Costs and benefits of regulating and restricting chemicals: The European Union’s REACH system and its impacts on the Austrian economy

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The REACH system

  - Substitutes all national regulations of chemicals in the EU member states → standardization of regulations contributing to the Common Market of the European Union
  - “Burden of proof” lies on producers, manufacturers and industrial users of chemicals
    → Instead of authorities having to prove that chemicals are dangerous, companies have to prove that their chemicals are not dangerous to human health and the environment
    → Costs of studies, processes/procedures (data sheets, information packages)
    → ECHA European Chemicals Agency (Helsinki)
      - Austria: 2005: “Ex ante” BCA on costs & benefits of REACH in Austria
      - 2014/2015: “Ex post” BCA
        - Several studies including stakeholder perspectives, production (value added), employment, prices [commissioned by the Austrian Ministry for the Environment]
Overview

- Benefit-cost analysis of the REACH system in Austria
  - Basic assumptions & frameworks
- REACH benefits
  - Human health
  - Environment
  - Business (innovation, qualification)
- REACH cost estimates
- Results
- Discussion, conclusions, perspectives
REACH Benefit-Cost-Analysis: basic assumptions

- Basic framework
  - Time frame
    - 2008: implementation of REACH in EU (& Austria)
    - Evaluation period: 2014-2044
  - Baseline: „Do-nothing-case“ (taking into account the growth of population)
    - i.e. national regulations of chemicals would be in place
  - Several scenarios for human health / environmental effects / costs of companies: range of benefits & costs

- Benefit-cost analysis
  - Efficiency vs. distribution of benefits & costs vs. burden of individual companies (e.g., SMEs)
What would happen if REACH would not exist?

- Development of a baseline scenario: REACH...
  - ... provides information on hazardous chemicals for companies and authorities
  - ... certifies ingredients of chemicals; ... tests & evaluates
  - Broader information basis, fewer hazardous chemicals
  - Improvements for human health (workplace, households, general public health) & the environment
REACH benefits: human health & the environment

- Health benefits: reduction of ...
  - Skin diseases (dermatitis)
  - Respiratory diseases (e.g. asthma, lung diseases)
  - Cancer
  - Multiple Chemical Sensitivity (MCS)
  - Poisoning and burns
  ≈ 5% of public health problems are directly related to chemicals → 5% of these cases are reduced owing to REACH

- Environmental benefits: reduction of ...
  - Hazardous waste
  - Contamination of the soil and ground water
REACH costs: direct and 'indirect' costs

- Direct costs
  - Chemicals assessment, registration, submission of documents (2008-2014, ECHA)

- 'Indirect' (net) costs – concept:
  - Potential costs of companies (e.g. investment in new technologies & changes of production processes)
    - Reduced availability of materials (chemicals)
    - Potential benefits of companies
      - Innovation
      - Quality and environmental management
      - Increased productivity

- 'Indirect' (net) costs = costs of changes of processes and products net of benefits of innovation, productivity, quality improvements
## Overview of key results of the benefit-cost analysis (2008-2044, baseline scenario)

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present value of net benefits</td>
<td>2,511,193</td>
<td>EUR Thsd.</td>
</tr>
<tr>
<td>Internal rate of return</td>
<td>35.14%</td>
<td>%</td>
</tr>
<tr>
<td>Annuity</td>
<td>97,304</td>
<td>EUR Thsd.</td>
</tr>
<tr>
<td>Benefit-cost ratio</td>
<td>9.15</td>
<td></td>
</tr>
<tr>
<td>Present value of total benefits</td>
<td>2,819,351</td>
<td>EUR Thsd.</td>
</tr>
<tr>
<td>Present value of total costs</td>
<td>308,158</td>
<td>EUR Thsd.</td>
</tr>
</tbody>
</table>
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Present value of costs and benefits (all categories, baseline scenario)

Costs ('indirect' net costs) 364,075
Costs (direct, e.g., registration costs) 121,358

Environmental effects: Ground water protection 8,947
Environmental effects: Contamination (soil) 78,263
Environmental effects: Hazardous waste 7,940
Health effects: Poisining and burns 10,837
Health effects: Multiple chemical sensitivity (MCS) 814
Health effects: Cancer (mortality) 2,216,908
Health effects: Cancer (incidence) 474,719
Health effects: Skin diseases 13,004
Health effects: Respiratory diseases 7,919

Present value of costs/benefits (EUR thsd.,)
Sensitivity analysis: discount rate

The graph shows the present value of net benefits (EUR Thsd.) against different discount rates (% real) with a baseline of 1%. As the discount rate increases from 0% to 4%, the present value of net benefits decreases from approximately 6,000,000 to 0 EUR Thsd.
Sensitivity analysis: health benefits of REACH

The present value of net benefits (green line) and the internal rate of return (blue squares) are plotted against the reduction of health problems (diseases) related to chemicals. The baseline is a reduction of all chemicals-related health problems by 5%.

- Present value of net benefits
- Internal rate of return (%)
Sensitivity analysis: Value of Statistical Life (VSL)

![Graph showing the present value of net benefits and internal rate of return as a function of the Value of Statistical Life (VSL) compared to the baseline (VSL = EUR 4,488 thsd.).]

Present value of net benefits (EUR Thsd.) vs. Value of Statistical Life (EUR thsd.) compared to the baseline (VSL = EUR 4,488 thsd.).

Internal rate of return (%) vs. Value of Statistical Life (EUR thsd.) compared to the baseline (VSL = EUR 4,488 thsd.).
Sensitivity analysis: Increases of direct costs

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Sensitivity analysis:
Relation of 'indirect' (net) costs to direct costs

Relation between direct costs and net ('indirect') costs due to changes of production processes and product and materials availability (net of benefits in terms of innovation, quality improvements, production efficiency a.s.o.)
Results & discussion

- Fundamental uncertainties ...
  - Estimation & scenarios of health benefits
  - Valuation of health benefits
  - Development of cost estimates over time (→ beyond 2018)

... however:

*It is very likely that total benefits of the REACH regulations (especially health and environmental benefits) in Austria are larger than total costs (e.g., registration costs); this means that the REACH regulation is „efficient“ from an economic viewpoint*

- Main driver: health effects in terms of reduced cancer morbidity
  - 5% reduction of chemicals-related cancer morbidity in 2044 corresponds to 43 cases of cancer avoided
    - CBA 2005: 44 cases avoided (2038)
    - 2013: ≈770 cases of cancer related to chemicals (=4% of all cases of cancer morbidity in Austria [in total about 20,000 cases])
Conclusions and perspectives

(Research) Problems & perspectives

- Quantification of health effects problematic (even ex-post)
  - REACH benefits may be there, but cannot easily be detected even if complete information would be available ("noise" in statistical procedures)
- Costs may be distributed unevenly
  - SMEs may face more severe problems than the large companies
  - Chemicals industry is managing REACH quite well
  - Worries & potential economic problems in down-stream branches

Information about REACH

- Opinions & guesstimates & expectations in surveys and workshops
  - Positive health benefits of REACH expected by all
  - Better coordination / cooperation
    - between chemicals industry & downstream branches
    - between different provincial/federal authorities
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THANKS!