OECD Smart Specialization Project

Constructing the Baseline

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Introduction

What indicators to use?

- Smart Specialization policy should stimulate innovation activities in some targeted domains that offer present or future strenghts for the regional economy
- Diagnostic tools underpinning a New Industrial Policy framework (NIP) should therefore provide insights in:
  - The scientific, technological, innovative and economic strengths of the region or country (compared to that of other regions or countries)
  - The potential matches and mismatches across these activities
  - Both within regions and within global value chains
  - Longitudinally and across consistent time periods

Relative indicators

- When benchmarking a country's or a region's scientific, technological or economic activity against international activities in these fields, one has to take into account possible biases:
  - International comparisons of patents may be hampered by differences in national legal conditions surrounding the granting of a patent
  - Countries (or regions) may differ in their general tendency to publish their research
  - Increases or decreases in a country's or region's scientific, technological and economic activities may simply be in line with worldwide trends and may therefore not represent an increased or decreased strength of that particular country or region
- To avoid these interpretational difficulties and to compare countries and countries on an "equal basis", relative indicators are used:
  - They imply a comparison of profiles of a focal country/region to profiles of a group of reference countries/regions.
  - They can hence be used to answer questions like *"Where does a country (or region) stand in various science/technology/economic domains, compared to other countries (or regions)?"*

$$\frac{\text{activity of country i in domain j / activity of all countries in domain j}}{\text{activity of country i in all domains / activity of all countries in all domains}}$$

Databases and classifications

- Using robust, existing data sources with benchmark potential:
  - WoS
  - Patent databases (EPO, USPTO, PCT)
  - (Regional) economic data (employment, added value, export, …)

- Using robust classification systems, that may differ though between domains:
  - Science: the Budapest–Leuven classification scheme (Glänzel et al., 2003) for classification of journals
  - Technology: IPC classes for classification of patents, which can be aggregated into 35 Fraunhofer technology classes
  - Economic data: sector classification (SIC or NACE-codes)

Results per country / region

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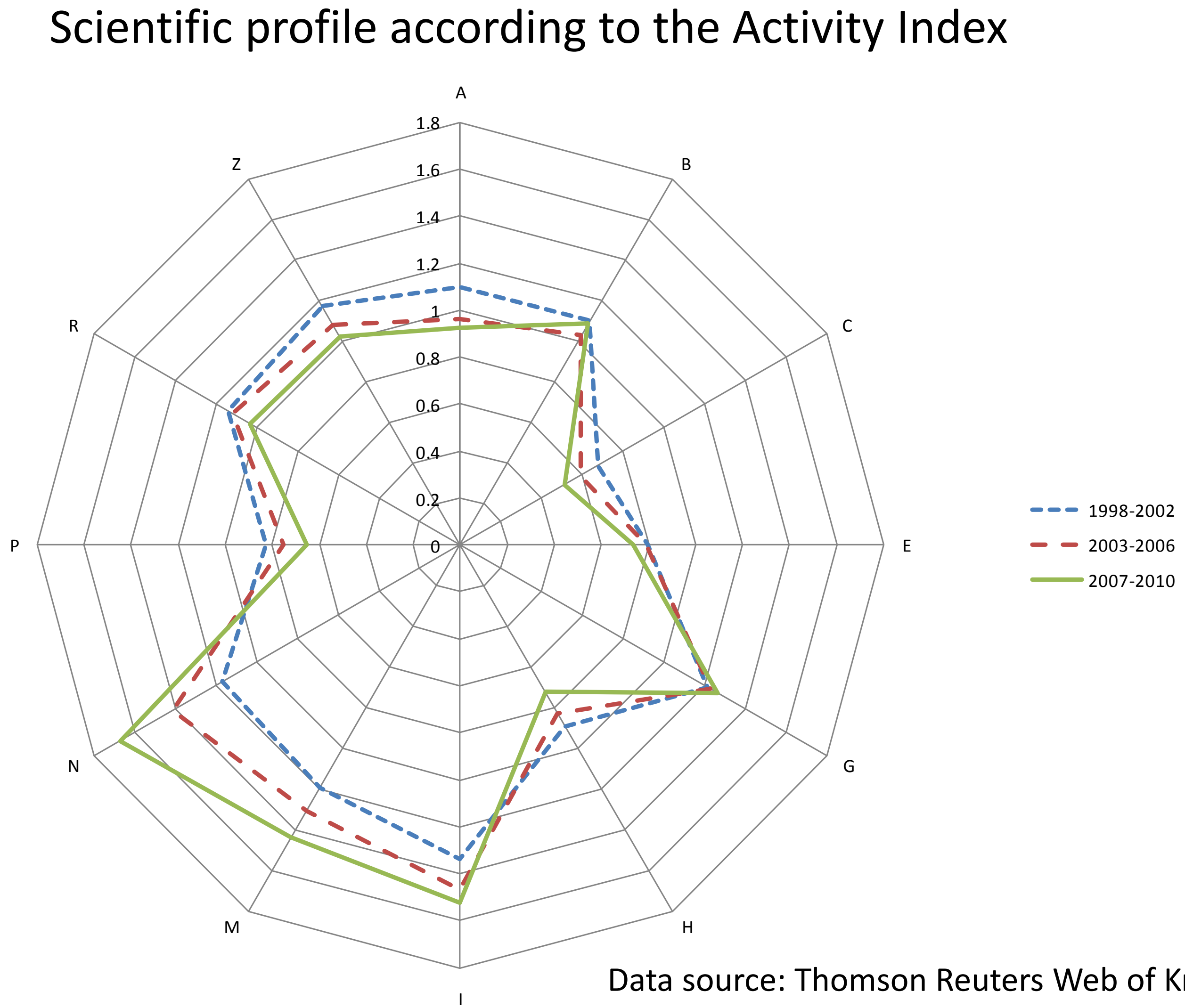
Profiles were made for the following eleven countries and fourteen regions:

- Australia
- Austria
  - Lower Austria (AT12)
  - Upper Austria (AT31)
- Belgium
  - Flanders (BE2)
- Finland
  - Etela-Suomi (FI18)
- Germany
  - Berlin (DE3)
  - Brandenburg (DE4)
- Netherlands
  - South Netherlands (NL4)
- Poland
  - Malopolska (PL21)
- South Korea
  - Jeolla (KR04)
- Spain
  - Pais Vasco (ES21)
  - Andalusia (ES61)
  - Murcia (ES62)
- Turkey
  - East Marmara (TR42)
- UK
  - West Midlands (UKG)

- Results consistently presented for three considered time periods (1998–2001 / 2002–2005 / 2006–2009).
- Research specialisation:
  - By major fields with high specialisation
  - By disciplines within fields of high activity
  - By disciplines with high specialisation in other fields
- Technological specialisation:
  - Evolution (1998-2009) of the number of patents per million inhabitants (EPO patents) for the top 10 technological domains in each country
  - Radar plots of the specialisations for the 35 Fraunhofer technological sectors (EPO patents)
- Economic specialisation:
  - Radar plots of the specialisations for 32 industries
- Striking observations are summarised.

The Netherlands



Data source: Thomson Reuters Web of Knowledge

The Netherlands

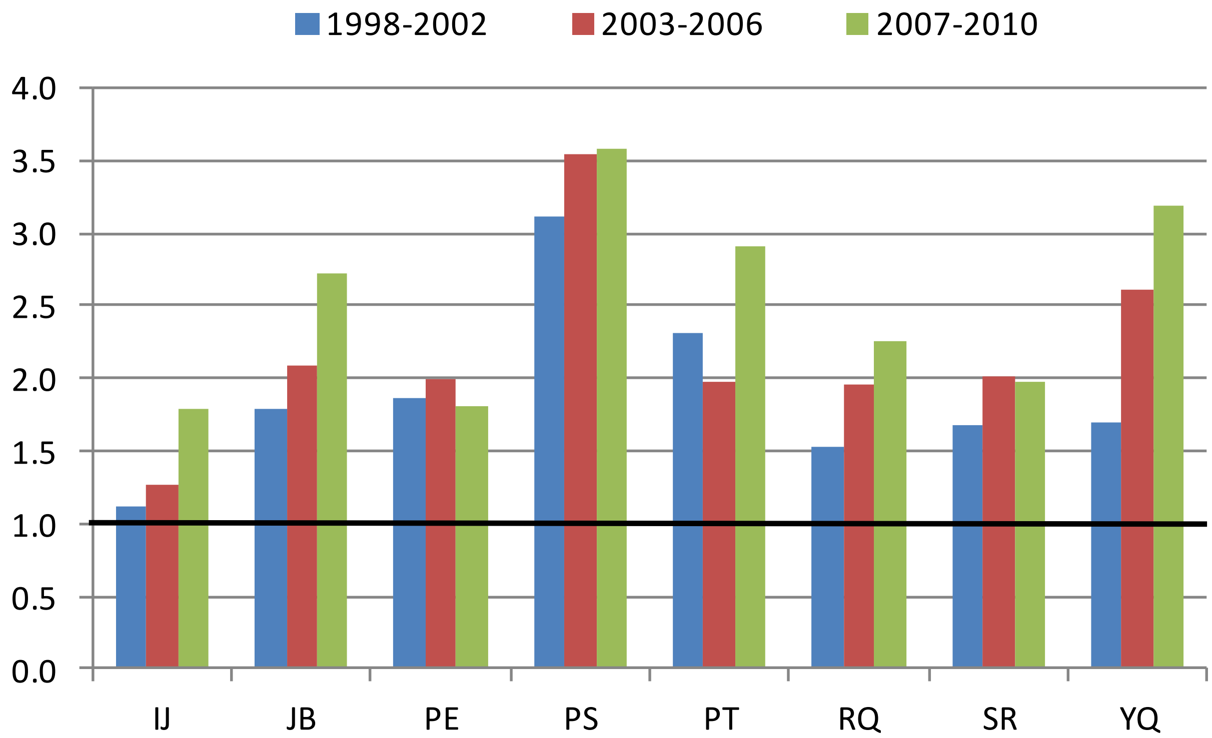
Specialisation within the science fields with the highest relative activity
(*AI values are given in chronological order*)

- neuroscience & behavior
  - psychology, social (AI=1.81; 1.54; 1.69)
  - psychology, applied (AI=0.93; 1.25; 1.36)
- clinical and experimental medicine II(non-internal medicine specialties)
  - rheumatology (AI=1.92; 2.04; 1.98)
  - health care sciences & services (AI=1.23; 1.34; 1.51)
- clinical and experimental medicine I (general & internal medicine)
  - peripheral vascular disease (AI=1.36; 1.44; 1.50)
  - hematology (AI=1.41; 1.40; 1.41)
  - cardiac & cardiovascular systems (AI=1.06; 1.13; 1.28)
- geosciences & space sciences
  - astronomy & astrophysics (AI=1.69; 1.55; 1.45)
  - geography (AI=1.28; 1.30; 1.46)

Data source: Thomson Reuters Web of Knowledge

The Netherlands

Subject Categories of specialisation outside the ‘focus fields’ (according to *AI*)



Legend: IJ: engineering, industrial; JB: environmental studies; PE: operations research & management science; PS: social sciences, mathematical methods; PT: medical informatics; RQ: mycology; SR: remote sensing; YQ: transportation

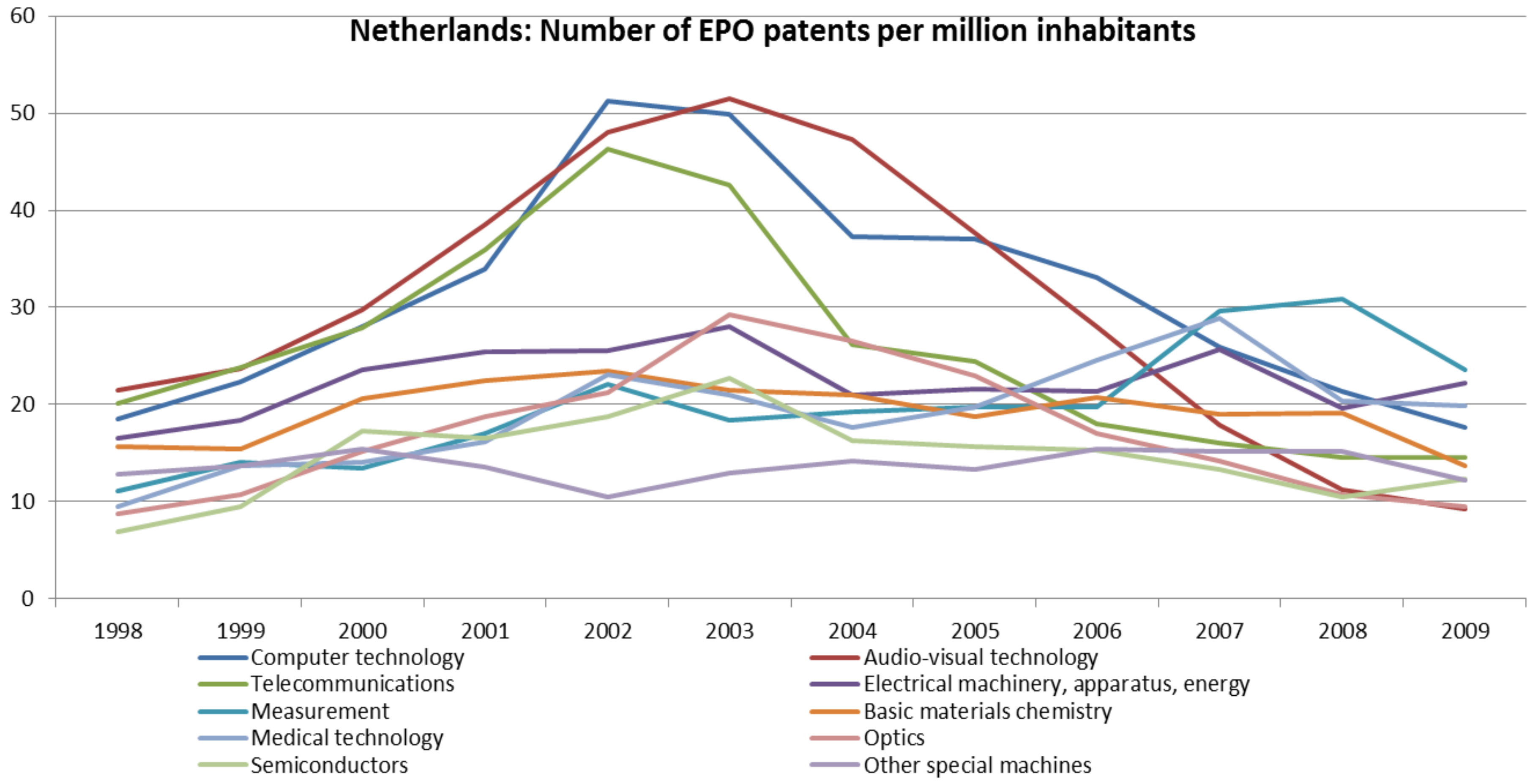
Data source: Thomson Reuters Web of Knowledge

The Netherlands

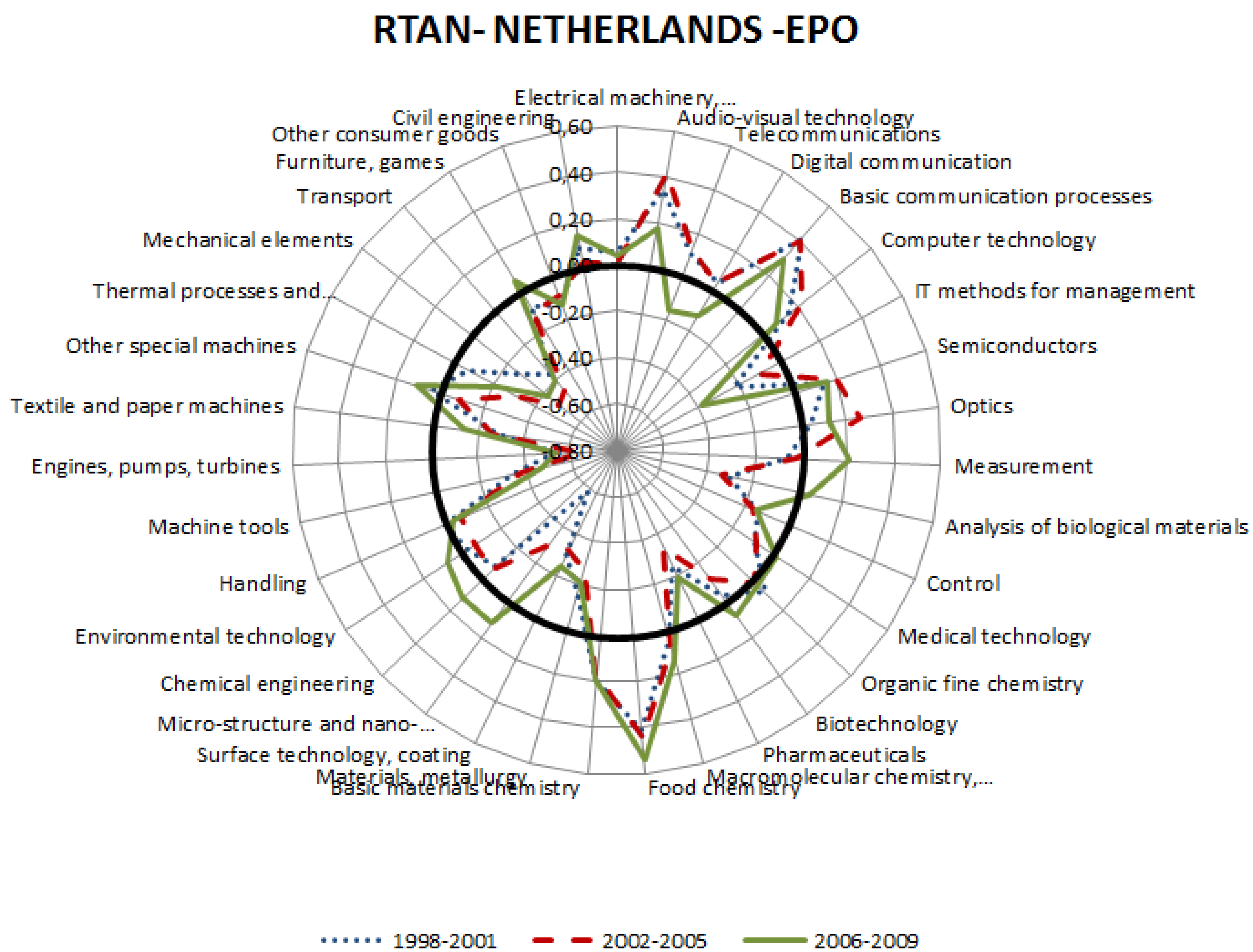
Striking observations, scientific profile:

- *General trends*
  - Increase of relative activity in clinical and experimental medicine I (general & internal medicine); clinical and experimental medicine II (non-internal medicine specialties)
  - High specialisation in neuroscience & behaviour and geosciences & space sciences
  - Decrease of relative activity in biology and agriculture & environment;
- *Highlights*
  - Enormous increase of specialisation in neuroscience & behaviour
  - In the ‘focus fields’: Enormous increase of specialisation in psychology, applied
  - Outside the ‘focus fields’: Very high specialisation in social sciences, mathematical methods; enormous increase of specialisation in environmental studies and transportation

The Netherlands: Technology profile



The Netherlands



The Netherlands

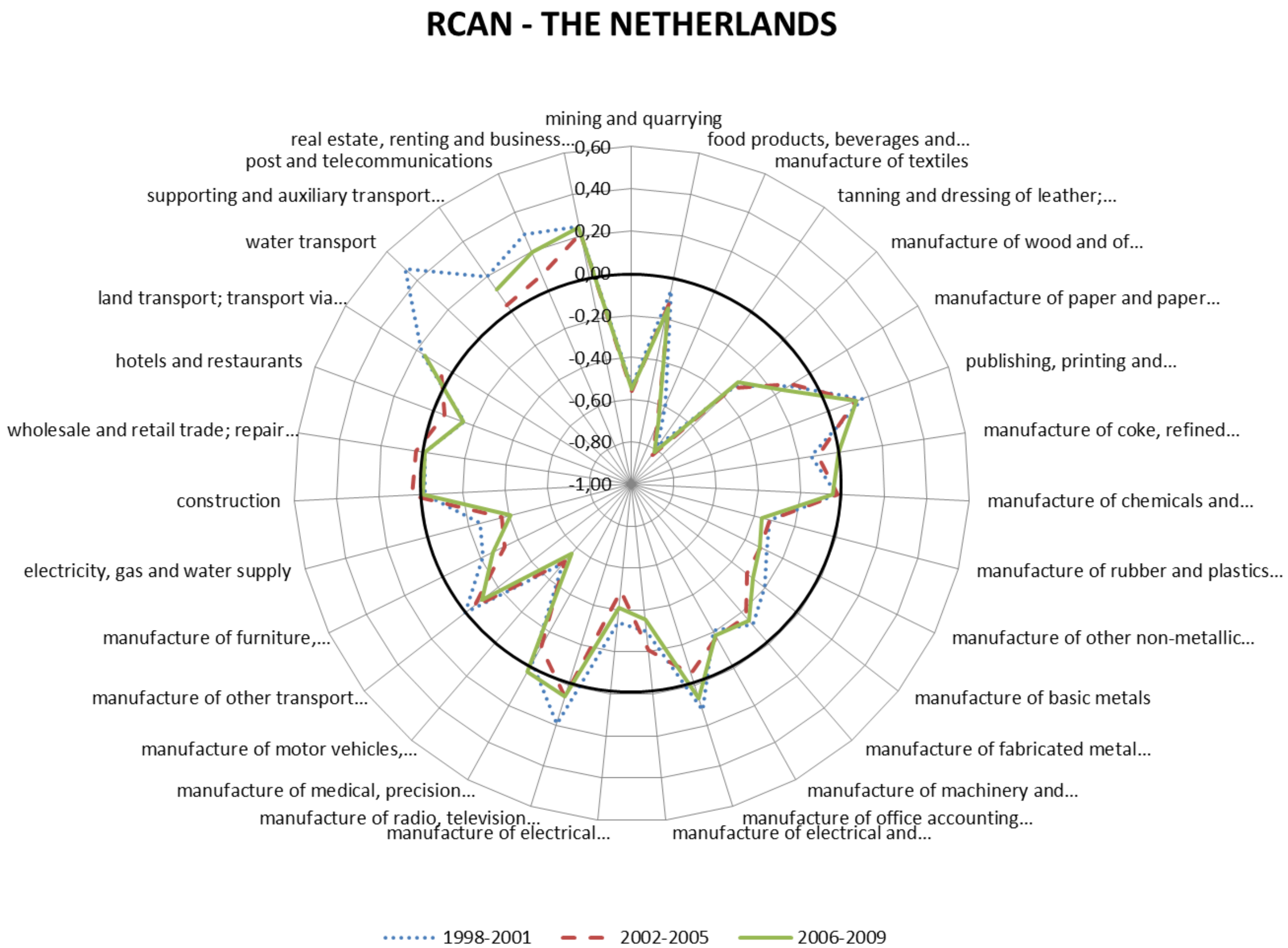
Observations, technology profile:

- *Top 3 highest and lowest specialisations*

Highest specialisation	**Lowest specialisation**
Food chemistry	Engines, pumps, turbines
Basic communication processes	Transport
Audio-visual technology	Mechanical elements

- *Highlights*
    - Top patent volumes in Computer technology, Audiovisual technology and Telecommunications (peaking around period 2002-2003, decreasing afterwards).
    - Food chemistry: highly specialised (but not especially pronounced in terms of patent volume per capita).
    - Other domains with high specialisation levels: Audiovisual tech (~patent volume; but decreasing); Basic communication (also decreasing); Measurement.
    - Recent specialisation increase in: Chemical engineering; Analysis of biological materials.

The Netherlands



Data source: OECD

The Netherlands

Observations, economic profile:

- *Top 3 highest and lowest specialisations*

Highest specialisations	Lowest specialisations
Real estate, renting and business activities	Tanning and dressing of leather
Post and telecommunications	Manufacture of textiles
Land transport; transport via pipelines	Manufacture of motor vehicles, trailers and semi-trailers

- *Highlights*
  - Overall stable over time.
  - No recent data available for water transport.

How to use these indicators?

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Example for Flanders: Nanotech for health

- We see that Flemish scientific and technological output in the medical fields (including neurosciences) is high:
  - Above average specialization in clinical research & neuroscience research, as well as in medical informatics & electrical engineering
  - High and increasing RTAN values for biotechnology & pharmaceuticals, microstructure & nanotechnology
- In addition, we have studied the subject categories in which IMEC has published more that 10% of its papers in the period 2000-2009.
- Findings: there is a strong and diverse basis of knowledge specialization in the area of nanotechnology for health --- but not (yet) translated into or aligned with an existing economic specialization.

  => should the Flemish government fund this???
- As a reaction, IMEC has launched an extensive survey mapping the possible impact of nanotech for medical applications, and the intention of Flemish actors to specialize in these, in order to see:
  - Whether industrial and non-industrial actors agree on the impact of certain nanotechnologies on medical applications
  - Whether actors plan to specialize in nanotechnologies and medical applications that have a significant impact on the effective and efficient treatment of pathologies
  - In which nanotechnologies and medical applications Flemish collaborations would be relevant
  - For which nanotechnologies and medical applications interregional or international collaborations are needed

Example for Flanders: FISCH

- Chemistry can build both on a strong economic base. The scientific and technological base is weaker.
- Chemical sector has been very process efficient, but has not been strong in renewing itself.
- Recently, the sector has launched the Flemish Initiative for Sustainable Chemistry, with six priorities.

  => What kind of actions can be taken to support this renewal?

  => Should all the priorities of FISCH be policy supported?

- For the six Flemish priorities in sustainable chemistry (FISCH), we have mapped Flanders' and other European regions' position in relevant IPC classes. These analyses show:
  - That strengthening this technological base will be an important objective for FISCH
  - There are some nearby regions with technological strengths in these areas, pointing to opportunities for INTERREG collaborations

So…

- Precise ex ante estimation of the future value of a specialization is impossible
- Therefore, selection of priorities should not be done in a top down manner
- Instead, decisions on policy support should come at a point at which local entrepreneurial commitment (by firms, universities, and/or research centers) has already achieved a certain level of stability and coherence
- Indicators should allow policy makers to interactively understand and assess already ongoing entrepreneurial processes:
  - Diagnosing apparent strengths, weaknesses, fits, and misfits
  - Identifying the relevant actors from academia, research and industry for cross-fertilization (both regional/national as international)

Thank you!
Further discussion …

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