Benefit –cost analysis of tolled projects Experiences from Norway

James Odeck

Norwegian Public Roads Administration

And

Norwegian University of Science and Technology

Questions addressed

1. What benefit-cost analysis (BCA) includes and the role that it plays in decision making
2. The relationship between toll fares and traffic volume and hence, impact on BCA
3. Users attitudes toward tolling
4. Are benefit-cost analysis correct *ex-post*?

Benefit-cost analysis (BCA) – what is it?

- A systematic evaluation of all advantages (benefits) and disadvantages (costs) that are expected to accrue from a project and that can be evaluated in monetary terms
- Because not all advantages/disadvantages are measurable in monetary terms, BCA must be supplemented with subjective evaluation of factors not measurable in monetary terms.

NB! The aim of BCA is to inform policy makers and the general public on what the outcome is expected be!

Mandatory for all projects in Norway

Merits of projects

1) Socioeconomic profitability:

NPV = discounted benefit – discounted cost

- >0, Profitable
- <0, Unprofitable

2) Ranking of projects:

NPV per Kroner funded thro' government budget; a rationing mechanism where projects with the highest ratios are preferred to others.

Impacts included

Monetized

- Users
  - Time and vehicle operating costs
- Operators
  - Income
  - costs
  - Transfers
- Government
  - Investment costs
  - Maintenance costs
  - Cost of public funds
  - Transfers
- Third party
  - Cost of accidents
  - Environment
  - Cost of public funds
  - Residual value of capital

Non-monetized

Landscape

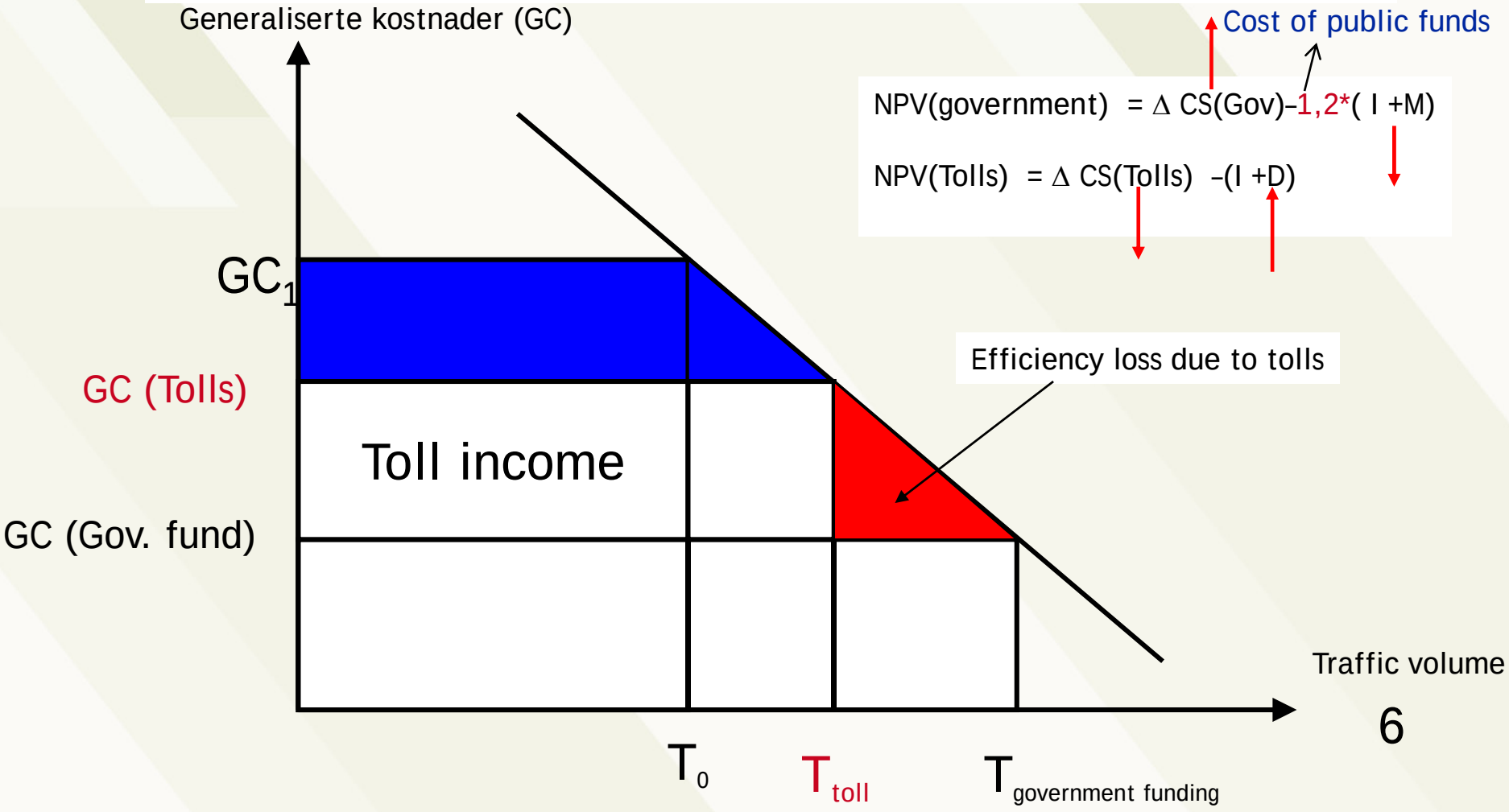
Community life and outdoor life

Natural environment

Cultural heritage

Natural resources

Tolls versus government funding



The role of BCA for toll projects in Norway

- Informs the decision makers on expected benefits in excess of cost
- Informs the general public on what tolling is good for
- Informs the ministry of finance on whether tolling can be prioritized.
- An examples:

Kvivsvegen: NPV with tolls = **-411 104**
NPV with Gov. funds =-278 481

Hence, the government fully financed it!

Toll fees = 90 NOK
Tolls to finance 10%
Tolls would reduce traffic by 50%
Traffic = 100AADT

Relationship between toll fees and traffic volume

Elasticity with respect to toll charges

- Answers the question of how much traffic is expected to reduce following an increase in Generalized costs

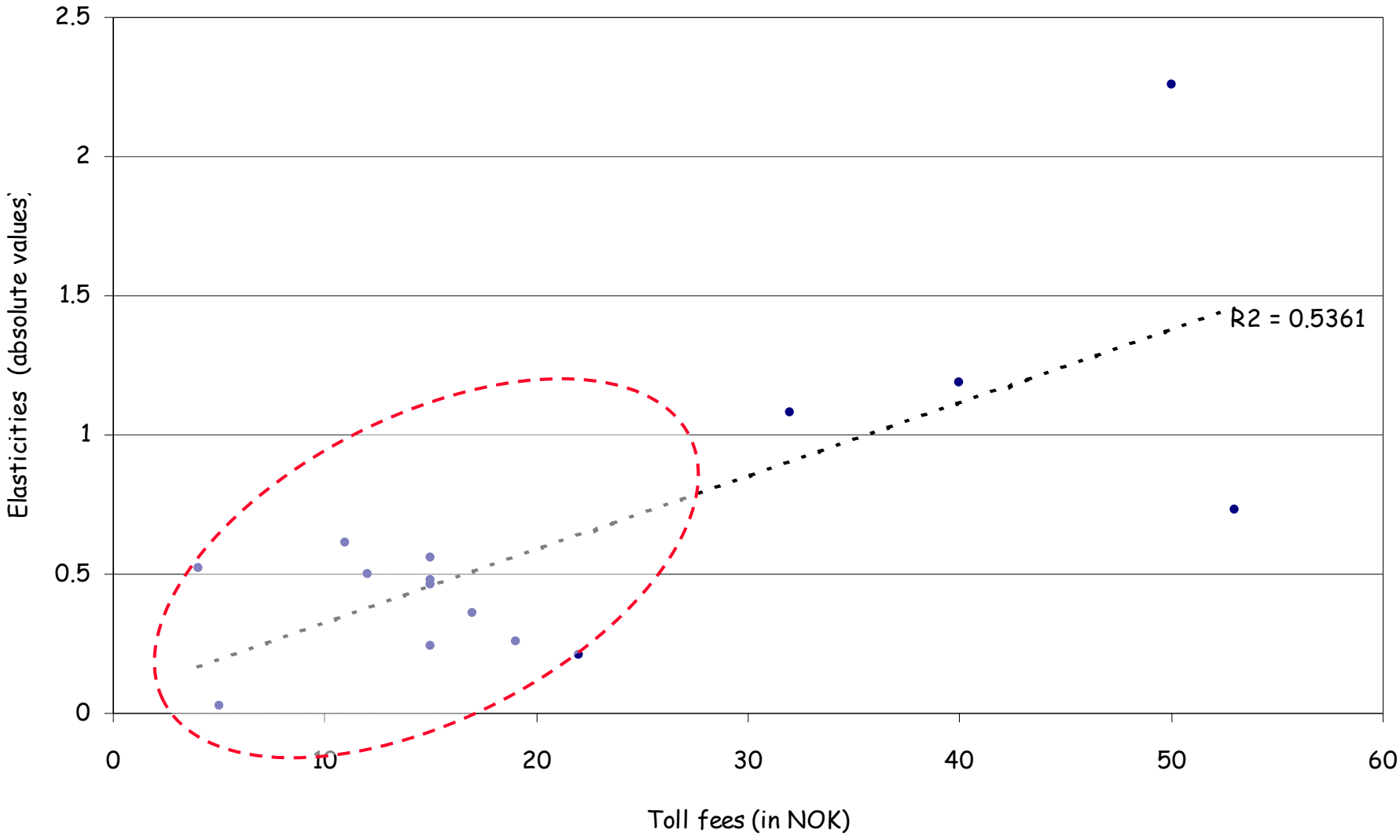
  If elasticity is equal to -0.5, it means that the traffic volume will change by 0.5% if tolls change by 1%

- studies have been conducted that includes several toll projects

Results of short-run elasticities

	Year of toll start/end	Status of toll at calculating elasticity	Toll fees in NOK (2003), cars incl driver	Arc-elasticity
Rural roads				
Rv 64 Atlanterhavsveien	99	Removed	50	-2.26
Rv 546 Austevoll /Husavik	91	Removed	4	-0.52
Rv 94 Kvalsundbrua	90	Removed	19	-0.26
E10 Gimsøystraumen	90	Removed	22	-0.21
Rv 60 Aure Aursnes	87	Removed	5	-0.03
Rv 63 Gravanesvegen	87	Removed	17	-0.36
Rv 457 Flekkerøytunnelen	98	Removed	32	-1.08
Leirfjorden	2001	Removed	40	-1.19
			Average	**-0.74**
Trunk roads				
E16 Skaret Vik	99	Removed	12	-0.50
E39 Boknprosjektet	99	Removed	53	-0.75
E 6 Mjøsbrua	96	Removed	15	-0.24
E39 Molde - Vestnes	93	Removed	11	-0.61
			Average	**-0.52**
Urban Motorways				
E6-Østfold(Moss)	2002	Started	15	-0.48
E18-Østfold(Askim)	2002	started	15	-0.46
E6-Lier(Drammen)	2002	Removed	15	-0.40
			Average	**-0.45**
			Grand average	***-0.62***
			Grand Max	***-2.26***

Relationship between elasticities and level of toll



Long-run elasticities

Ålesund tunnels	1987	Started	55	-0.88
Molde	1991	Started	55	-0.90
Kristiansund	1992	Started	63	-0.79
Askøy(Bergen)	1992	Started	50	-0.75
Helgeland	1991	Started	82	-0.81
			Average	*-0.83*

Long-run elasticities are about 1.34 times higher than the short-run elasticities

Users' attitudes

A questionnaire was undertaken to examine:

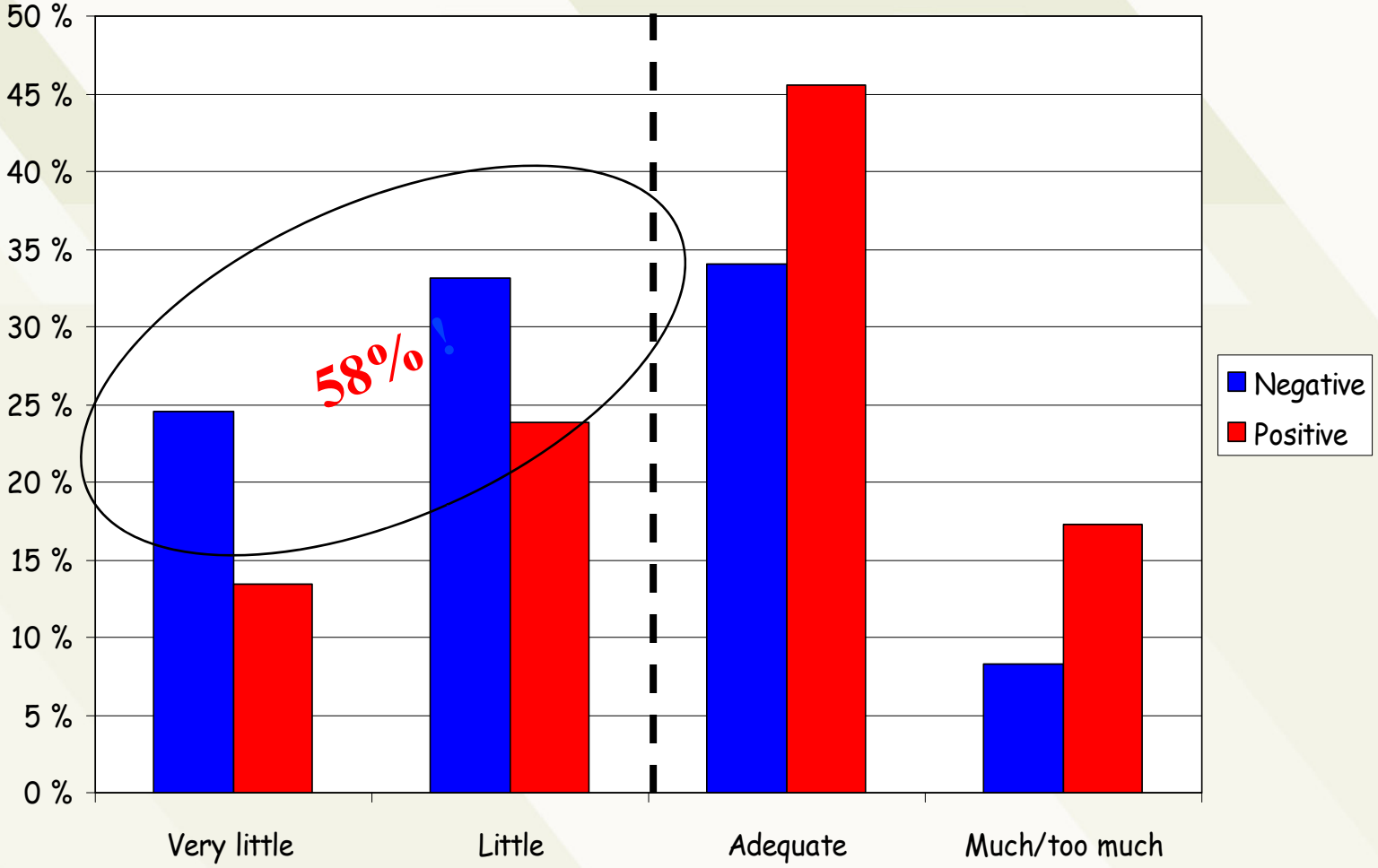
1) Users attitudes towards tolls as a means of financing infrastructure

2) The amount of information available on the reasons and intentions for tolls prior to their implementation

Users' attitudes towards tolls

Status of toll charging	Name of scheme	Type of toll scheme	Availability of alternative toll-free route	Average Toll rates	Negative attitudes(%)	Positive attitudes (%)	Total number of responses
Tolls about to be implemented							
	Tønsbergpakken (a)	Toll Ring	No	8.25	89	11	11 856
Tolls in operation							
	Tønsbergpakken (b)	Toll ring	No	8.25	70	30	1 732
	E18 Østfold	Single toll	Yes[1]	13.96	86	14	785
	E6 Østfold	Single toll	No	13.95	78	22	1 730
	Fv311 (E6) Østfold[2]	Single toll	No	13.95	90	10	563
	Skarnsundbrua	Single Toll -strait-crossi	No	62	39	61	512
	Helgelandsbrua (a)	Single Toll -strait-crossing	No	65.12	72	28	499
	Average(tolls in operation)			*26.50*	*76*	*24*	*5 821*
Tolls removed							
	Helgelandsbrua (b)	Single Toll -strait-crossing	No	65.12	61	39	520
	E18 Lierbommen	Single toll	Yes	13.57	68	32	382
	Rv.285 (Lierbommen)	Toll-free [3]		0	66	34	118
	Average(no tolls removed)			*26.23*	*67*	*33*	*5 526*
	Grand average			*26.36*	*81*	*19*	*23 203*

Relationship between attitudes and information provided to users



Remarks:

- People do not foresee the usefulness of tolling unless the reasons are explained to them, otherwise they remain negative(Tønsberg)
- Once tolls are implemented and construction activities in place, people start to perceive their usefulness, and become less negative (Østfoldpakke)
- Users become even less negative when they can use part of the infrastructure built by toll funds (Oslo)
- The level of negative attitudes reaches a minimum when tolls are removed (e.g. Lier). Those who still remain negative do so as a matter of principle: Tolls are seen as an extra tax.

What can be done ?

There are strong reasons to believe that more information on the purpose of toll collections, and the consequences without tolls, needs to be provided.

Ex-post evaluation of BCA- Traffic

Project	*Traffic opening year (AADT)* Before (Estimates)	Post opening	Deviation before/after	*Average traffic growth, 5 first years* Before (Estimates)	Post opening
Rv. 23 Oslofjordforbindelsen	4240	3780	-11 %	1,4 %	6,8 %
E18 Rannekleiv - Temse	8232	10242	24 %	1,2 %	3,2 %
Rv. 714 Hitra - Frøya	353	512	45 %	1,2 %	18,3 %
E134 Teigeland - Håland	1000	1367	37 %	1,2 %	2,3 %
Rv. 62 Øksendalstunnellen	1386	1345	-3 %	1,0 %	5,5 %
E8 Norkjosbotn-Laksvatnbukt	2300	2400	4 %	1,1 %	3,7 %
E18 Gutu-Helland-Kopstad	12000	16700	39 %	1,2 %	3,0 %
E39 Kleivedammen-Andenes	686	924	35 %	1,0 %	3,9 %

- 2 projects had lower traffic than expected for the opening year
- 6 projects had higher traffic than expected
- The average traffic growth has been higher than forecasted

All projects have higher than expected traffic 5 years after project opening

Some general conclusions

1. Benefit –cost analysis is very important as an information base both to decision makers and the public at large
2. It is not given that government funding is to be preferred as compared to tolling –BCA determines!
3. Road user are elastic with respect to tolls (0.33 -0.80)
4. Road users are negative towards tolls but the degree of negative attitudes reduces with level of information and once users see project in place
5. Ex-post studies show that projects are more profitable than was forecasted

Relationship between elasticities and users attitudes