMENTS AND EFFECTS OF REGIONAL INNOVATION POLICY

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Introductory remarks

- Starting in the 1980ies new theories wer introduced to explain the paradigmatic shift from production to knowledge society

- Following challenges had to be adressed:
  - Scientific-technological excellence
  - Innovation and institutional/regional learning
  - New policy mechanisms on a (supra)national level
  - New regional orientation due to internationalisaiton, adaption and imitaion of growth paths.

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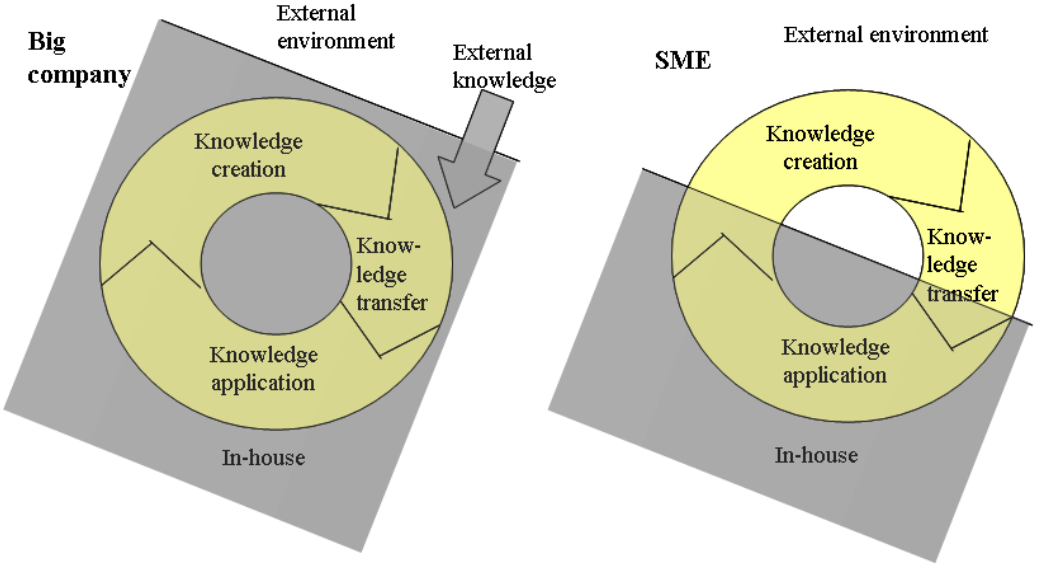
System boundaries & innovation process

- Define the system boundaries for innovation processes
- Generation and transfer of innovation relevant knowledge within a company usually involves several external actors (e.g. universities, R&D & transfer institutions, suppliers and customers..)



Schematic diagram of the system boundaries of the innovation process of companies depending on their size, (a) Big companies can cover the full process of knowledge creation, transfer and application (b) SME in manufacturing usually cover only more applied parts of it (Wiedenhofer, 2012)

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Economic Geography

Classical Theoretical Framework

- Location theories
- Spatial mobility theories
- Regional growth and development theories

Classical Arguments for Spatial Development and Differentiation:

- Production Factors
- Reduction of Mobility Barriers
- Internal and External Economies
- Market & Competition
- Sectoral-Regional Polarisation

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New Economic Geography I

- Theories: New Growth Theory
  New Foreign Commerce Theory
- Attributes
  - Not-Decreasing scale earnings through positive externality
    Endogen explanation of technological advancement
    Regress to theoretical innovation concepts
    Knowledge accumulation
    Imperfect market
  - Growth occurs off balanced path -> regional disparities
  - Unbalanced: human capital, knowledge, externalities, learning effects, transportation costs

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New Economic Geography II

- Models:
  - Models towards human capital, growth, learning by doing, competitive advantage
  - Equilibria model regarding endogen technological change
  - Models concerning innovation
  - Models on comparative advantage
  - Models on broadened variety of products as well as increased product quality
  - Models on foreign commerce

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Industrial Site models

Dynamic – cyclic concepts

- Product cycle theory; Theory of the “long waves”

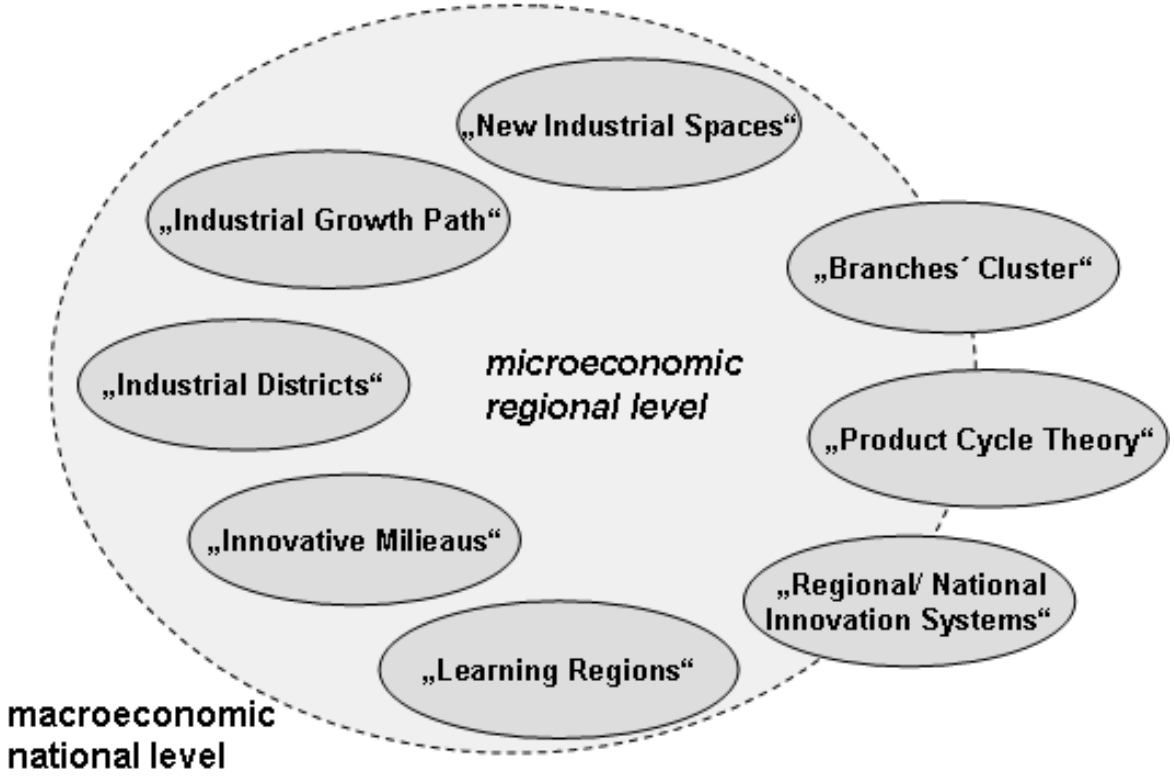
Dynamic evolutionary concepts

- Industrial districts
- Innovative milieaus
- Industrial growth paths
- New industrial spaces
- Branches cluster (Porters Diamond)
- Learning regions

Systemic concepts

- Regional innovation systems

Industrial Site models



Industrial site and regional models including innovation and technological development, Wiedenhofer (2012).

Conclusion

- Innovation processes of companies (especially SME) often include external stakeholders and structures
- „Territoriality“ of knowledge creation and exchange and learning processes are important
- „New“ growth models (industrial site models) including innovation and learning can be used as a base to identify key driving factors.
- Assignment of such driving factors to IC defines the base for ICR with focus on innovation including micro- and macroeconomic elements.
- IC as a common language supports and defines the interfaces of included stakeholders and thus further regional development.
- From a scientific point of view this approach includes a convergence of different concepts – new economic geography & related site models, innovation & system research and the classical IC management.

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