Performance of different approaches in international benefit transfer: Insights from a nine country experiment

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International benefit transfer (BT)

- Demand for benefit transfers increases
- Additional challenges in international BT
- Mixed results on accuracy and best practices
  - E.g. Ready et al. 2004, Brouwer & Bateman 2005, Kristofersson & Navrud 2007, Lindhjem & Navrud 2008, Czajkowski & Scasny 2010, Johnston & Thomassin 2010, Bateman et al. 2011, Hynes et al. 2013, Kosenius & Ollikainen 2015
- How to make international BTs more reliable?
- What kind of BT approach produces the lowest transfer errors?

Objective of the study

- Examine the performance of different benefit transfer approaches in international transfers
  - Unit value transfer with adjustments
  - Benefit function transfer

- Nine country experiment
  - Identical surveys
  - Same environmental good
  - Variation in income levels and geography

Methods

- Unit value transfers
  - Purchasing power parity (PPP) adjusted
  - PPP and income elasticity = 1
- Benefit function transfer: Spike model
  - Theory-driven variables: income, distance
- Transfers
  - from country *i* to country *j*
  - from *n-i* countries to country *i*

Performance of transfer methods

- Transfer errors:

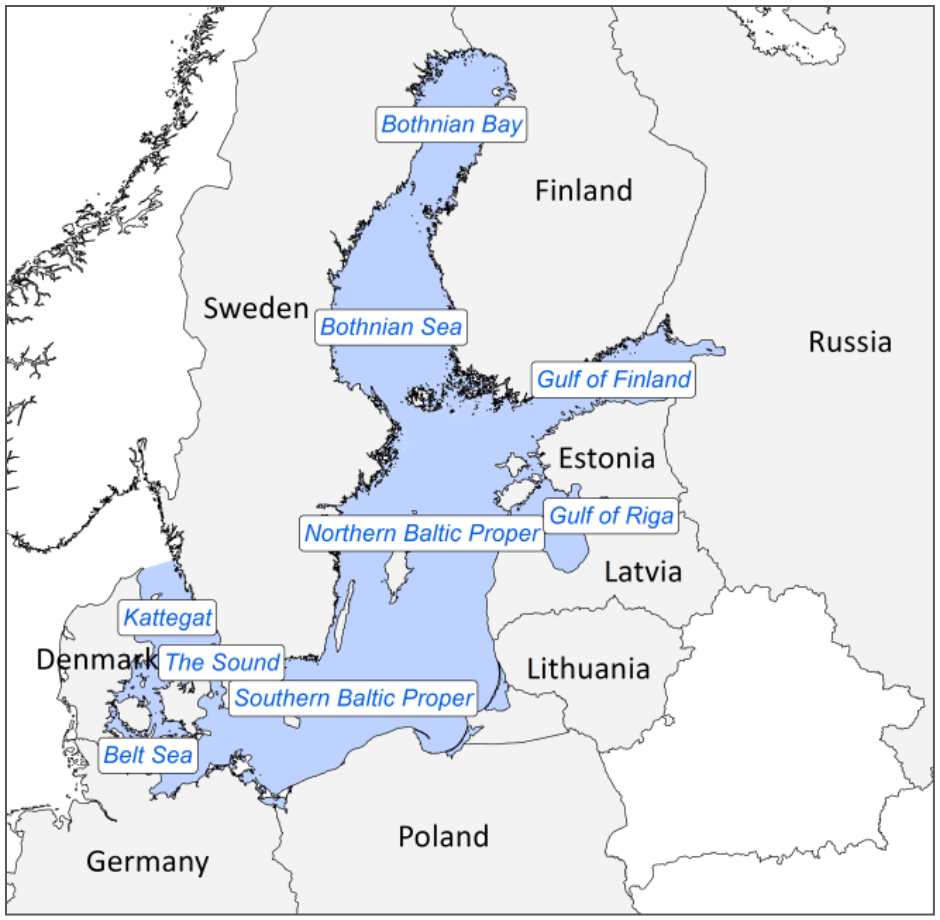
$$TE = \frac{WTP_{transferred} - WTP_{observed}}{WTP_{observed}}$$

- Minimum tolerance levels:

$$min\theta \in [0, +\infty)$$
$$s.t.\, Pr\left(\left|WTP_{transferred} - WTP_{observed}\right| \geq \theta WTP_{observed}\right) < 0.05$$

Data

- 9 country contingent valuation study in 2011
- Internet panels and face-to-face interviews
- Willingness to pay for reduced eutrophication in the Baltic Sea in northern Europe
- Two scopes (half, full) based on existing environmental polices
- Environmental state predictions from marine models

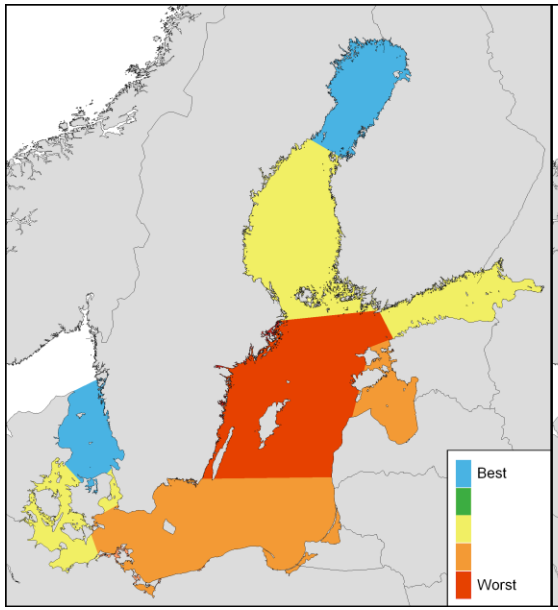


Change in eutrophication

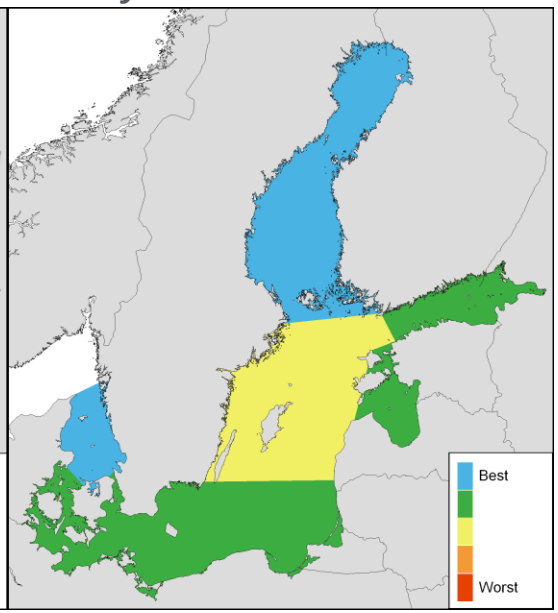
- Change described with a five-step water quality ladder and coloured maps
- Each level of eutrophication linked to a specific colour

Description of the effects of eutrophication						
Water quality	*Water clarity*	*Blue-green algal blooms*	*Underwater meadows*	*Fish species*	*Deep sea bottoms*	Water quality
Best possible water quality	Clear	Seldom	Excellent condition Good for fish spawning and feeding	Cod, herring and perch common	No oxygen deficiency Bottom animals common	Best possible water quality
	Mainly clear	Sometimes	Patchy vegetation Good for fish spawning and feeding	Cod, herring and perch common	Oxygen deficiency in large areas Bottom animals common	
	Slightly turbid	In most summers	Cover a small area Less good for fish spawning	Fewer cod, but herring and perch common More roach, carp and bream	Oxygen shortages often in large areas Some bottom animals rare	
	Turbid	Every summer	Cover a small area Bad for fish spawning	Fewer cod, herring and perch More roach, carp and bream	Oxygen shortages often in large areas Some bottom animal groups have disappeared	
Worst possible water quality	Very turbid	On large areas every summer	Almost gone Not suitable for fish spawning	Almost no cod, fewer herring and perch Lots of roach, carp and bream	Oxygen shortages always in large areas No bottom animals in many areas	Worst possible water quality

Baseline scenario



Policy scenario



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Spike model results

Country	Constant (standard error)	Distance (standard error)	Income (standard error)	Standard deviation (standard error)
Denmark	-16.93**	-47.09**	13.69***	90.45***
	(8.80)	(23.31)	(4.45)	(1.61)
Estonia	-15.47**	2.65	17.55***	74.58***
	(6.89)	(8.08)	(5.04)	(1.91)
Finland	-10.35*	-9.67***	20.05***	88.92***
	(6.04)	(3.52)	(2.82)	(1.31)
Germany	-1.77	-2.18*	6.62***	72.71***
	(6.74)	(1.34)	(2.66)	(1.50)
Latvia	-5.90***	-4.04***	12.29***	17.17***
	(1.65)	(1.44)	(2.11)	(0.38)
Lithuania	-8.39**	-1.11	27.22***	27.89***
	(3.95)	(1.37)	(7.49)	(0.90)
Poland	-10.36***	-0.57	14.53***	33.93***
	(2.19)	(0.50)	(1.37)	(0.41)
Russia	-39.74***	-0.66***	23.68***	53.66***
	(4.26)	(0.12)	(4.91)	(0.88)
Sweden	2.27	-39.31***	47.07***	166.97***
	(17.31)	(13.98)	(10.8)	(3.47)
Variables significant at the * 1%, ** 5% and *10% level.**				

Note: Results for the full scope scenario

Willingness to pay estimates (in PPP corrected 2011 €)

Country	Mean	Median	Spike prob. 0-WTP (std. error)
Denmark	36.0	1.4	0.50
Estonia	30.0	2.0	0.50
Finland	43.9	15.6	0.43
Germany	29.4	1.5	0.50
Latvia	5.8	0.00	0.55
Lithuania	10.6	0.2	0.52
Poland	13.6	0.5	0.50
Russia	9.8	0.00	0.71
Sweden	97.0	53.9	0.37

Note: Annual WTP per person for the full scope scenario

Transfers from country *i* to country *j* (144 transfers)

BT method	Mean transfer errors (%)	Minimum tolerance levels (%)*
Unit value: PPP adjusted	164 (2-1561)	183 (15-1685)
Unit value: Income elasticity = 1	71 (1-460)	86 (12-503)
Function transfer	102 (0.2-1077)	289 (169-1348)

*** Minimum tolerance level is the minimum difference between the transferred and observed estimate which would result in the rejection of the null hypothesis of equivalence at the 5% level.**

Transfers from countries *n-i* to country *i* (18 transfers)

BT method	Mean transfer errors (%)	Minimum tolerance levels (%)*
Unit value: PPP adjusted	120 (9-444)	142 (24-490)
Unit value: Income elasticity = 1	44 (1-121)	59 (11-141)
Function transfer	49 (0-132)	80 (11-205)

*** Minimum tolerance level is the minimum difference between the transferred and observed estimate which would result in the rejection of the null hypothesis of equivalence at the 5% level.**

Conclusions

- Unit value transfer with PPP and income adjustment performs better than unit value transfer with PPP adjustment and function transfer
- Role of the functional form of income?
- National and unique good with significant non-use values: importance of distance and substitutes?

Thank you!

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