International Energy Agency

WORLD ENERGY OUTLOOK

World Energy Outlook

Dr Fatih Birol

IEA Chief Economist

Vaasa, 7 April

The world energy scene today

WORLD ENERGY OUTLOOK 2013

- **Some long-held tenets of the energy sector are being rewritten**
  - *Countries are switching roles: importers are becoming exporters…*
  - *… and exporters are among the major sources of growing demand*
  - *New supply options reshape patterns of trade*
- **But long-term solutions to global challenges remain scarce**
  - *Renewed focus on energy efficiency, but CO_2 emissions continue to rise*
  - *Fossil-fuel subsidies increased to $544 billion in 2012*
  - *1.3 billion people lack electricity, 2.6 billion lack clean cooking facilities*
- **Energy prices add to the pressure on policymakers**
  - *Sustained period of high oil prices without parallel in market history*
  - *Large, persistent regional price differences for gas & electricity*

Unconventional oil and gas has made a major contribution to production growth

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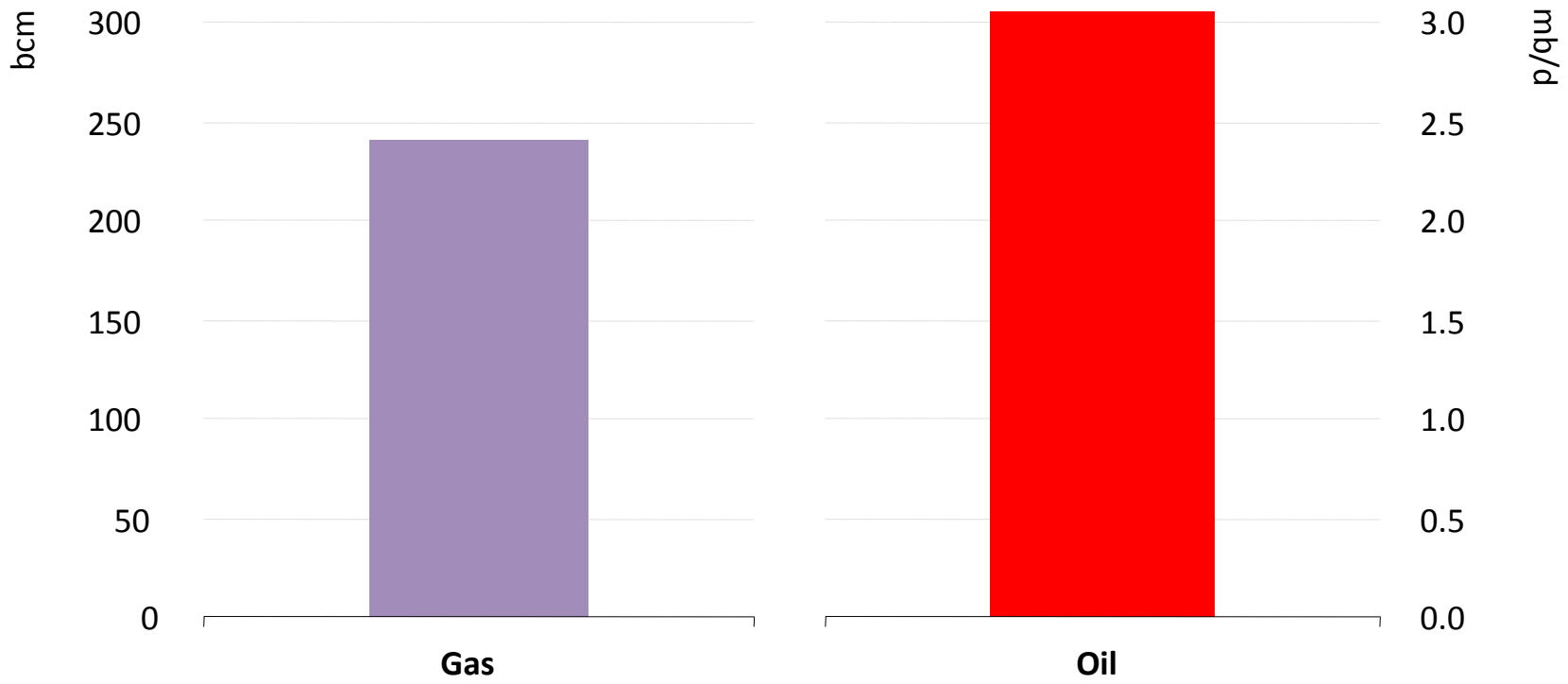
US shale gas and shale oil production increases: 2005-2014



Growth in US shale gas output since 2005 is equivalent to the total production of Qatar, Kuwait, UAE and Iraq <u>combined</u>. While shale oil output is equal to that of Iraq

The engine of energy demand growth moves to South Asia

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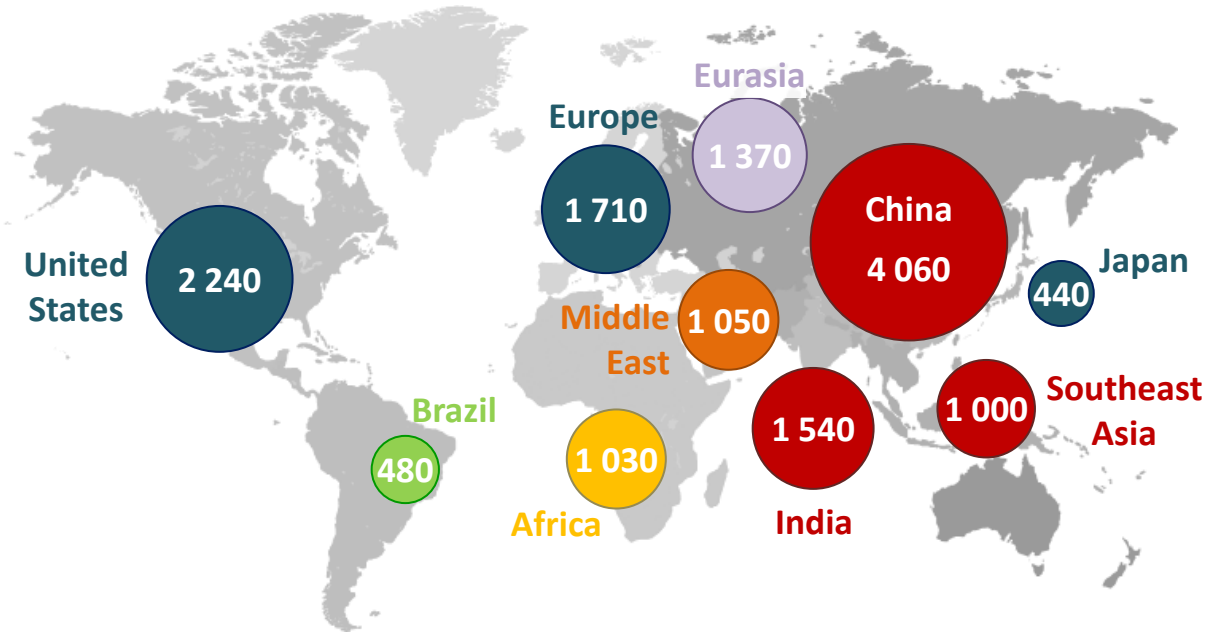
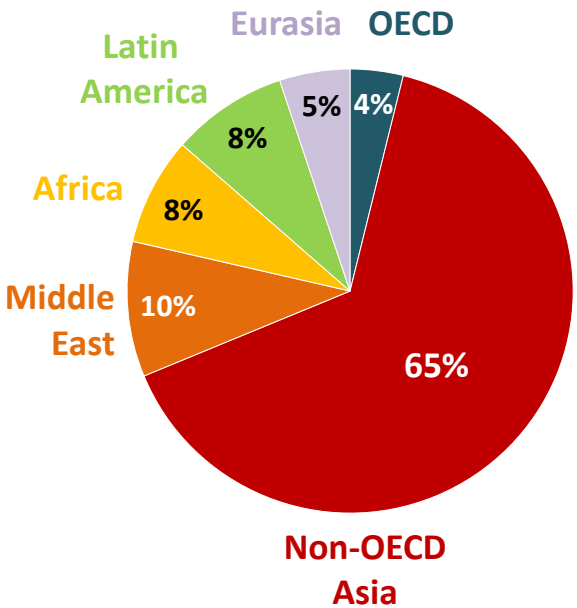
Primary energy demand, 2035 (Mtoe)



Share of global growth 2012-2035



China is the main driver of increasing energy demand in the current decade, but India takes over in the 2020s as the principal source of growth

The energy mix is slow to change

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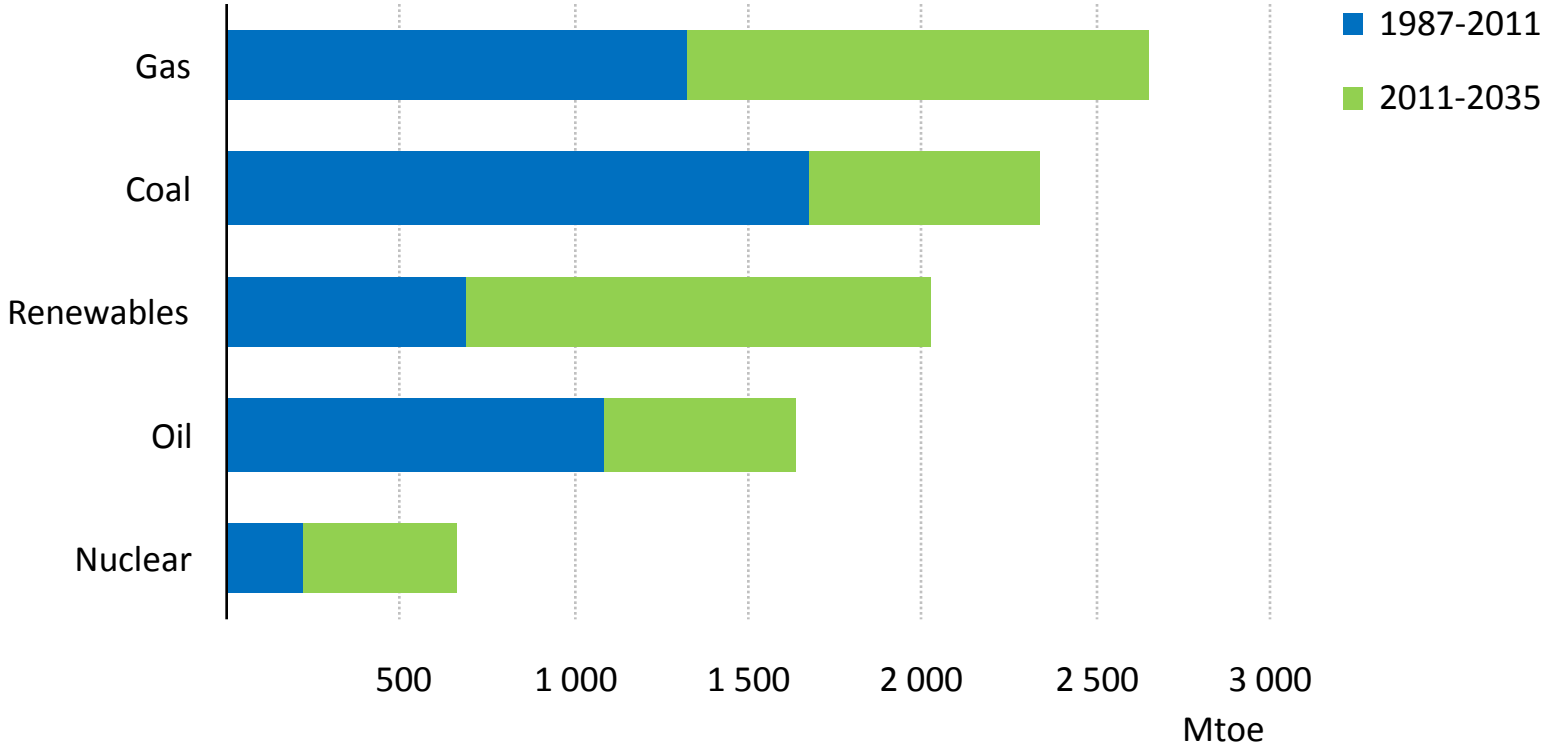
Growth in total primary energy demand



25 years ago the share of fossil fuels in the global mix was 82%; it is the same today & the strong rise of renewables in the future only reduces this to around 75% in 2035

European Union 40% carbon reduction target in 2030

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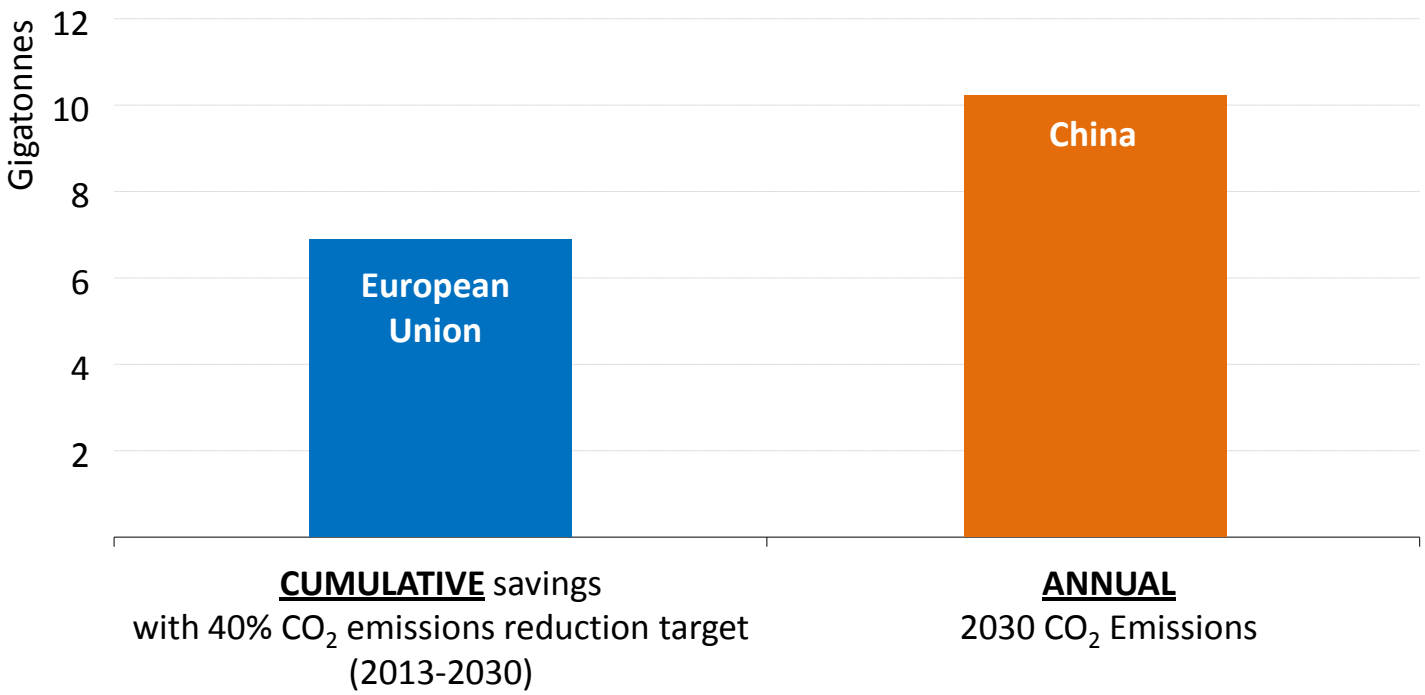

EU cumulative CO_2 savings over the next 16 years would represent only 8 months of Chinese CO_2 emissions

Emissions off track in the run-up to the 2015 climate summit in France

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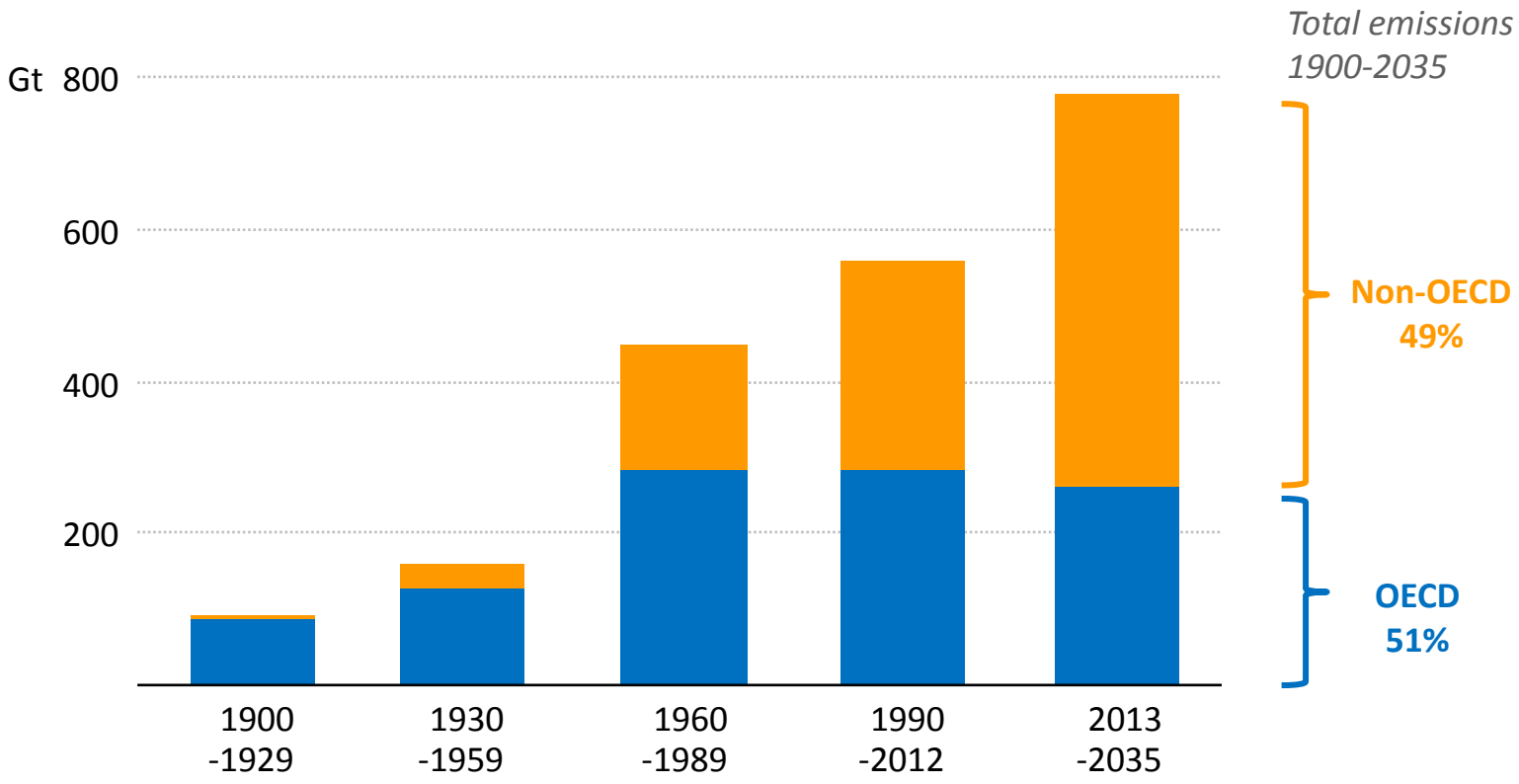
Cumulative energy-related CO_2 emissions



Non-OECD countries account for a rising share of emissions, although 2035 per capita levels are only half of OECD

Two chapters to the oil production story

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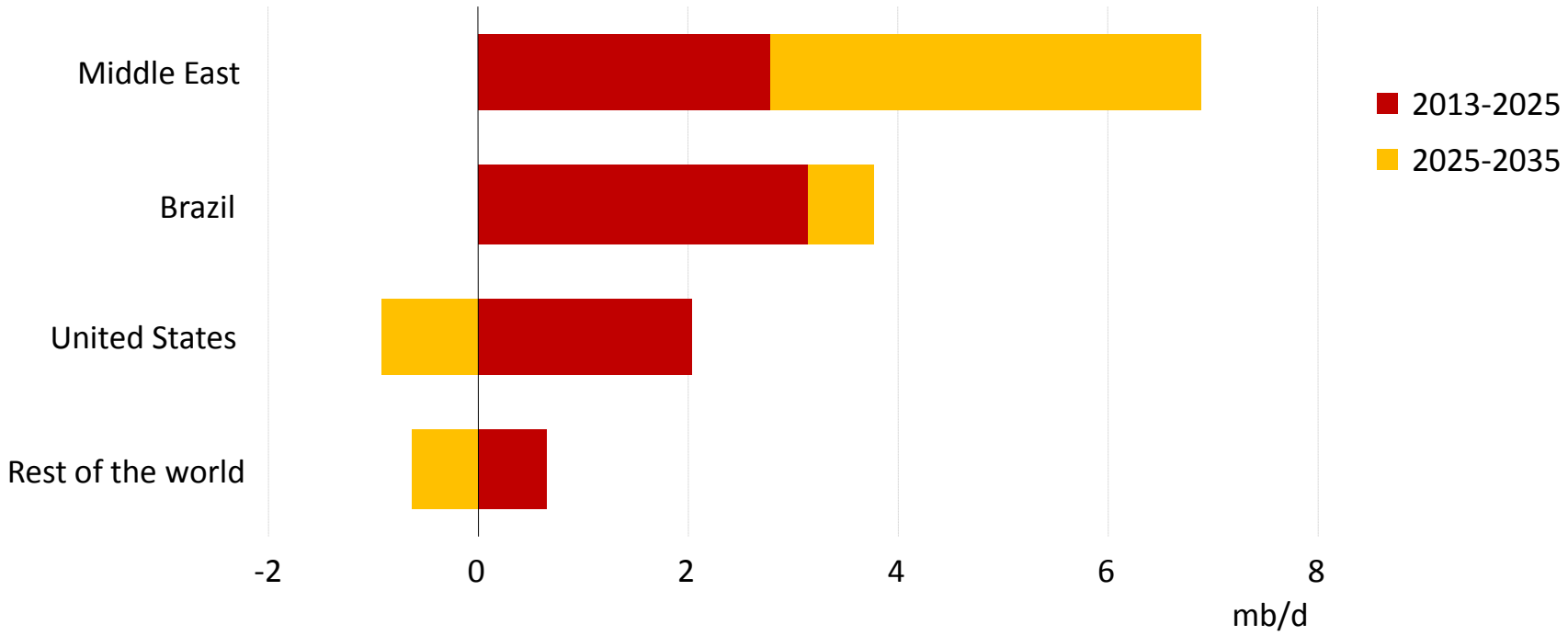
Contributions to global oil production growth



The United States (light tight oil) & Brazil (deepwater) step up until the mid-2020s, but the Middle East is critical to the longer-term oil outlook

Renewables power up around the world

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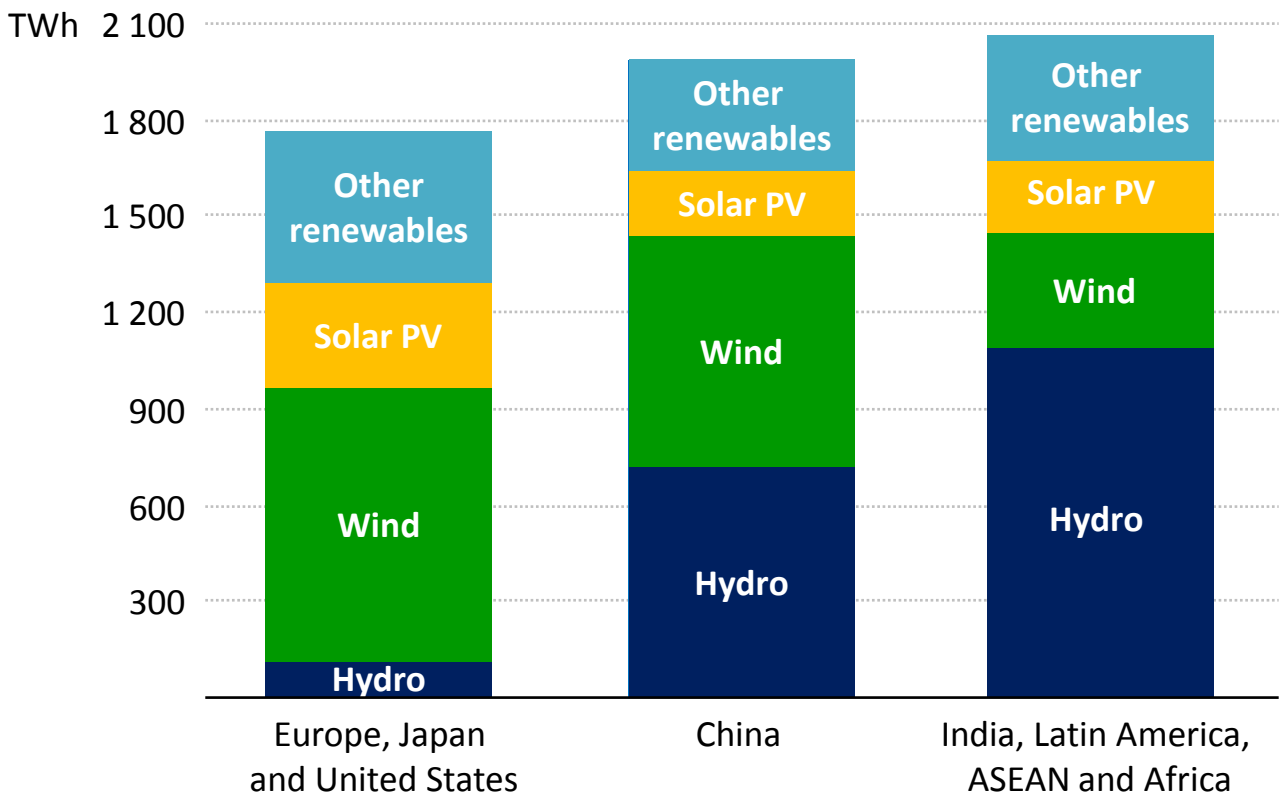
Growth in electricity generation from renewable sources, 2011-2035



The expansion of non-hydro renewables depends on subsidies that more than double to 2035; additions of wind & solar have implications for power market design & costs

Increasing subsidies for increasing renewables

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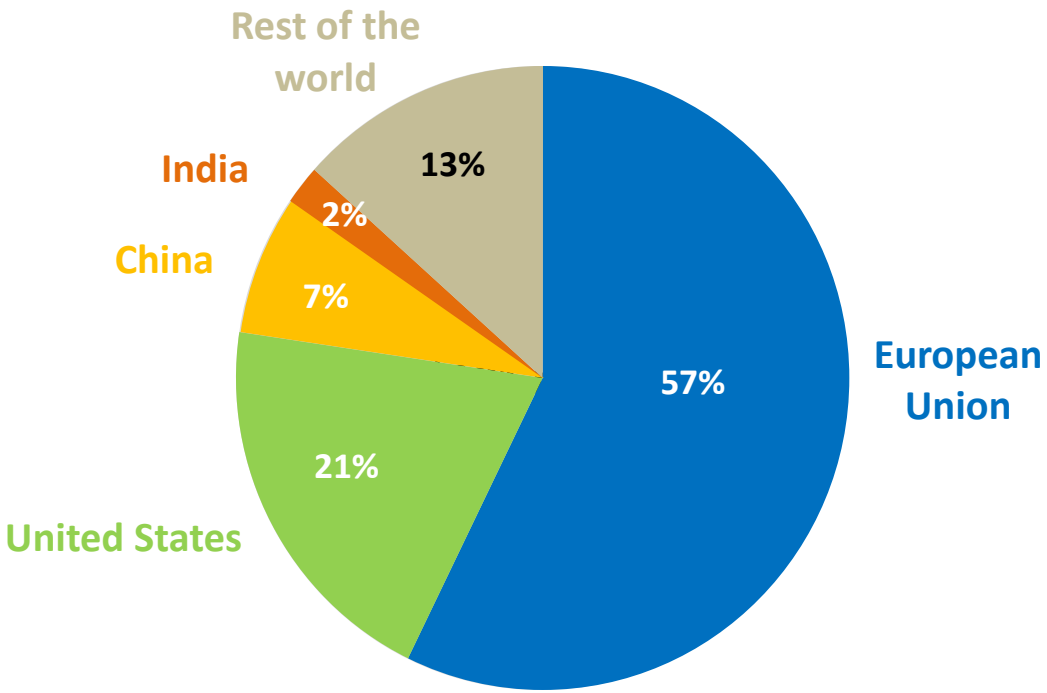
Renewable-energy subsidies by region in 2012



Renewables subsidies increased to $101 billion in 2012, more than half of which are in the European Union; renewables subsidies are set to more than double by 2035

Who has the energy to compete?

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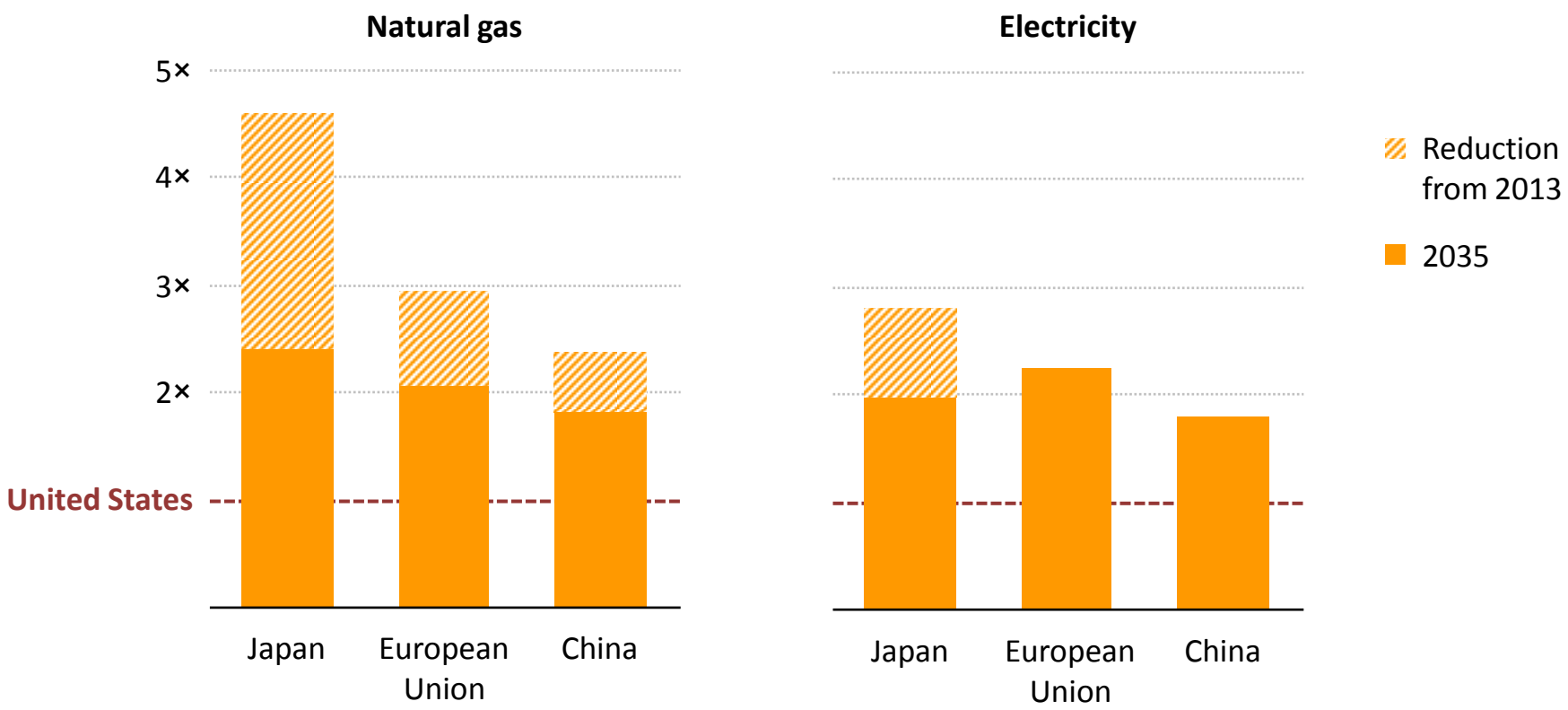
Ratio of industrial energy prices relative to the United States



Regional differences in natural gas prices narrow from today's very high levels but remain large through to 2035; electricity price differentials also persist

Energy-intensive industries need to count their costs

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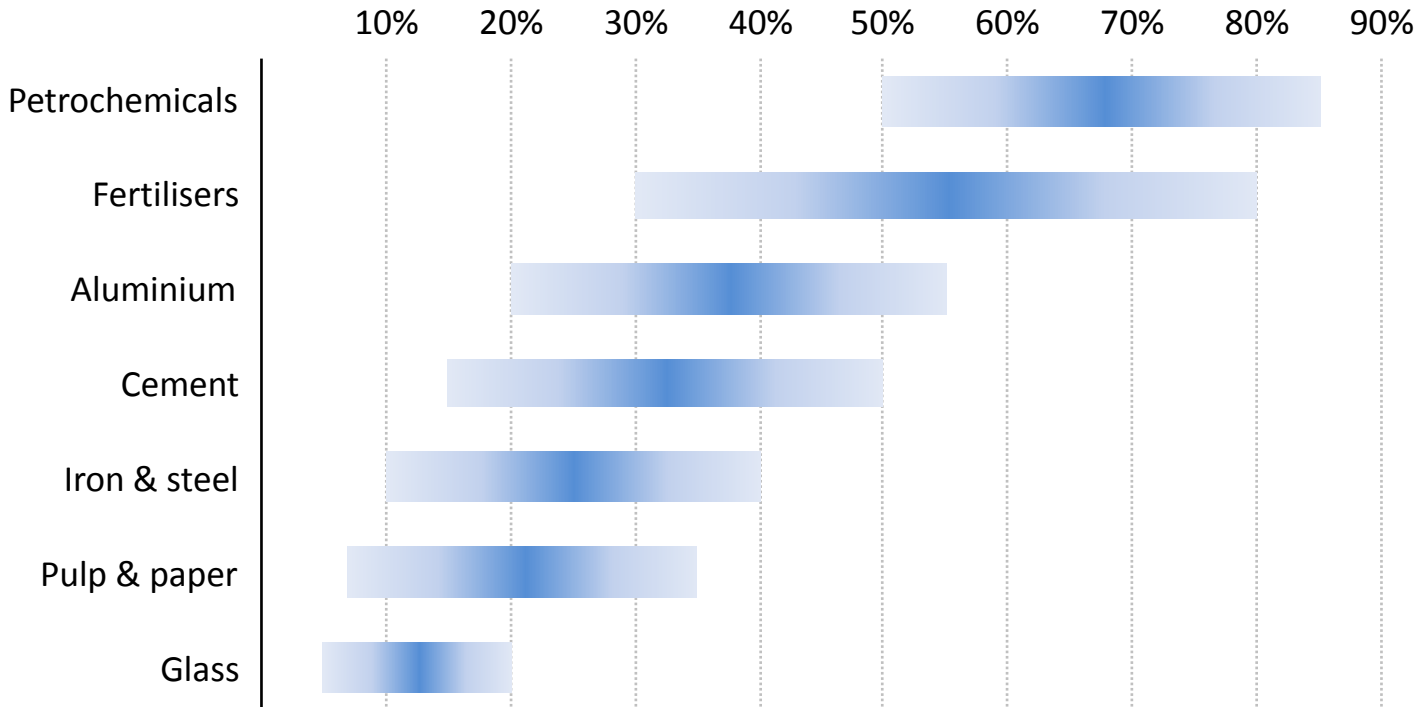
Share of energy in total production costs for selected industries



Energy-intensive sectors worldwide account for around one-fifth of industrial value added, one-quarter of industrial employment and 70% of industrial energy use.

An energy boost to the economy?

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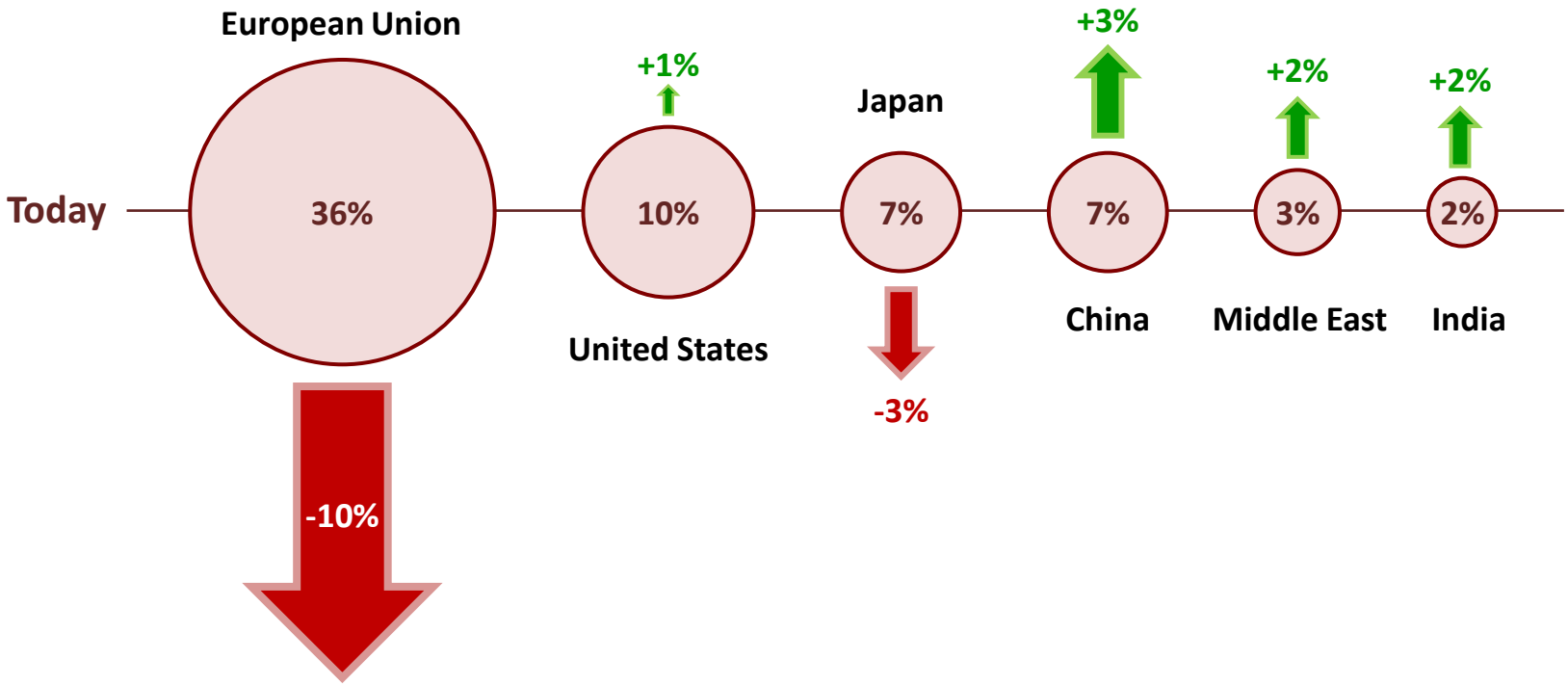
Share of global export market for energy-intensive goods



The US, together with key emerging economies, increases its export market share for energy-intensive goods, while the EU and Japan see a sharp decline

LNG from the United States can alleviate strain on the gas markets, but is no silver bullet

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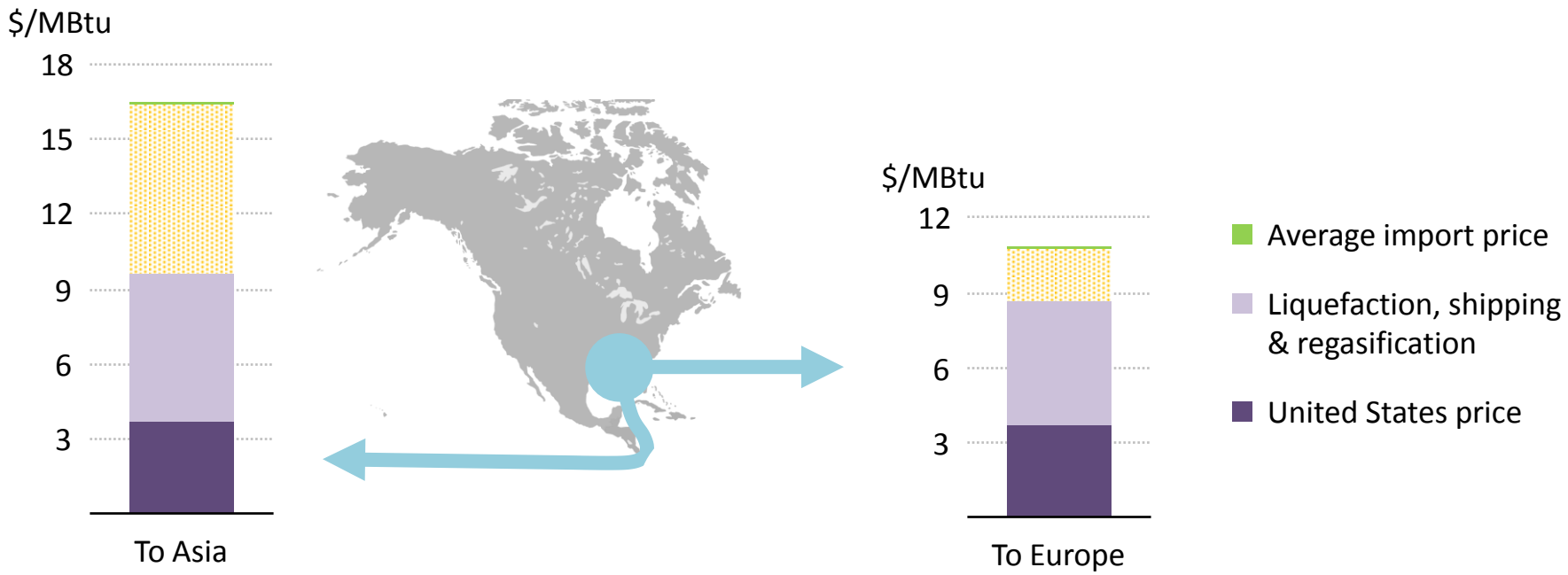
Indicative economics of LNG export from the US Gulf Coast



New LNG supplies accelerate movement towards a more interconnected global market, but high costs of transport between regions mean no single global gas price

A Third Way for Europe: balancing competitiveness & sustainability

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- **The high cost of energy in Europe is a structural issue, not a one off**
- **Europe's share of the global export market for energy-intensive goods is set to decline substantially by 2035, directly impacting 30 million jobs**
- **Both competitiveness & sustainability are crucial issues for Europe, but it must not be seen as an "either-or" choice**
  - *improve energy efficiency*
  - *negotiate more competitive terms for natural gas imports*
  - *develop renewables, nuclear power & unconventional gas*
  - *complete the internal energy market*
- **Decisions taken will influence Europe's long-term prosperity & could provide powerful inspiration for others to follow**

Future Challenges and Trends of the Energy Markets

Session of the Economic Council
Vaasa 7 April 2014

Esa Härmälä
Director General
Energy Department
Ministry of Employment and the Economy

Europe’s role in energy and climate getting marginal. The key question is not how we can reduce emissions but how we can help the world to make it. The implementation of the four measures proposed by IEA decisive (energy efficiency, fossil fuel subsidies, inefficient use of coal, methane releases)

Finland can achieve 2050 goals (-80 - 95 %) only if:

Biomass is considered carbon neutral,

Carbon Capture and Storage will come into general use, and

Nuclear stays in the energy pallet

The challenge of the 2020s for Finland is how to have enough non-intermittent electricity generation capacity and are we able to maintain the role of district heating and combined heat and power production?

Intermittent electricity (Wind, Solar) have already caused big trouble in many European markets as it varies, is subsidized and has no fuel cost

Many countries try to rebalance the situation with the help of subsidies to conventional electricity production (UK, Germany, France)

DH and CHP threatened by electricity market situation, carbon neutrality of biomass and heat pumps

Besides the delayed nuclear project OL3, waste incineration (by law) and wind mills (subsidized) there are no new investments in eletricity production in Finland but old capacities are closed

The Finnish investment dilemma: can our investments get enough operating hours when intermittent production grows in Nord Pool and can they in general be competive against Norwegian and Swedish hydro during the water rich years?

Professor Sanna Syri, HS 20. March: ” I challenge the political decision makers to tell how reliable energy supply in winter time would be realized without massive electricity imports or increase of CO2 emissions?”

Increasing of self sufficiency in electricity generation getting impossible.

Remarks on presentation Knowledge bases, regional innovation policy and global competitiveness by Björn Terje Asheim

Economic Council in Vaasa, April 7, 2014

Seija Virkkala, University of Vaasa

The new growth is the solution of economic crisis and it can be discovered

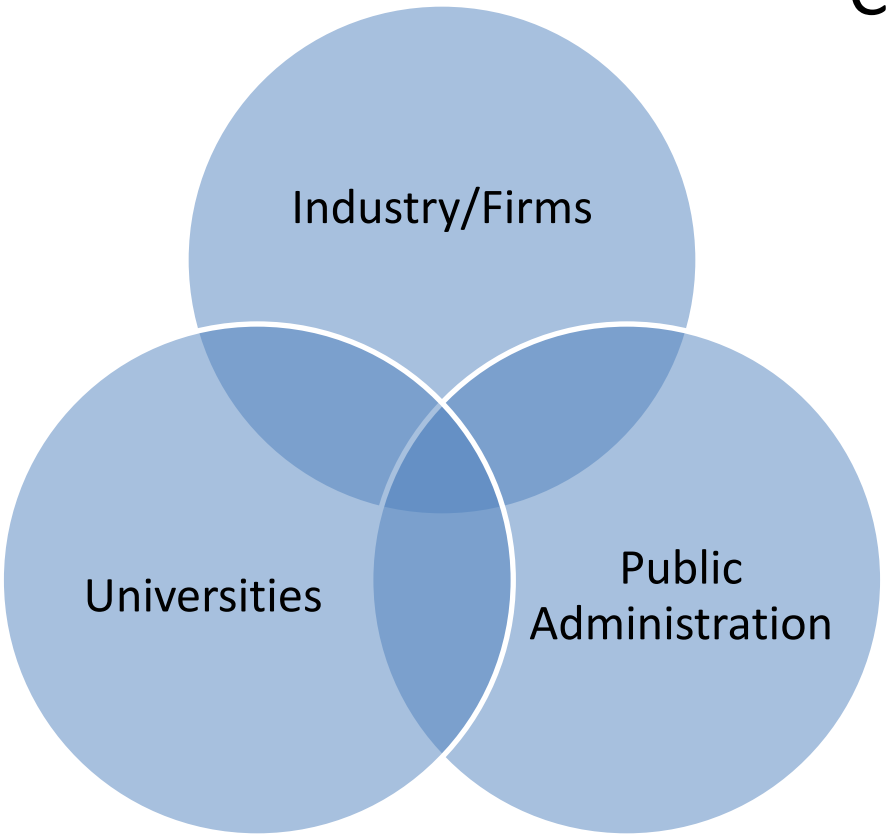
- **at the regional level**, not at the national level
- implementing **broad innovation** policy,
- by activating the growth and **innovation potential of all regions**,
- and by **diversifying** the already existing unique regional specialisation with the help of **entrepreneurial discovery** and interregional/global networking. This is the smart specialisation initiative.

Case Wärtsilä in Vaasa

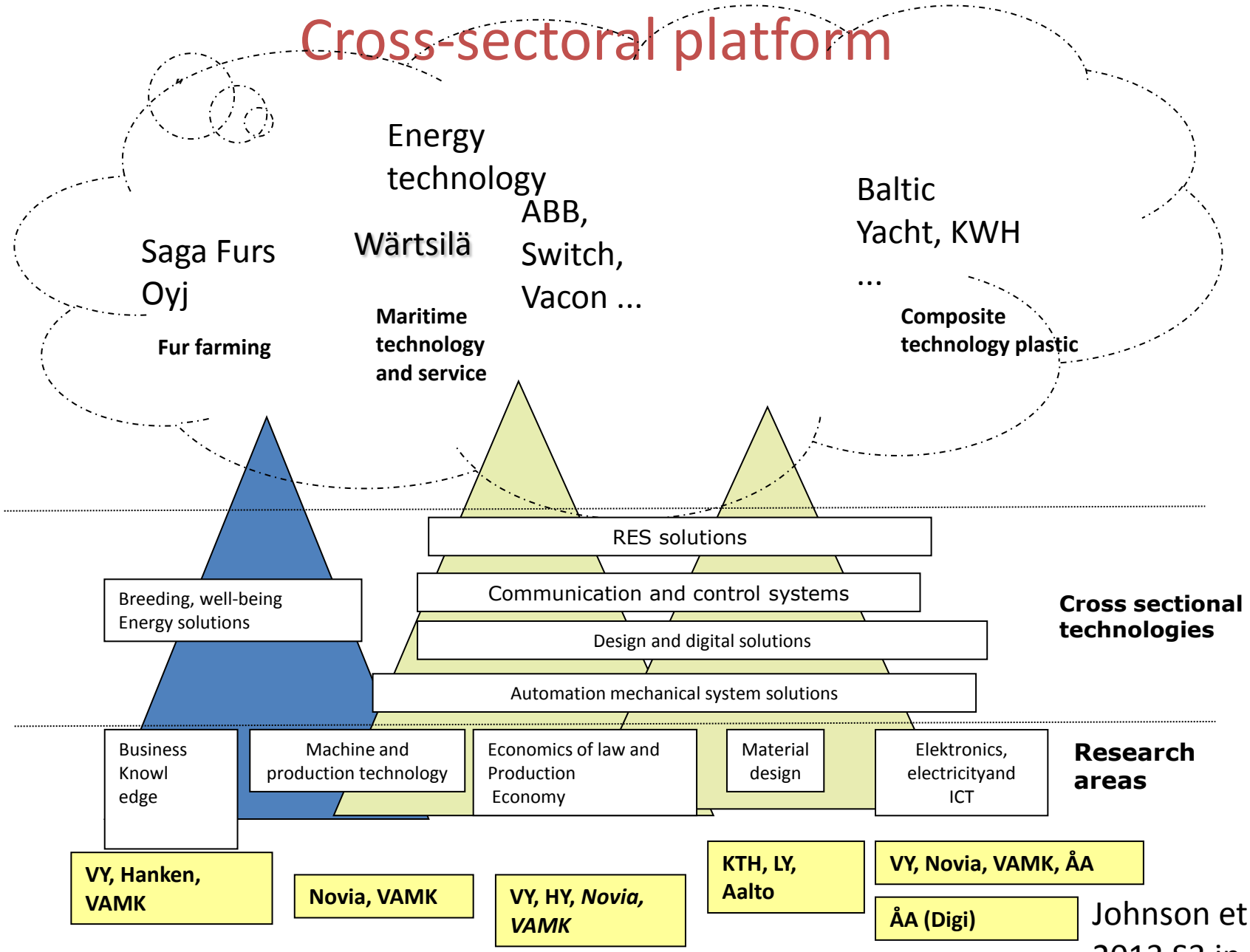
- Long history and path dependency in the locality
- Local embeddedness in Vaasa:
  - co-operation with educational institutions, UAS (polytechnics): embodied knowledge and synthetic knowledge base, as well as universities
  - Local supplier network
  - specialised services
  - Local labour market
- Global actors and global value chain/ networking for the critical mass.

Smart specialisation: tripple helix

Connectivity?

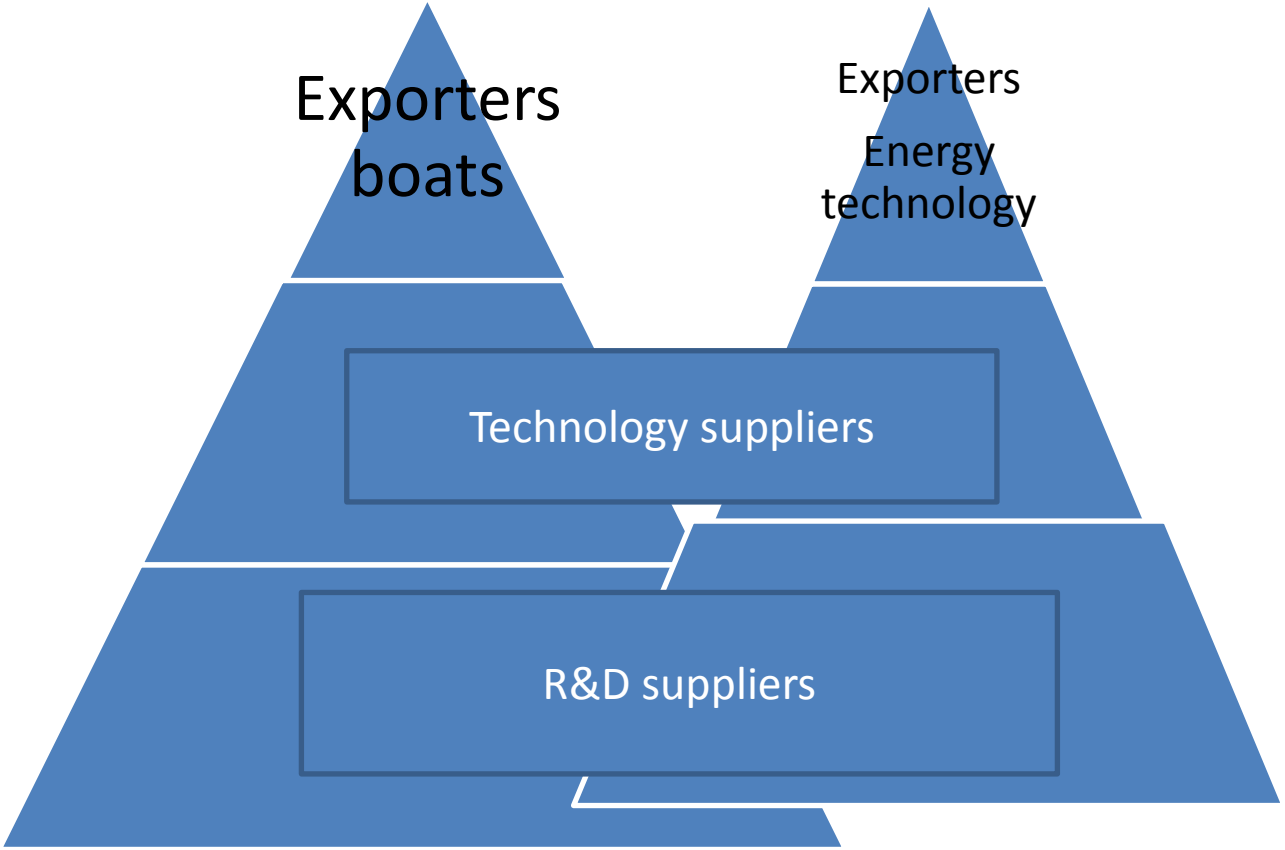


Cross-sectoral platform



Johnson et al 2013 S3 in O.

Technology platform



Regional technology platforms are networks of industries and R&D firms and institutions which are able to support the formation several clusters in different sectors.

Well-develped regional technology platforms are likely to enable innovation of new product, industries and clusters through related varieties and entrepreneurial discoveries.

Smart specialisation strategy, survey in Ostrobotnia 2013-2014

- Relationships between and inside 3 helixes (firms, universities, public administration)
- Clusters with global market (energy technology, boat building, fur industry)
- Spaces: Ostrobotnia, other part of Finland, outside Finland
- Technological platforms
- 53 interviews in 2013: 21 firms, 15 universities, 17 public admin.

1. Network analysis: 27 relations

University

Firm

Public administr.

- FIRMS, Ostrobothnia
- FIRMS, other Finland
- FIRMS, world

- UNIVERSITIES, Ostrobothnia
- UNIVERSITIES, other Finland
- UNIVERSITIES, world

- PUBLIC ADMINISTRATION, Ostrobothnia
- PUBLIC ADMINISTRATION, other Fin
- PUBLIC ADMINISTRATION, world

1.Findings: **Tripple helix relations in O. are dense but asymmetric**

- The firms co-operate mostly with other firms and secondly with public administration. Actors in public administration and universities want more to co-operate with firm sector than the firms with them.
- Energy cluster companies are embedded both in Ostrobotnia, other parts of Finland as well as globally measured by the amount of partners and the importance of the partnerships.
- Partners in the university sector elsewhere in Finland are slightly more important than in Ostrobothia and they tend to seek foremost cooperation in research outside the region.

2. Gap analysis on the tripple helix: identify problems, look for solutions

- Questions to business leaders (AND OTHERS IN THE 3H):
- What is your expectations to research and education (and other sectors) in your region (ON A SCALE FROM 1 – 10) – and
- what are your experiences (ON A SCALE FROM 1 – 10)?
- GAP is the difference.
- A GAP > 2 indicates a problem
- A small GAP with high expectations indicates that this might be a good solution
- compare GAPs across regions in different countries, and in the same region through time (improvements)
- Dialogue on PROBLEMS, search for HAPPY solutions

2.Findings: the gaps between expectations and experience are relative small in O.

- Generally, **the gaps were low between expectations and experiences** in the relationships with firms by the firms themselves and by the actors in public administration and universities.

Energy technology firms, cooperation with other companies – Ostrobothnia

	Energy sector, Expectations and experiences with companies in Ostrobothnia		
	Expectations	Experiences	Gap
Sub-contractor	9,3	7,8	-1,5
Customer	9,3	8,5	-0,8
In-house cooperation	9,0	8,0	-1,0
Technology	9,0	7,6	-1,4
Production	7,3	6,8	-0,5
Process	6,3	6	-0,3
Organizational	5,8	6	0,2
Marketing	7,2	7,3	0,1

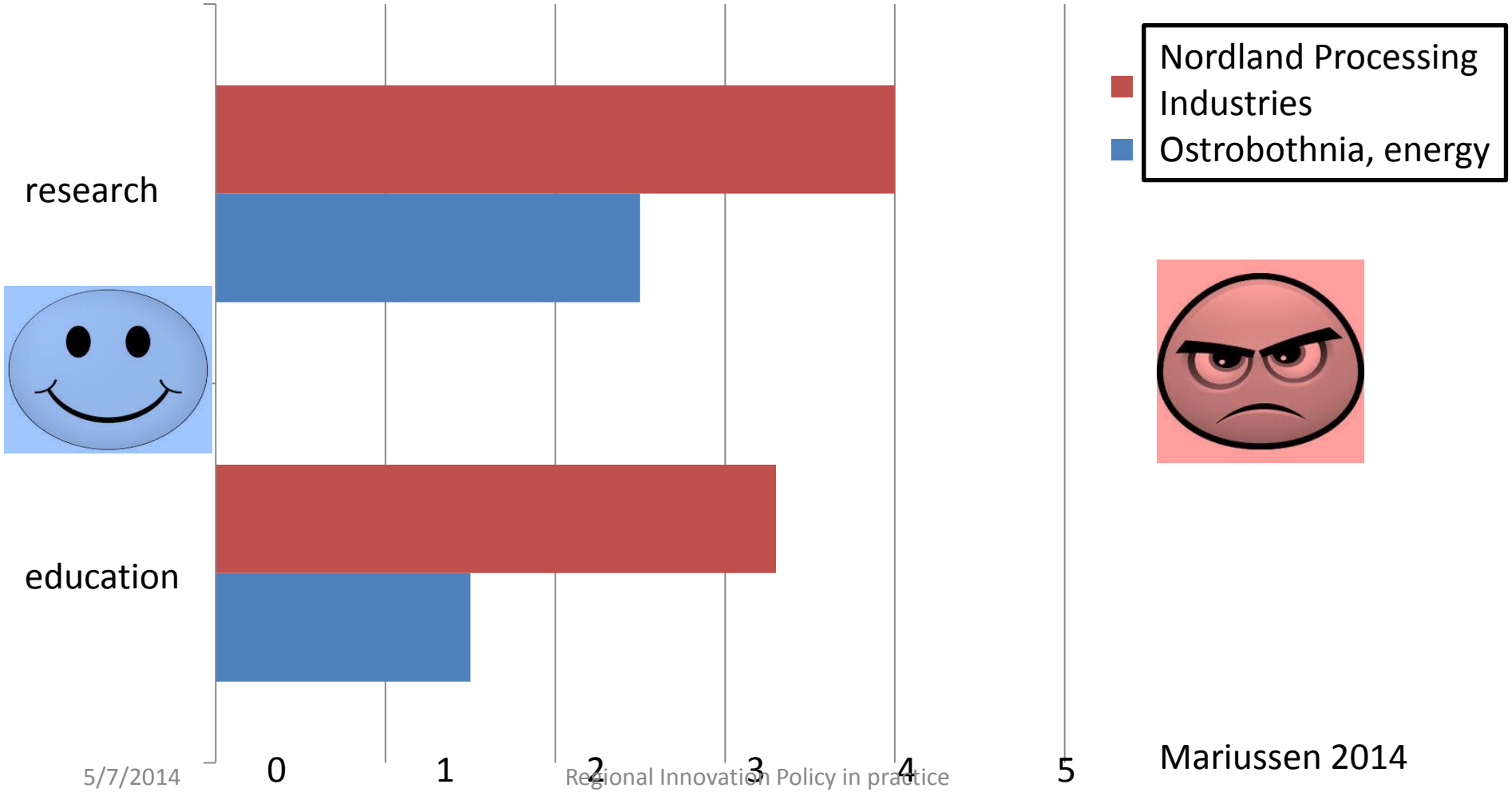
Björk, Johansson et al 2014

Energy technology firms, cooperation with Public organizations – in Ostrobothnia

	Energy sector, Expectations and experiences with Public organizations in Ostrobothnia		
	Expectations	Experiences	Gap
Infrastructure/Logistics	8,5	6,5	-2,0
Regional development	9,0	6,6	-2,4
Tecnological development	7,3	6,5	-0,8
Business development	7,7	6,0	-1,7
Spatial planning	6,5	3,5	-3,0
Environmental issues	4,7	4,7	0,0
Labour issues	5,8	5,8	0,0

Björk, Johansson et al 2014

GAP comparisons: Why are Finns happier that Norwegians?



Mariussen 2014

3.Technologies: 1.How important are these technologies for your firm (1-10?)

TYPE	IMPORTANCE /MERKITTÄVYYS		
THE KEY ENABLING TECHNOLOGIES (KET)	NOW	IN FUTURE	WHY? HOW TO DEVELOP IT MORE?
NANOTECHNOLOGY	4,3	6,8	
MICRO- AND NANOELECTRONICS	5,9	7,6	
PHOTONICS	3,2	4,4	
ADVANCED MATERIALS	6,0	7,8	
BIOTECHNOLOGY	5,1	6,5	
PROGRESSIVE PRODUCTION METHODS	8,2	9,3	
SMART GRIDS	7,2	8,7	
RENEWABLE ENERGY	7,9	9,3	
OTHERS			

Björk, Johansson et al 2014

3.2. Mapping of partners providing important technologies today

Where are your most important partners in developing the most important current technologies? (1-10)	Inside own organization	Private firms	Public authorities/ institutions	Universities, UAS	Industrial parks, science parks, network organizations
in Ostrobothnia?	**15**	**19**	5	**17**	9
in other parts of Finland?	4	**15**	3	13	5
outside Finland	5	10	4	11	4

3.3. Where do you expect to find the sources of future technologies in your industry in 20 years?

Where do you expect to find partners in developing future technologies? (1 – 10)	Inside own organization	Private firms	Public authorities/ institutions	Providers of science, research, education and expertise	Industrial parks, science parks, network organizations
in Ostrobothnia?	8,2	**8,7**	3,0	7,6	5,2
in other parts of Finland?	7,0	**8,4**	3,0	8,2	4,4
outside Finland?	7,2	8,1	3,3	8,1	4,4

Ostrobotnia is a success story, since

- The innovation system is **business driven** and supported by environmental regulations and policies.
- Relatively **high regional and global connectivity** (tripple helix)
- **But is the growth in Ostrobotnia sustainable**?
  - **Diversification** through regional technology platform would increase the sustainability.
  - **Even better connectivity** and more public money directed research matching the private sector research in order to deepen the embeddedness of the global firms.
  - European **interregional networking** resulting in co-evolution and co-specialisation of regional economies to promote more critical mass.

Thank you!

Knowledge Bases, Regional Innovation Policy and Global Competitiveness

Bjørn T. Asheim

Professor

University of Stavanger and Lund University

uis.no

Presentation for the Economic Council of Finland,
Vaasa, Finland, Monday 7th April 2014

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Established 2004 as part of Lund University, the largest and third oldest (1666) university in the Nordic countries

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Six messages

- Firms and regions compete on the basis of unique products and services
- Uniqueness is created through product differentiation
- Product differentiation can be achieved in all types of economic activities but in different ways dependent on the dominent knowledge bases
- Competitiveness is based on continuous innovation – innovation represents the high road strategy of competition
- Competitiveness is both path extension and new path development (path renewal and path creation) – regional resilience
- To succeed in achieving this a broad based innovation policy is needed

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Innovation as a progressive force

- Innovation represent ’the high road strategy’ that is the only long-term, sustainable growth alternative for developed, high-cost economies as well as for developing economies (in contrast to ‘the low road strategy’ based on relative cost)
- Innovation is not only R&D in high-tech industries (linear model), but can take place in all kinds of economic activities (broad based innovation policy)

Theoretical perspectives: Innovation systems

- OECD work in 1982 ('Science, Technology and Competitiveness') developing an alternative to mainstream, static economic's view on international competitiveness as based on 'relative cost' (i.e. the 'low road' strategy).
- Instead a dynamic perspective on innovation and learning in the promotion of economic growth with an active role of government stimulating learning and innovation was proposed (i.e. the 'high-road' strategy).
- Innovation at the centre of economic growth
- IS both selection environments (shaping selection processes) and sources of new variety creation (shaping creativity)

Economic performance: Global competitiveness report (World Economic Forum)

	2005	2008	2009	2010	2011	2012	2013
Finland:	1	6	6	7	4	3	3
Sweden:	3	4	4	2	3	4	6
Denmark:	4	3	5	9	8	12	15
Norway:	9	16	14	14	16	15	11
Spain:						36	35
Italy:						42	49
Portugal:						49	51
Greece:						96	91

How to secure regional resilience

- To secure resilience is an ongoing process rather than a recovery to a stable equilibrium state
- Resilience means that the capacity of a region to develop new growth paths and to sustain long-term development is regarded as more important than the capacity of a region to respond positively to short-term shocks
- Thus, there is not a trade-off between adaptation (within existing paths) and adaptability (new path development)
- Securing competitiveness means securing existing as well as future competitiveness
- Sweden called the most resilient economy in Europe by OECD

Existing competitiveness

Strengthening existing industries (incremental (process) innovations in existing technological trajectories securing high productivity) – path extension (positive lock-in):

- Norwegian Centre of Expertise (NCE) – securing and developing competitiveness in Norway's four leading clusters (oil & gas, maritime, marine and metal smelting) – successful example
- NOKIA successful in keeping the mass marked for cheap mobile phone in the 3rd world – unsuccessful example
- This cannot be left to firms to take care of – public innovation policy is needed. To secure future competitiveness this is even more important (TEKES, VINNOVA)

Future competitiveness

a) upgrading existing industries (changing technological trajectories through regional branching) – path renewal:

- Statoil branching into sustainable energy production
- Aker Solution producing platform for ocean based windmills
- Nokia developing a successful smart phone (not successful)

b) promoting new emerging industries (radical (product) innovations) – path creation

- Oslo cancer cluster – R&D based development
- 3B's Research Group, University of Minho
- Regenerative medicine in Tampere

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Definition of Constructing Regional Advantage (CRA)

- *Constructing Regional Advantage* means:

1. turning *comparative* advantage into – or
2. creating

   competitive advantage through an explicit policy push promoting a Chamberlinian *monopolistic competition* based on product differentiation resulting in *unique* assets or products

- Report from DG Research, European Commission, May 2006
- CRA can be adapted as an innovation strategy in all kinds of industries
- Basic assumption also in the innovation systems and Porter's cluster approaches
- Strenghtening regional innovation systems policies

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Differentiated knowledge bases

- Knowledge creation and innovation take place in all kind of industries but is done in different ways, needs different kinds of knowledge and skills and requires different forms of innovation support
- No type of knowledge should a priory be considered superior with respect to generating economic growth and innovation. All knowledge bases can be used to create product differentiation
- Characterise the nature of the *critical knowledge* which knowledge creation and innovation processes in different industries cannot do without (ontological, generic category)
- Distinguish between three *different* knowledge bases:
  - a) *analytical* (science based)
  - b) *synthetic* (engineering based)
  - c) *symbolic* (art based)

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Differentiated knowledge bases: A typology

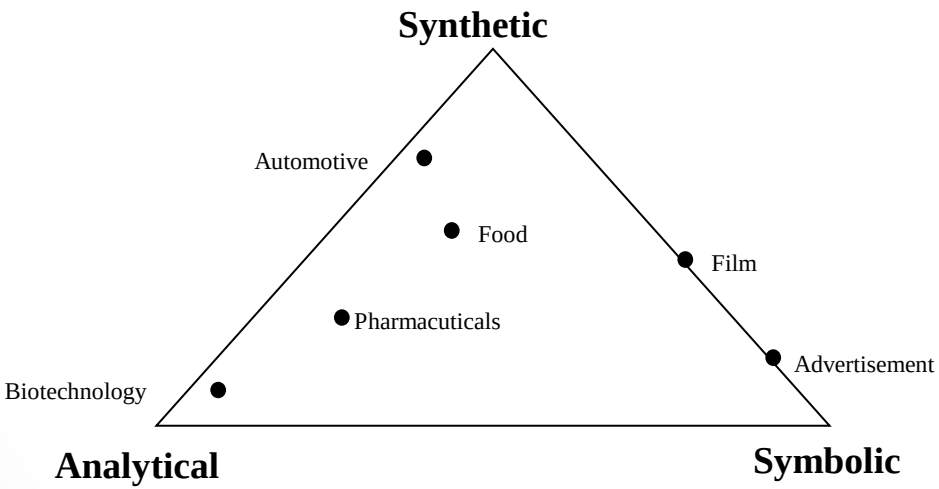
Analytical (science based)	*Synthetic* (*engineering based*)	*Symbolic* (art based)
Developing new know-ledge about natural systems by applying scientific laws; *know why*	*Applying or combining existing knowledge in new ways; know how*	Creating meaning, desire, aesthetic qualities, affect, intangibles, symbols, images; *know who*
Scientific knowledge, models, deductive	*Problem-solving, custom production, inductive*	Creative process
Collaboration within and between research units	*Interactive learning with customers and suppliers*	Experimentation in studios and project teams
Strong codified knowledge content, highly abstract, universal	*Partially codified knowledge, strong tacit component, more context-specific*	Importance of interpretation, creativity, cultural knowledge, sign values, implies strong context specificity
Meaning relatively constant between places	*Meaning varies substantially between places*	Meaning highly variable between place, class and gender
Drug development	*Mechanical engineering*	Cultural production, design, brands

Different modes of innovation

- *'How Europe's Economies Learn. Coordinating Competing Models'* : Different *modes* of innovation (Lorenz and Lundvall, 2006)

1. *STI* (*S*cience, *T*echnology, *I*nnovation) – *analytical* knowledge/basic research (science push/supply driven) and *synthetic* knowledge/applied research (market/user driven)
2. *DUI* (*D*oing, *U*sing, *I*nteracting) – *Competence* building and *organisational* innovations – *synthetic* and *symbolic* knowledge (market/user driven)
3. Combining modes of innovation (STI/DUI) makes firms perform better (Berg Jensen et al., 2007)
4. Firms sourcing broadly (both R&D and experience based knowledge) are the most innovative (Laursen and Salter, 2006)

Combining knowledge bases: illustrating empirical examples



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New sources of growth: Knowledge-based capital (KBC) (OECD Review of Sweden's Innovation Policy)

- KBC comprises *intangible* assets used in production and owned by business, such as:

1. Computerised information (software and databases)
2. Innovative property (patents, *copyrights*, *trademarks*, *designs* (Apple – increased importance of symbolic knowledge base))
3. Economic competencies (including *brand equity*, *firm-specific human capital*, *networks of people and institutions*)
4. The *organisational know-how* that increases enterprise efficiency
5. Aspects of *advertising and marketing*

- Large and growing business' investments in KBC as a key source of changes in productivity and GDP

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Regional resilience and knowledge base combination

- Analyses of Italian regions shows that:

1. Related variety and the symbolic knowledge base appear to be drivers of regional resilience. Regions with a significant symbolic knowledge base (but not prevelant) which is balanced with other knowledge bases (synthetic) are the most positively performing
2. Regions characterised by a prevelance of industries with an analytical knowledge base shows a poor resilience
3. The positive impact of symbolic knowledge suggests that the core resources for regonal resilience is not to be found primarily in technology intensive fields but in more creativity intensive fields, where e.g. design can be used to renew traditional manufacturing

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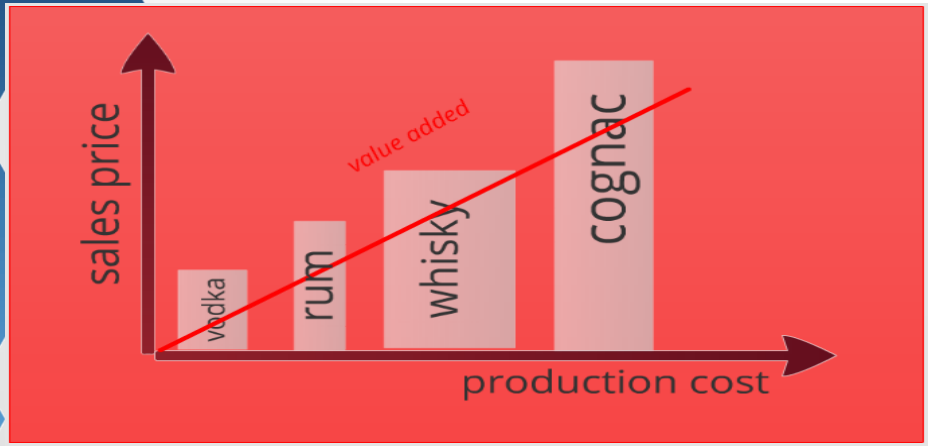
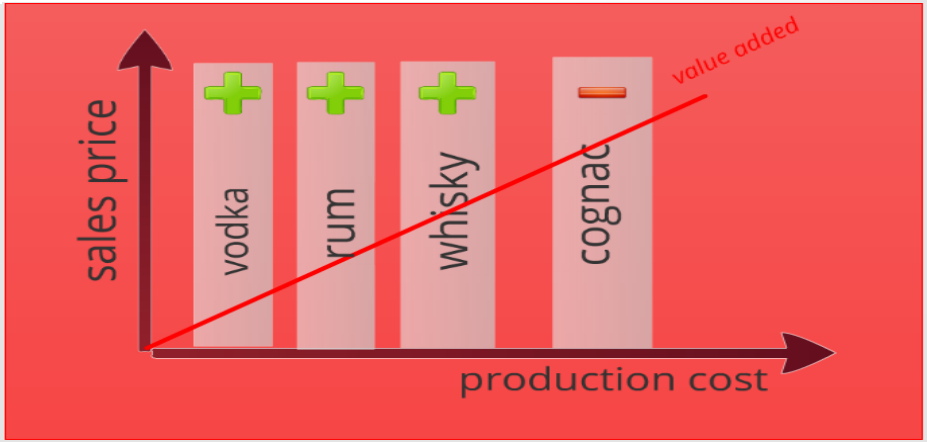
Innovation strategies in traditional industries

- Upgrading of traditional industries through *product differentiation*:

1. Increased knowledge input of (analytical)/synthetic (engineering) knowledge base (technical textile/shoes), *or*
2. Fashion using branding and design (symbolic knowledge): Zara Finland has a strong design tradition to be used to promote style (e.g. in making Finnair more competitive) – ’the difference between fashion and style is quality’ (Armani)
3. Food and beverages through branding and design (symbolic knowledge): Grey Goose and Balik salmon as well as increased quality (organic production): Denmark (agriculture)
4. Tourism: Go upmarket by creating unique products/ services/experiences (symbolic knowledge base): Ice hotel in Northern Sweden and The Santa Claus Village in Rovaniemi (crossing the magical Arctic Circle) – platform policy

The value added potential of intangibles - symbolic knowledge base (Source: Lionel Sack, CIRCLE)





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The entrepreneur: Sidney Frank

American Entrepreneur: creator of Grey Goose (i.e. non-local actor)
Creative reuse of local knowledge (**synthetic** (analytical))
Adding external competence: branding, international marketing (**symbolic**)
No fear of breaking with local institutional context
Linking up to externalities – tangible (local) and **intangible** (non-local). No track record in the industry. Small initial investments
Path renewal – regional branching (related variety)
Sold brand in 2004 to leading MNC in the industry for 2.2Bn US$ (Bacardi)

Forms of innovation:Technological and application development

- Two modes of innovation (synthetic knowledge based, engineering industries with batch production):

1. *Application* development. Incremental innovations through user-producer relationships with demanding customers and suppliers in connection with the actual production. In-house experience based competence dependent on a highly qualified workforce. **D**(oing), **U**(sing), **I**(nteracting) mode of innovation
2. *Technological* development. Research projects together with universities to develop platform technologies as the basis for application development. **S**(cience), **T**(echnology), **I**(nnovation) mode of innovation

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Innovation indicators and measurement

- However, many such innovations, which ’relied on well-developed engineering competence and highly competent labor, ..., may not even be classified as innovations by CIS (community innovation study)-type surveys that mainly focus on product and process innovations’ (Fagerberg et al., 2009a)
- This implies that ’learning-by-doing and engineering based activities such as the design of large process plants in oil refining or basic metals are not captured by the Frascati manual of definitions of R&D and may not be captured by the design category in the CIS expenditures question’ (Fagerberg et al. 2009b)

Forms of work organisation (micro foundation of the DUI mode of innovation)

- **‘Learning’ forms of work organisation (CME)**:
  - + : Netherlands, ***Denmark***, ***Sweden*** and ***Norway***
  - - : *Southern countries* and *Ireland*

- **‘Lean’ forms of work organisation:**
  - + : UK, *Ireland*, *Spain* and France
  - - : Netherlands, ***Denmark***, ***Sweden***, Germany and Austria

- **‘Taylorist’ forms of work organisation:**
  - + : *Southern countries* and *Ireland*
  - - : Netherlands, ***Denmark*** and ***Sweden***

- **‘Simple’ forms of work organisation:**
  - + : *Southern countries*
  - - : Netherlands, ***Denmark***, ***Finland*** and UK

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Can learning work organisations be ’generalised’ to all knowledge bases

- Learning work organisation typical in synthetic knowledge (engineering) based industries
- What about analytical and symbolic knowledge based industries, or knowledge intensive business services?
- Can autonomy in work situation creating learning dynamics be ’generalised’ into organisational slack to break routines (e.g. as in Google)?
- Increased focus on the developmental/creative aspects of learning (’logic of exploration’) in contrast to reproductive/adaptive learning (’logic of exploitation’) traditionally characterising learning work organsations

Distributed knowledge networks

- As a result of the increasing complexity and diversity of knowledge creation and innovation processes, firms need to access and acquire new, external knowledge to supplement their internal, core knowledge base(s)
- The awereness and importance of implementing strategies for external knowledge sourcing is increasing, linked to the challenges and opportunities of global innovation networks
- Concepts such as open innovation and innovation systems build on the recognition that interorganisational linkages are critical to the innovative capabilities of firms and the growth of economies
  - Transition from internal knowledge base(s) within firms to distributed knowledge networks across a range of firms, industries and sectors locally and globally
  - Extent and reach of external sourcing depends on firms' knowledge bases

Knowledge bases and proximity

- The absorptive capacity for accessing, diffusing and making use of new external and internal knowledge is unenven due to the heterogeniety of firms' competence bases and the importance of their position in internal and external innovation networks
- The importance of proximity dependent on the *knowledge bases* of firms
- *Analytical* knowledge based firms (e.g. biotech) are part of a local node of excellence in global knowledge networks and epistemic communities - less sensitive to proximity – codified knowledge
- *Synthetic* and *symoblic* knowledge based firms are more dependent on local knowledge networks and communities of practice - distance matters more – context dependent – higher content of tacit knowledge
- For all knowledge bases: Early phasis of innovation facitlitated by F-2-F interaction

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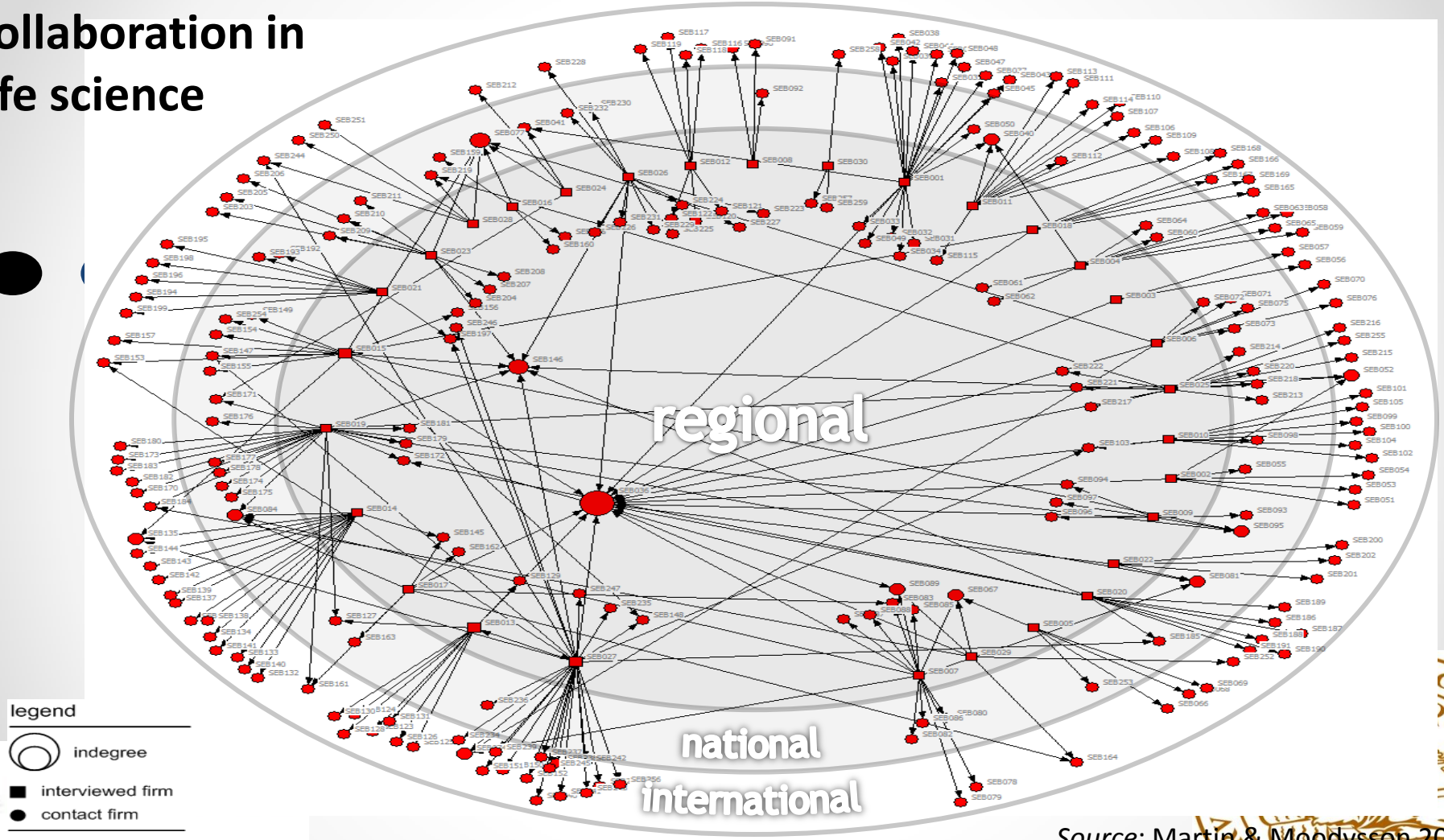
Figure: Knowledge sourcing through

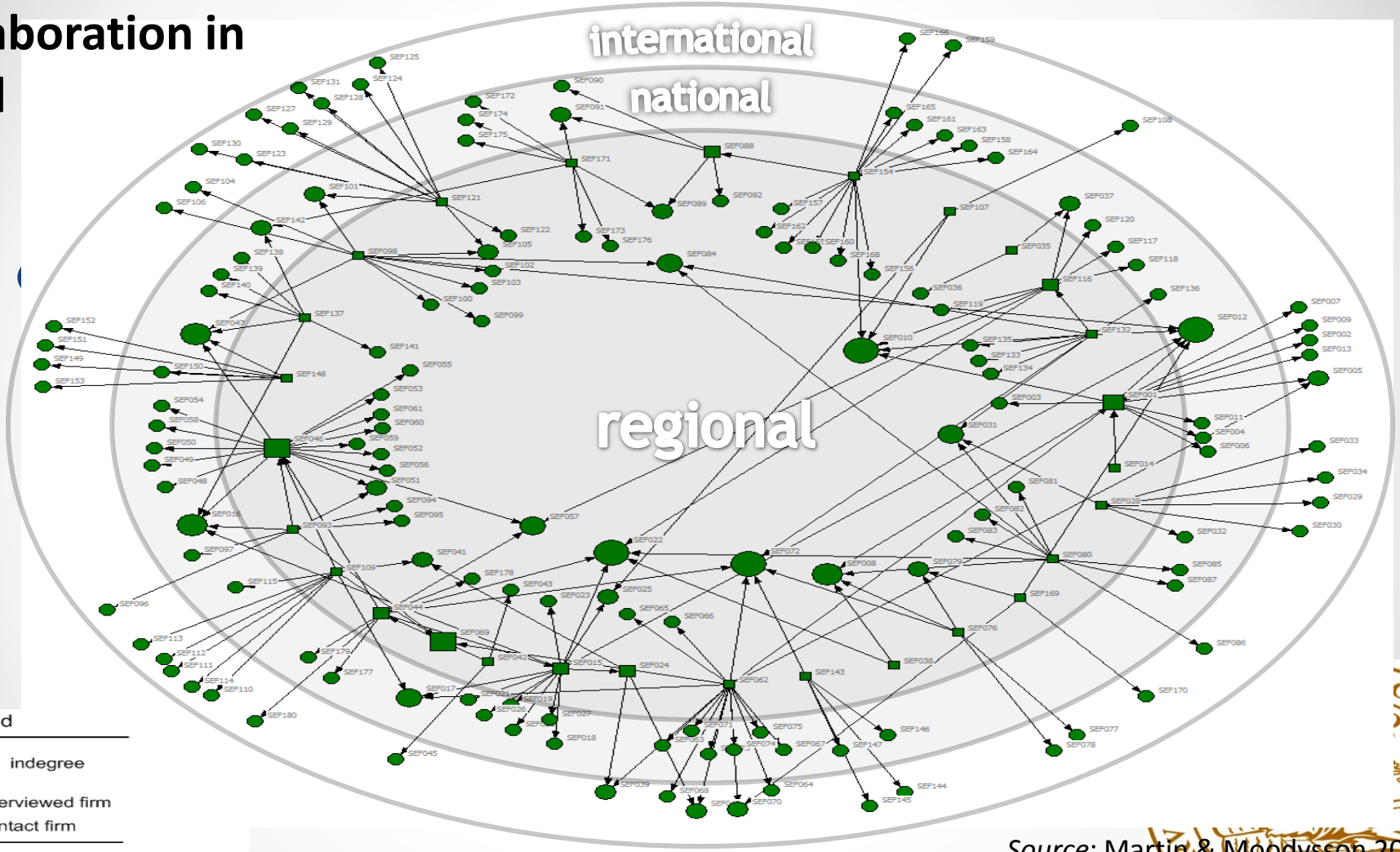
collaboration in life science



Source: Martin & Moodysson 2012

Figure: Knowledge sourcing through

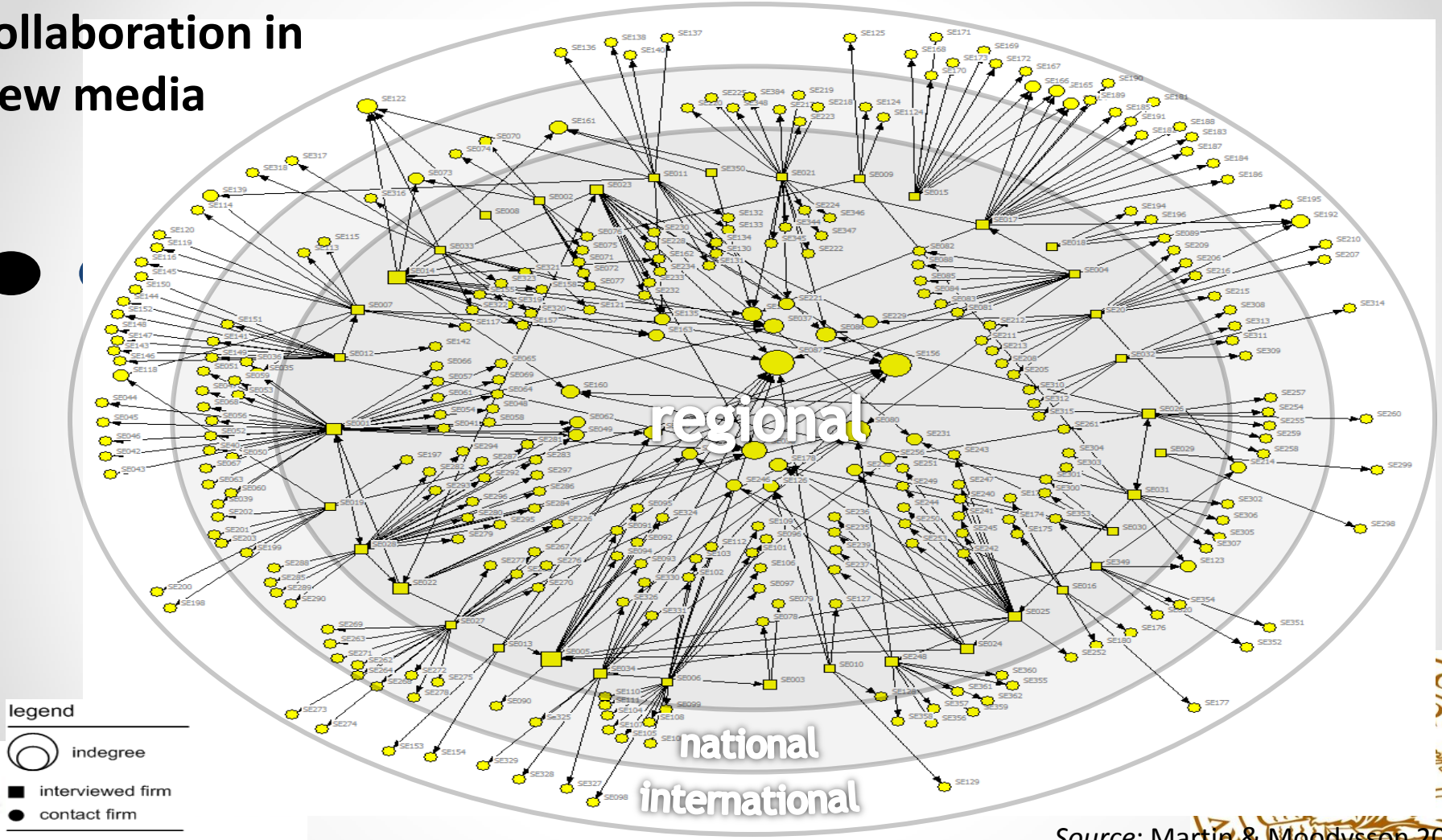
collaboration in food



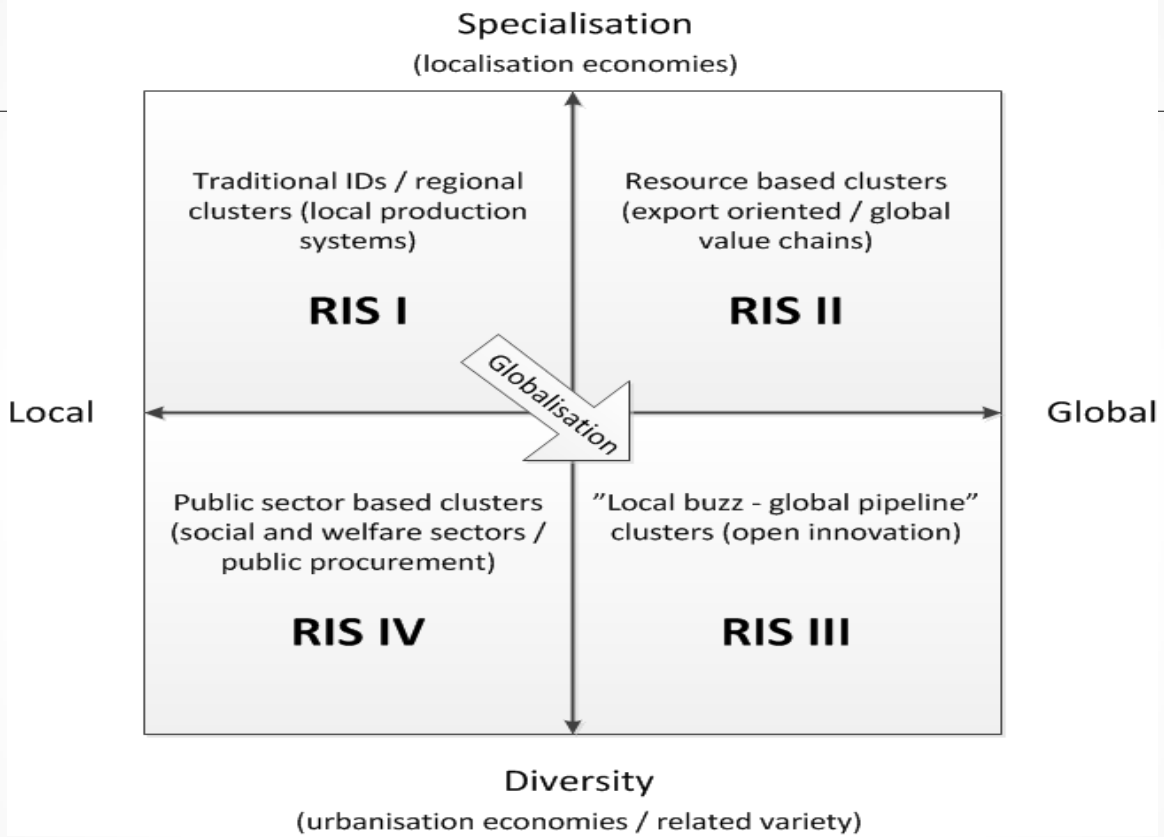
Source: Martin & Moodysson 2012

Figure: Knowledge sourcing through

collaboration in new media



Source: Martin & Moodysson 2012



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The new context of RIS in a globalising economy

Attracting talents: Do the Creative class have the same priorities?

- The Creative class (30-40 % of the work force) belongs to different knowledge bases (analytical, synthetic and symbolic)
- Different preferences and trade-offs between firms, occupations and places
- Synthetic/engineering knowledge base: people follows jobs (business climate still most important)
- Analytical/science and symbolic knowledge bases: jobs follow people (people climate more important, especially for people working in symbolic, artistic based industries)
- Thus, focus on *people* climate should complement (not substitute) the traditional focus on business climate

Sillicon Valley - Sillicon Cities

- From clusters to ’innovation districts’
- Found in US cities such as Atlanta, Boston, Philadelphia, San Francisco and Seattle
- These districts cluster leading-edge anchor institutions (e.g. Universities) and cutting-edge innovative firms, connecting them with supporting and spin-off companies, business incubators, mixed-use housing, offices, retail and 21st urban amenities
- Combination of localisation economies and urbanisation economies

Sillicon Cities – innovation districts

- These trend is fueled in part by young profesionals, often starting families later than earlier generations, who want to access restaurants, shops and cultural attractions
- They want a vibrant street life, historic neighborhoods, and public transit
- Science and technology companies are discovering that they benefit from the shared knowledge and entrepreneuria activity fostered by innovative districts
- Combination of business climate and people climate

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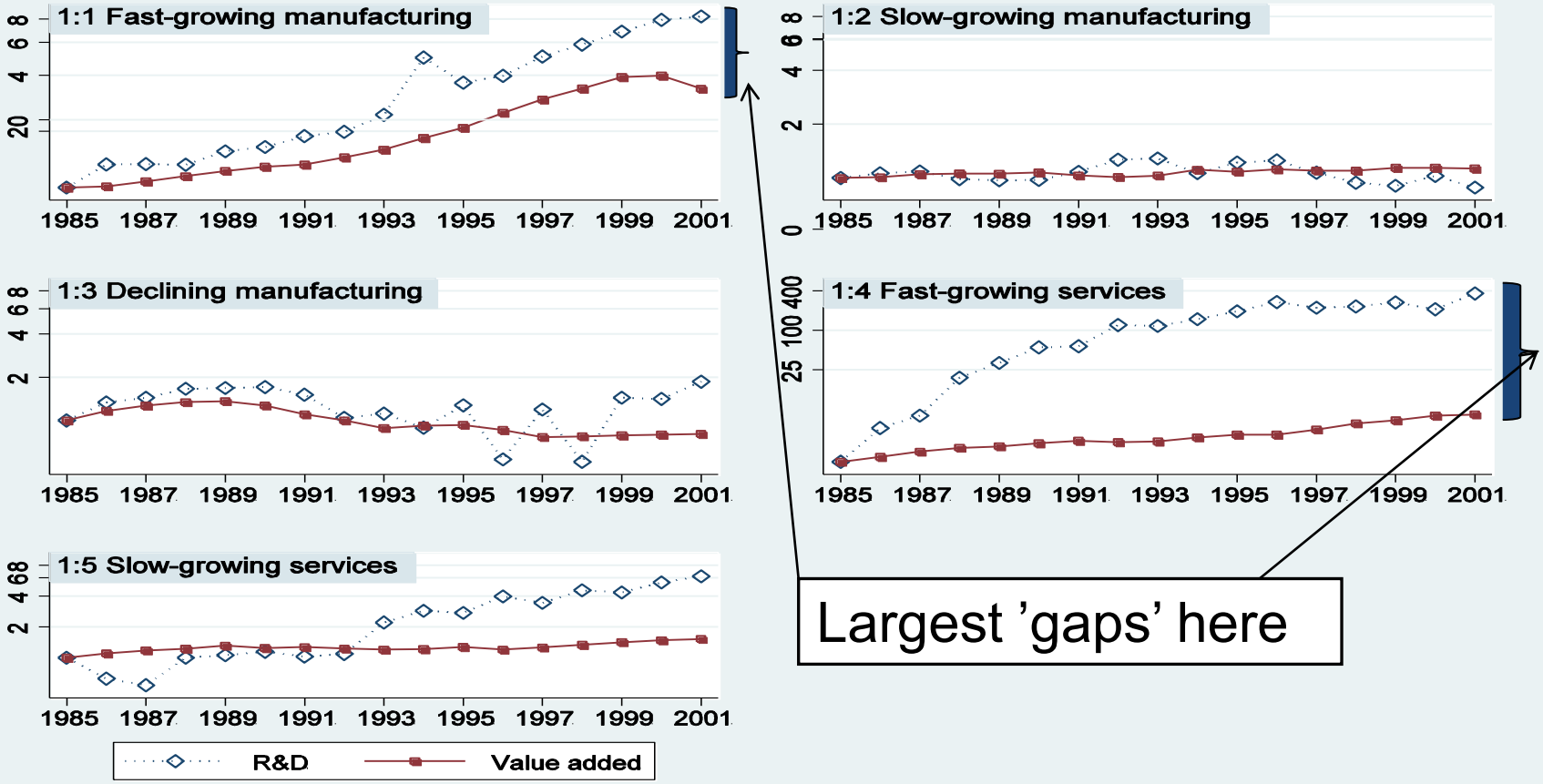
Sweden: An R&D paradox?

- High *business* R&D-intensity
- ’Surprisingly’ Low ”output” / export value in high tech goods
- Can we really expect R&D and growth to grow in proportion?
- Article in Research Policy (Ejermo et al., 2011) concludes that there is no paradox
- Argue that if a system failure existed the paradox would manifest itself in slow growing sectors which could not transform R&D into growth (medium and medium-low tech)
- However, the ’paradox’ only occurs in fast-growing manufacturing and service sectors
- Diminishing marginal return to R&D investments in high-tech sectors, which are dependent on R&D for their global competitiveness

Ejermo, Kander & Svensson Henning (2011), Research Policy



Largest 'gaps' here

The Swedish Paradox

- Economy growth dependent on sectors with *growing* R&D/value added gap
- Growing R&D-intensity – *systemic* and *needed* feature of the economy
- High R&D-intensity because of many MNEs, and the industry structure
- Profit not necessarily generating growth ▫ decoupled link between R&D and GDP (Gross Domestic Product)
- An expensive policy with strong demands on high research quality and competence level
- Will only work in already highly developed countries and regions – not an optimal policy for PIGS and not even for Finland as experience has shown

The Norwegian ’puzzle’

- Norwegian ’puzzle’ (OECD): High welfare and per capita income levels, one of the highest GDP globally, and strong performance with respect to productivity in combination with a very low level of investment in R&D (also when controlled for industry structure)
- High level of absorptive capacity due to one of the highest levels of tertiary education in Europe
- The high level of absorptive capacity results in a high level of adoption of new technologies, efficient knowledge diffusion and frequent cooperation in innovation both within firms in learning work organisations as well as between firms in regional clusters
- However, such characteristics of a national innovation system is ’typically not captured by conventional indicators of innovation input or output’ (Fagerberg et al. 2009a)

Drivers of innovation

- *Supply* driven (science/R&D – analytical knowledge base)
- *User* driven (user-producer interaction - synthetic knowledge base)
- *Market* driven (manifest demand in markets - either explicit or implicit (e.g. fashion - design driven innovations – symbolic knowledge base))
- *Demand* driven (latent demand in markets: basic human needs; environmental challenges – public/NGO procurement) – social innovation
- *Employee* driven (learning work organisations)

Typology of policies

Principles of policies / Types of Policy	Indirect, general (framework cond.)	Direct, general	Direct, specific
Science policy		Basic research in universities and research institutes/ (T-H) - IPR policy	
Technology policy		Specific 'strategic' technologies and sectors - public procurement policy	
Innovation policy	SkatteFUNN (tax relief) - Norway		Vinnväxt (T-H)/ VINNOVA – Sweden

Bjørn Asheim, 2007

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Broad based innovation policy

- Regions' economic structure are heterogenous, where a one dimensional R&D (S&T) based policy will not work. A customised regional innovation policy is needed - especially for peripheral areas (Constructing Regional Advantage/Smart Specialisation)
- Many drivers of innovation (supply, demand, market, employee driven)
- Many types of innovation (radical vs incremental; product, process, organisational)
- Many regions and nations starting to have a stronger focus on this problematic. Thus, the idea of a *broad based innovation policy* get increasingly more support
- In OECD's review of Sweden's innovation policy it was recommended that VINNOVA got an extended mission of pursuing a broad based policy
- Needs both *narrow* and *broad* RIS to be implemented

Regional Innovation Systems (RIS) narrowly (I) and broadly (II) defined

- **(I)** A RIS is constituted by two sub-systems and the systemic interaction between them (and with non-local actors and agencies):
- The *knowledge exploration and diffusing sub-system* (universities, technical colleges, R&D institutes, technology transfer agencies, business associations and finance institutions)
- The *knowledge exploitation sub-system* (firms in regional clusters as well as their support industries (customers and suppliers))
- **(II)** A wider system of organisations and institutions supporting learning and innovation, and their interactions with firms in the region. Integrating innovation policy with education and labour market policies(learning regions)

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VINNOVA - Strong R&I milieus

Regional innovation systems	• Promote innovativeness and competitiveness • Strong R&I milieus, focus on knowledge creation
Triple Helix	• University – industry – government • Normative (regional) innovation policy approach
Mode 2	• Interdisciplinary, problem-oriented, application driven research
Regional Proximity/ Globally connected	• Spatial and organisational proximity • Global knowledge networks (open innovation)
Emphasis on global excellence	• In knowledge exploration and exploitation

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Historical background

- First promotion of strong R&I milieus in 1979 when STU (The Board for Technical Development) supported basic research in new and potentially important areas for Swedish industry (IT, microelectronics and biotech).
- First explicit promotion of strong R&I milieus in 1990 when 11 interdisciplinary material consortiums were established. This inititative had a 10 years perspective and was funded by the National Science Research Council.
- In 1995 another ten years program was started (Competence Center Program). This is a further development of the concept which was introduced in the material consortiums. 28 centres were included in this program.

Roles of universities in RIS:

- Third mission (after teaching and research): direct interaction between universities and society as key actor in the *knowledge exploration* subsystem of RIS
  - Creating high-tech firms
  - Consulting for local industry
  - Delivering advice for politicians
  - Informing general public debates
- Universities are increasingly of strategic importance for regional development in the knowledge economy by often being the only actor bringing global state-of-the-art science and technology into the region
- Generative role: discrete outputs in response to specific demands
- Developmental outputs: development of regional institutional capacities (e.g. in the context of RIS)

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The performance of Lund University

- Triple Helix: The Entrepreneurial University – proactive part of a T-H (regional) coalition
- Third task – societal engagement in addition to teaching and research
- Mode 2: Universities internal organisation adapting (slowly) – establishment of interdiscplinary centres of excellence (e.g. CIRCLE) and faculty like organisations
- Both academic and third task success – LU has got 14 out of the Research Council's 40 CoExcellence. Spin-off through IDEON Science Park and Medicon Valley – the best researchers are also most active in Third task activities (professors' exemption)

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VRI – a Norwegian regional innovation policy program: Broad based approach

- Anticipated later theoretical developments:

1. DUI mode of (experienced based) innovation with learning work organisations as the micro foundation
2. Combining DUI and STI by linking local firms to regional universities – later research has shown that firm sourcing broadly for knowledge for innovation are more innovative – Triple Helix on regional level
3. Combining research with action research by creating regional learning arenas in the form of regional partnerships (learning regions)
4. Norway had a broad based innovation policy on the regional level 3-4 years before Finland introduced such a policy on the national level
5. Important policy learning for smart specialisation strategies in EU

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Smart Specialisation

- Encouraging investment in programs that will compelement a country or region's other productive assets to create future domestic capability and interregional competitive advantage
- Combined with skills in generic technologies (GPT) to develop unique and original activities and, in the longer term, entirely new sectors
- Thus, still a tendency for a STI/R&D bias
- How will it be done? Entrepreneurial discovery
- This is what is 'Smart': The way new specialisations are identified
- New wine in old bottles -using 'specialistion' a problem.
- Should have been 'smart diversification'

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Entrepreneurial discovery

- Entrepreneurial discovery identifies and selects specialised domains for the future – specialised diversification across related technologies
- Entrepreneur in SS needs to be understood broadly
- Traditional individual ’stand alone’ entrepreneur
- Knowledge based, academical entrepreneurs – university spin-offs - needs systemic support
- Intrapreneurship – large firms spin-offs
- Entrepreneurial systems
- Should have been ’innovation discovery’ – drivers of innovation

SS vs CRA – ERIS vs IRIS

- SS = ERIS (entrepreneurial regional innovation system) – Liberal Market Economies (LME)
- CRA = IRIS (institutional regional innovation system) – Coordinated Market Economies (CME)
- ERIS also requires institutions:

1. Regulations for venture capital and capital formation
2. Regulations for IPOs/stock market

- CRA in core regions (org./inst. thick): Narrow RIS
- CRA in lagging regions (org./inst. thin): Broad RIS

Thanks for the attention

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