Is benefit-cost analysis to blame for bad Norwegian roads?

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The 5th Concept Symposium on Project Governance
Valuing the Future - Public Investments and Social Return
20. – 21. September 2012

Symposium web-site: http://www.conceptsymposium.no/
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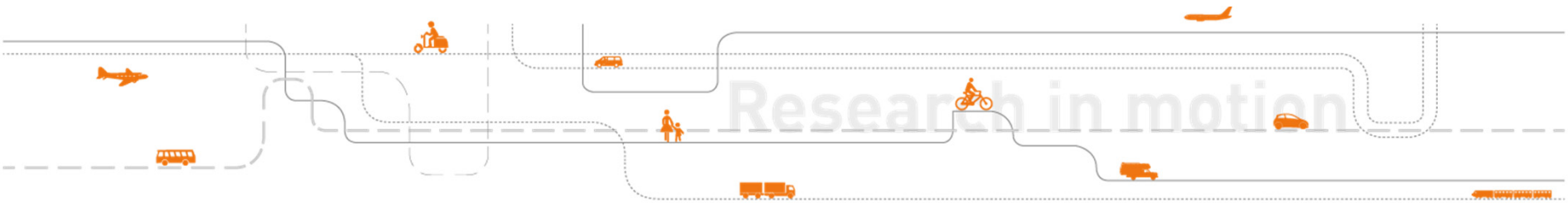
Concept Symposium, Losby, 19-20 September 2012



Outline:

1. Five fundamental facts
2. The impact of costs and benefits on priority setting
3. The profitability of Norwegian road investments
4. Politicians' use of BCA
5. Checking for wider economic benefits
6. What is wrong with BCA?
7. Summary

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Fact 1: demography

- Norway has, second to Iceland, the lowest population density of European countries: 13 inhabitants/km^2
- Sweden: 23
- Switzerland: 193

Ceteris paribus, the benefit derived from a piece of infrastructure is

- 13/23 of that of Sweden, and
- 13/193 = 1/15 of that of Switzerland.

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Fact 2: topography

Norge – Europas steinrøys.

Sverige – flatt som en pannekake.

Norway is, next to Switzerland, Europes most mountanous country. There are numerous fiords and sounds to cross.

In Sweden, 80-90 per cent of the population live in flat areas.

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Fact 3:
economically optimal resource allocation

Theoretically, a welfare optimal resource allocation is reached when each factor is used up to the point where marginal cost (MC) equals marginal benefit (MB). (Assuming that, before this point, MB>MC.)

If MC is twice as large, and MB is half as large, the optimal point would be reached much earlier in Norway than in Sweden.

If road investments in Norway and Sweden were determined by BCA, the answer would be yes.

Fact 4: non-centralization

Unlike most other countries, Norway has been pursuing a non-urbanization policy.

Road investments are seen as an important instrument for regional development (without scientific foundation).

Rural roads, bridges and tunnels are being built, not on account of BCA, but in defiance of it.

Roughly speaking half the investments in the national Norwegian road network have a B/C ratio of less than one. In the UK, no project is being considered if B/C>1.5.

Fact 5:
Norwegian decision makers disregard BCA

Several studies all point in the same direction:

Fridstrøm L & Elvik R (1997): The barely revealed preference behind road investment priorities. *Public Choice* **92**:145-168.

Nyborg K (1998): Some Norwegian politicians' use of cost-benefit analysis. *Public Choice* **95**:381-401.

Nyborg K & Spangen I (1996): Politiske beslutninger om investeringer i veger. TØI-notat 1026, Transportøkonomisk institutt, Oslo.

Odeck J (1991): Om nytte-kostnadsanalysens plass i beslutningsprosessen i vegsektoren. *Sosialøkonomen* nr 3, s 10-15.

Odeck J (1996): Ranking of regional road investment i Norway: does socio-economic analysis matter? *Transportation* **23**:123-140.

Odeck J (2010): What determines decision makers' preferences for road investments? Evidence from the Norwegian road sector. *Transport Reviews* **30**:473-494

Studies of formal priorities given to investment projects

- Investment projects are formally ranked from first to lowest priority in the national transport plan
- These priorities are influenced by a host of factors, not just the results of cost-benefit analyses
- Two studies of similar design have been reported:
  - *Fridstrøm and Elvik (1997): Ample model – 23 variables; parsimonious model – 14 variables*
  - *Odeck (2010): Five different models compared – ranging from 5 to 33 variables*
- Results can be presented as changes in the probability of preferring a project when two projects are compared

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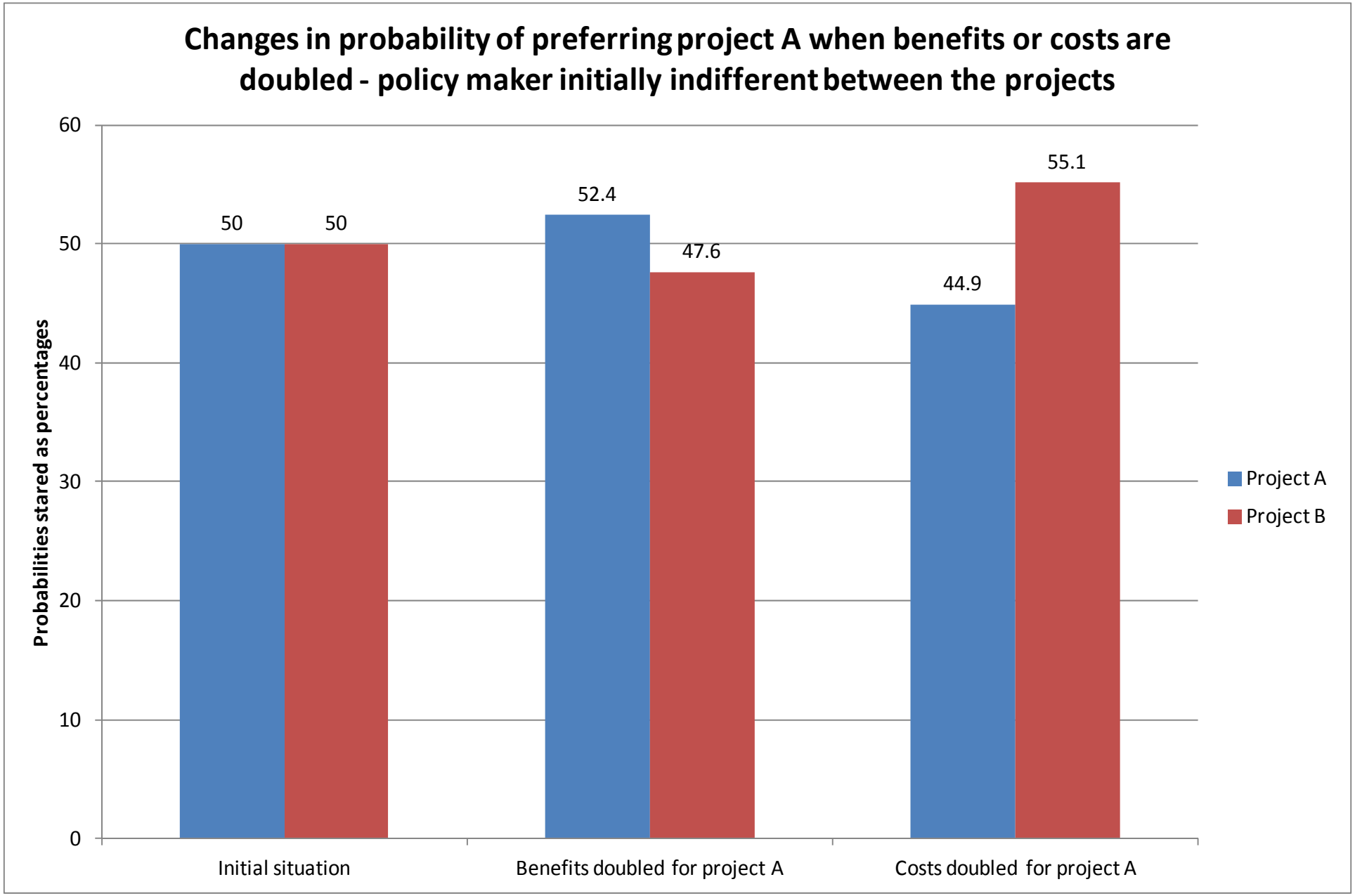
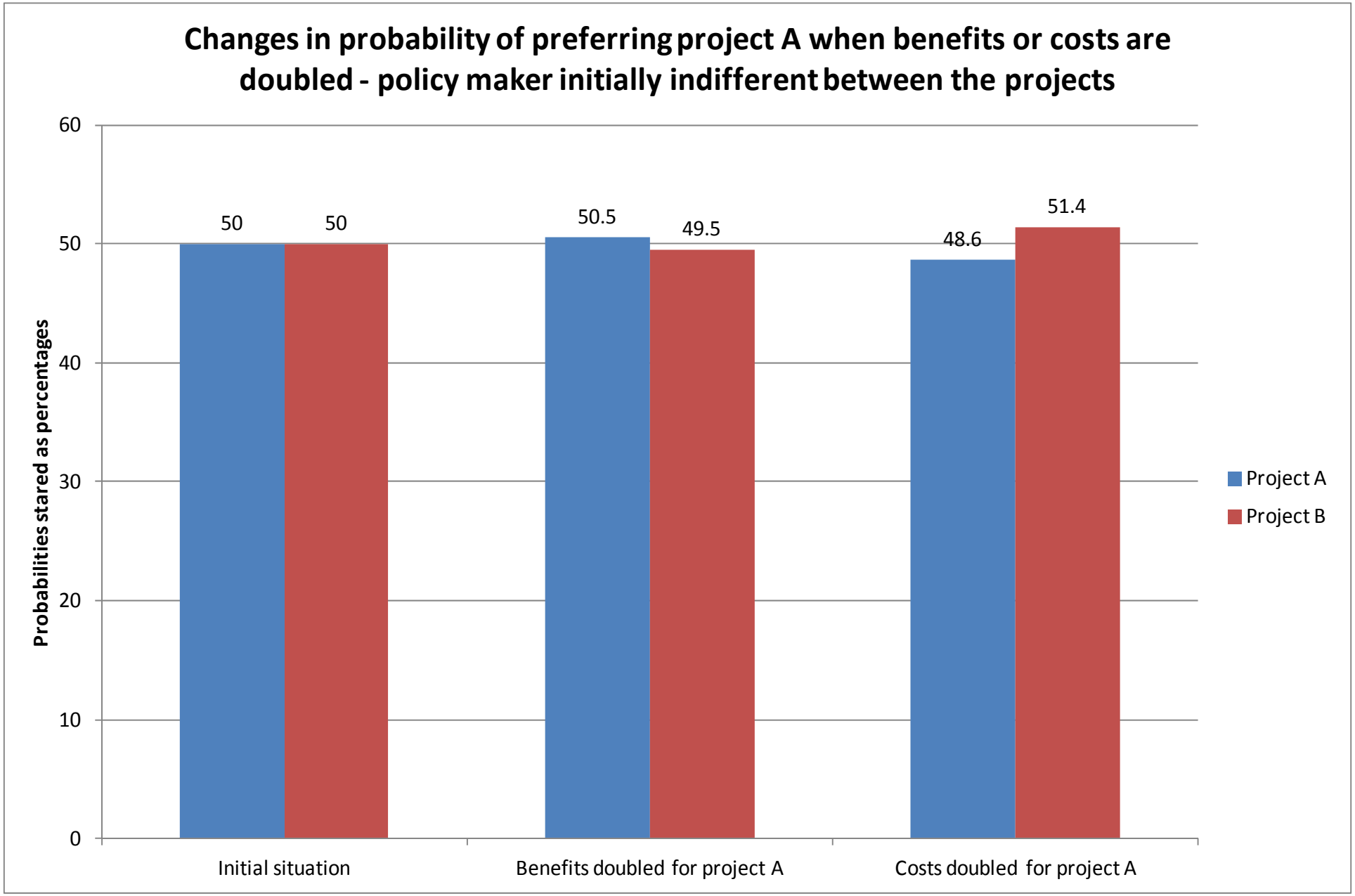


Source: Fridstrøm L & Elvik R (1997): The barely revealed preference behind road investment priorities. *Public Choice* **92**:145-168.



Source: Odeck J (2010): What determines decision makers' preferences for road investments? Evidence from the Norwegian road sector. *Transport Reviews* **30**:473-494

The stability of regional allocation

	Percentage distribution of state funding in each planning term						
County	1970–73	1974–77	1978–81	1982–85	1986–89	1990–93	1994–97
Østfold	3.5	3.2	3.1	2.9	2.6	2.4	4.0
Akershus	7.9	7.1	7.0	7.1	6.9	7.7	11.8
Oslo	6.0	5.3	5.1	5.0	6.6	7.4	6.3
Hedmark	4.6	3.9	3.8	3.5	3.0	2.4	1.9
Oppland	5.3	5.0	5.1	4.8	4.0	4.0	3.1
Buskerud	5.3	4.7	4.7	4.3	4.0	3.2	4.8
Vestfold	2.2	2.6	3.2	3.1	3.2	5.8	6.3
Telemark	4.5	4.0	3.9	3.8	3.8	3.6	3.4
Aust-Agder	3.3	2.6	2.4	2.3	2.3	2.3	2.4
Vest-Agder	3.3	2.8	2.7	2.5	2.4	2.7	2.4
Rogaland	4.6	4.8	4.5	4.1	3.8	3.4	4.2
Hordaland	9.0	11.4	11.2	11.4	11.1	10.0	10.7
Sogn og Fjordane	5.6	5.7	5.7	6.5	6.5	7.8	7.3
Møre og Romsdal	6.3	6.6	6.6	6.7	5.8	5.9	5.3
Sør-Trøndelag	4.7	4.6	4.6	4.4	4.6	4.8	5.6
Nord-Trøndelag	4.8	4.4	4.3	4.5	4.2	3.8	3.6
Nordland	9.4	10.4	10.4	12.2	13.5	12.5	10.0
Troms	4.8	5.3	5.2	5.2	6.0	5.6	3.6
Finnmark	4.7	5.7	6.5	5.7	5.8	4.8	3.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

How do politicians use cost-benefit analyses?

- Interviews with 16 members of the transport committee of the Storting
- Four types of use were identified:
  - *To support decisions*
  - *As a screening device in the positive sense (to identify good projects)*
  - *As a screening device in the negative sense (to identify bad projects)*
  - *No use of cost-benefit analysis*
- A quote: ”If my own conclusion is supported by the cost-benefit analysis, I will use that cynically. If the analysis does not support my view, it does not bother me very much.”

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Opinions differ from left to right

Table 5. An index of attitudes towards cost-benefit analysis. 0 = most negative, 12 = most positive.

0	1	2	3	4	5	6	7	8	9	10	11	12
SL		La		Ce	La	La	Co	Co	PP		Co	
SL		La					Co					
		La					La					
		CD					PP					

SL = Socialist Left Party, La = Labour, CD = Christian Democrat, Ce = Center, Co = Conservative, PP = Party of Progress.

Source: Nyborg (1998)

The 'profitability' of Norwegian road investments

81 of the 290 road projects considered by the Norwegian Public Roads Administration (NPRA) for the National Transport Plan (NTP) 2010-2019, were profitable. I. e., 30 %.

The net present value of these profitable projects was NOK 16 billion. Their cost was NOK 34 billion, i. e. the net benefit per NOK public expenditure was about 0.5.

The final set of projects decided have a net present value of NOK –20 billion. Their cost is NOK 45 billion, i. e. the net benefit per NOK public expenditure is –0.4.

The pros and cons of tolling

- Deadweight loss, roughly proportional to squared toll rate.
- Costs of collection.

+ The income tax burden is relieved. Cost of funds = 0.2.
+ Road construction is facilitated where tolling is possible.
  Overall efficiency of road investments may be enhanced.
+ No deep reason why road users should not pay as they drive.
+ Traffic volumes are reduced, and hence also their externalities:
  noise, emissions, road wear, congestion, accidents.

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Preliminary conclusions on politicians' use of BCA

- Costs and benefits influence the priority given to projects, but their influence is quite weak
- Costs appear to have greater effects than benefits
- The influence of cost-benefit analysis does not appear to have increased over time
- The most recent study suggests that policy makers are influenced by the impacts included in cost-benefit analysis, but assess these impacts in natural units, not in monetary terms
- Obtaining a good geographical balance of projects is important – everybody should get something

List is due to Rune Elvik, TØI

What's wrong with BCA?

- The willingness-to-pay principle?
- The lack of ex-post evaluation?
- The discount rate?
- The assumption of perfect competition? Whose is the burden of proof?

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The willingness-to-pay principle

An imitation of the market. The great bulk of resource allocation – all goods sold in the marketplace – already follows this principle. Should public goods follow the same logic?

Willingness-to-pay ≠ (marginal) utility. => BCA is inherently biased against the poor.

However, this does not affect BCA as practiced in the road sector, since only national averages are used for the subjective value of time (SVOT) and other quality attributes. (It would be a problem if values were allowed to vary geographically.)

What happens if BCA is applied in one sector, but not in others?

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The need for ex-post evaluation

Under standard assumptions, there are no wider economic benefits. Land values rise as the benefits obtained in the transport market are 'resold' to secondary agents. It would be double counting to add increased property values to the benefits derived in a transport appraisal.

When transport improvements lead to new equilibria in land use and property markets, property owners will capture all the benefit (Mohring 1961, 1993; Wheaton 1977). Hence there are two equivalent ways of measuring the benefit:

1. Transport appraisal
2. Property values.

These methods should be contrasted through ex-post evaluation!

Mohring, H (1961): Land values and the measurement of highway benefits. *Journal of Political Economy* **69**(3), 236-249.

Mohring, H. (1993): Maximizing, measuring and not double counting transportation-improving benefits: A primer on closed- and open-economy cost-benefit analysis. *Transportation Research B* **27**(6), 413-424.

Wheaton, WC (1977): Residential decentralization, Land Rents, and the Benefits of Urban Transportation Investment. *American Economic Review* **67**(2), 138-143.

Is the discount rate to blame?

According to current BCA guidelines, costs and benefits are to be discounted at a rate of 2 + α % p. a., where α is the risk premium.

For a project whose benefit is independent of GDP (zero correlation), α = 2.5.

For a project whose benefit is positively correlated with GDP, we should have α > 2.5.

For a project whose benefit is negatively correlated with GDP, we should have α < 2.5.

According to this logic, investments in the production of inferior goods should have a discount rate of less than 4.5 % p. a. (α < 2.5). (Confer ice cream and umbrellas…)

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Are there inferior transport goods?

Yes!

Demand elasticities for shorter trips, by mode (< 100 km one way)

	Car driver	Car passenger	Public transport	Bicycle	Walk	Total
Income	0,06	-0,08	**-0,11**	**-0,07**	**-0,06**	0,01

Source: Steinsland C & Madslien A (2007): TØI report 924

Demand elasticities for longer trips (>100 km one way)

		Work	Leisure	Total
Income	Car	0.514	0.429	0.440
	Bus	0.041	0.166	**0.157**
	Sea	-0.294	0.158	**0.114**
	Rail	0.244	0.149	**0.162**
	Air	0.750	0.412	0.569
	Total	**0.589**	**0.383**	**0.422**

Source: Hamre T (2002) TØI report 555

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Modes differ in terms of investment risk

For slower, less comfortable goods, it makes sense to use a discount rate below 4 % p. a.: metro, tramway, bus, local rail, bicycling, walking.

For modes whose demand is only moderately income dependent, a reasonable discount rate would be 4 – 4.5 % p. a.: private cars.

Since, however, road freight is positively correlated with GDP, a correct discount rate for road investments would no doubt be above 4.5 % p. a.

For faster, superior modes, the discount rate should be well above 4.5 % p. a.: air, high-speed rail.

When the same discount rate is used for all transport modes, the benefit from investment in PT, bicycle paths and walkways is downplayed.

Is there perfect competition? Who has the burden of proof?

BCA rests on the assumption of perfect competition, i. e. that prices equal marginal costs.

Economists defend BCA by stating that, for any wider economic benefits to exist, there must be market failure.

Is it fair to shift the burden of proof to the critics? Are the assumptions underlying economic theory falsifiable?

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Summary (1)

- The main reason for the low quality of Norwegian infrastructure is its poor profitability: high cost, low benefit.
- Political priorities for regional development add to this predicament.
- Roads, bridges and tunnels are being built, not on account of BCA, but in defiance of it.
- In the Norwegian context, widespread tolling may enhance overall efficiency.

Summary (2)

- The willingness-to-pay principle mimics the market solution – with its strengths and weaknesses. For public goods, alternative decision rules are legitimate.
- The presence of wider economic benefits might be checked by contrasting property value development to the transport appraisal.
- Modes differ widely in terms of income elasticity. So discount rates, too, should vary between modes.
- BCA rests on the assumption of perfect competition. Whose is the burden of proof?

Thank you for listening!