

EIPRO & The Danish perspectives

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The Danish IO-database

- 1999 data from Statistics Denmark
- 130 industries/products disaggregated to 185
- Energy, emissions and investment matrices
- Including use and disposal stages
- All important environmental exchanges
- Including imports based on modified US data
- Market-adjusted model (taking into account market constraints)
- Quantified uncertainties
- Full documentation: www.lca-net.com/io-databases/

Comparing DK & EIPRO approaches

- National statistics versus transfer
- 185 versus ~ 480 industries
- Detailed versus rough treatment of use stage
- Important emissions versus comprehensive
- Market-adjusted model versus attributional
 - The case of milk, cheese & butter
 - Sugar
 - Leather & shoes

Critical assumptions in EIPRO

- Expansion from OECD 1990 35x35 table rather than from more recent and detailed national tables
- RAS rather than linear expansion
- Government expenditure equalled to private
- Attributional modelling (full elasticity of supply)

RAS or linear expansion?

- Possible approaches to expansion
 - Linear direct proportion
 - Column-weighted linear
 - RAS
- Comparison by Notten et al. (2005)
- Initial indications:
 - Linear better when significantly different structure between tables

Linear direct proportion expansion

$$S = \begin{pmatrix} A & B \\ C & D \end{pmatrix} \quad L = \begin{pmatrix} a_1a_1 & a_1a_2 & a_1a_3 & a_1b_1 & a_1b_2 \\ a_2a_1 & a_2a_2 & a_2a_3 & a_2b_1 & a_2b_2 \\ a_3a_1 & a_3a_2 & a_3a_3 & a_3b_1 & a_3b_2 \\ b_1a_1 & b_1a_2 & b_1a_3 & b_1b_1 & b_1b_2 \\ b_2a_1 & b_2a_2 & b_2a_3 & b_2b_1 & b_2b_2 \end{pmatrix} \quad \text{MAP} = \begin{pmatrix} 1 & 0 \\ 1 & 0 \\ 1 & 0 \\ 0 & 1 \\ 0 & 1 \end{pmatrix}$$

$$L_{\text{agg}} = \begin{pmatrix} aa & ab \\ ba & bb \end{pmatrix}$$

expansion
factors



$$\begin{pmatrix} a_1a_1/aa & a_1a_2/aa & a_1a_3/aa & a_1b_1/ab & \dots \\ a_2a_1/aa & a_2a_2/aa & a_2a_3/aa & a_2b_1/ab & \dots \\ a_3a_1/aa & a_3a_2/aa & a_3a_3/aa & a_3b_1/ab & \dots \\ b_1a_1/ba & b_1a_2/ba & b_1a_3/ba & b_1b_1/bb & \dots \\ b_2a_1/ba & b_2a_2/ba & b_2a_3/ba & b_2b_1/bb & \dots \end{pmatrix}$$

RAS or linear expansion?

- Comparison by Notten et al. (2005) of possible approaches to expansion:
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Private vs. government expenditure

Impact category	Unit	Consumer spending; Impact per kDKK	Public spending; Impact per kDKK	Relative; Public/Private
Global warming	Mg CO ₂ -eqv.	1.17E-01	3.75E-02	32%
Ozone depletion	Mg CFC-11-eqv.	1.09E-07	4.70E-08	43%
Acidification	Mg SO ₂ -eqv.	5.26E-04	1.76E-04	33%
Nutrient enrichment	Mg NO ₃ ⁻ -eqv.	1.63E-03	3.31E-04	20%
Photochemical ozone formation	Mg C ₂ H ₄ -eqv.	1.97E-04	6.17E-05	31%
Ecotoxicity	Person-eqv. (PE)	1.73E-03	1.11E-03	64%
Human toxicity	Person-eqv. (PE)	3.47E-03	1.69E-03	49%
Nature occupation	PAFm ² yr	1.18E+02	1.48E+01	13%

Danish results

(consumption perspective)

Top 10:

- Car purchase and driving
- Dwellings and heating
- Meat purchase
- Tourist expenditures by Danes travelling abroad
- General public services, public order & safety affairs
- Clothing purchase and washing
- Catering
- Personal hygiene
- Education and research
- Bread and cereals purchase

Differences in results?

- In general, good correlation
- Exceptions:
 - Tourist expenditures
 - Public spending
 - Market-adjusted (dairy, sugar, leather...)
 - Services

Outlook for the future

- Appropriate methodology
- Improved European model, based on available European statistics:
 - would be applicable for many different purposes,
 - would improve consistency of policy support,
 - would avoid much of the current duplicative work of stand-alone projects, i.e. in a larger perspective it would be cost-neutral or even cost-efficient.