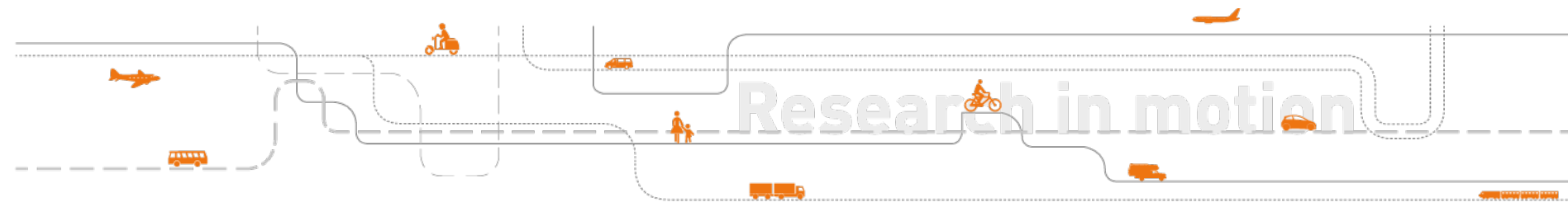


# E39: regional projects – national benefits

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# and what is he going to talk about...

- Transport and the economy
  - *Some key concepts*
  - *Wider economic impacts*
- Assessment tool: SCGE-models
- Results and concluding remarks

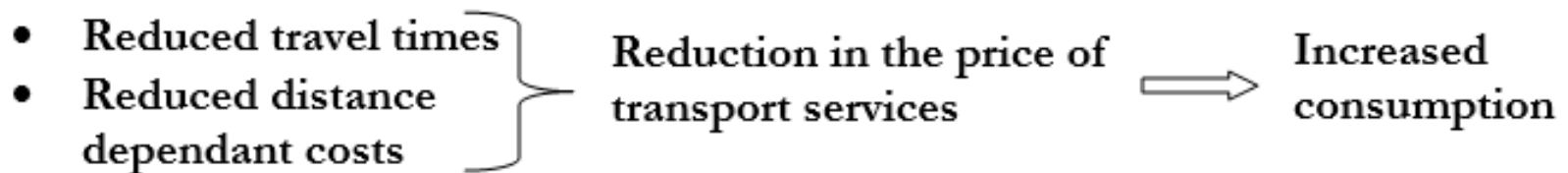


# Key concepts and theoretical underpinnings

- Spatial interaction
  - *Process of moving goods, people, information and ideas across space*
  - *Fundamental principle: trade-off between the cost and the benefit of interacting*
- Accessibility = potential for interaction
- Norwegian geography: “the most important” external condition for Norwegian industry

# Key concepts and theoretical underpinnings

- The demand for transport is **derived** from the demand for other products or activities in the economy
- **Transport infrastructure**: input in the production of transport
- **Transport**: input in the production of intermediates, consumption goods and service products
- Infrastructure investment:



# Generalized transport costs

- The sum of all costs faced by the users of the infrastructure in the travel decision making process
  - *Time costs*
  - *Fuel costs*
  - *Other distance dependant costs*
  - *Toll fares*
  - *Ferry tickets, etc*



New / improved  
infrastructure



Reduced generalized  
transport costs

# New infrastructure - what happens

- **Temporary construction phase effects**
  - Direct
    - Construction
    - Environmental effects
  - Indirect
    - Crowding out effects
    - Backward expenditure effects
    - Environmental effects
- **Permanent effects related to the use of the infrastructure**
  - Direct
    - Exploitation and time savings effects
    - External effects (emissions, noise, accidents, etc)
  - Indirect
    - Productivity and location effects
    - Backward expenditure effects
    - Emissions etc

# New infrastructure - what happens

	Direct effects	Indirect effects
<b>Temporary</b>	<ul style="list-style-type: none"> <li>• CBA: costs</li> </ul>	<ul style="list-style-type: none"> <li>• Quality assessment</li> </ul>
<b>Permanent</b>	<ul style="list-style-type: none"> <li>• Travel times</li> <li>• CBA: benefits</li> </ul>	<ul style="list-style-type: none"> <li>• Productivity and location effects</li> <li>• Backward expenditure effects</li> <li>• Emissions etc</li> </ul>

# Wider economic impacts (WEI)

- In CBA, as long as the markets are perfectly competitive the user benefit will equal the total benefit of the investment (Kanemoto and Mera, 1985) (Jara-Diaz, 1986), and adding spillover effects will only result in double counting (Mohring, 1993)
- However, when the price of important market goods exceeds marginal cost, the traffic improvement will produce repercussions in other sectors of the economy not evening out (Jara-Diaz, 1986)
- Market imperfections in secondary markets may lead to an under estimation of the user benefit of a project (Venables and Gasiorek, 1998) (SACTRA, 1999)



# WEI

- **Wider economic impacts:** *all economic benefits not captured in the direct user benefits of the type which are normally analyzed in a well constructed transport cost-benefit analysis after allowing for environmental and other directly imposed external costs (Vickerman 2007)*
- The most important economic effects not captured in a traditional CBA can be summarized in four categories:
  - *Agglomeration effects*
  - *Labour market effects*
  - *Increased production in imperfect markets*
  - *Increased competition in imperfect markets*

# In a perfect competitive environment

We build a new road...



Cost: 100

... which leads to lower transport costs



Benefits: 200

The CBA calculates a net present value equal 100. The user benefit produce repercussions in the economy (positive for some – negative for others) which may materialize itself in different ways:

More spare time: 20



Improved firm results: 80



Added employment (wages after tax): 60



Increased property prices: 40



Total repercussions  
= user benefits  
= 200

# Imperfect secondary markets...

More spare  
time: 20



Improved firm  
results: 80



Added  
employment  
(wages after  
tax): 60



Increased  
property  
prices: 40



CBA:  
Total  
repercussions  
equal user  
benefits:

200



Increased  
monopoly  
profit: 10



Net taxes from  
new employees  
: 10

However, if we include the  
effects in imperfect  
secondary markets..

...the total repercussions  
in the economy equals  
220.

**Wider economic  
impacts: 20**

# Key concept: Wider economic impacts

CBA



Supplementary  
tools / analysis

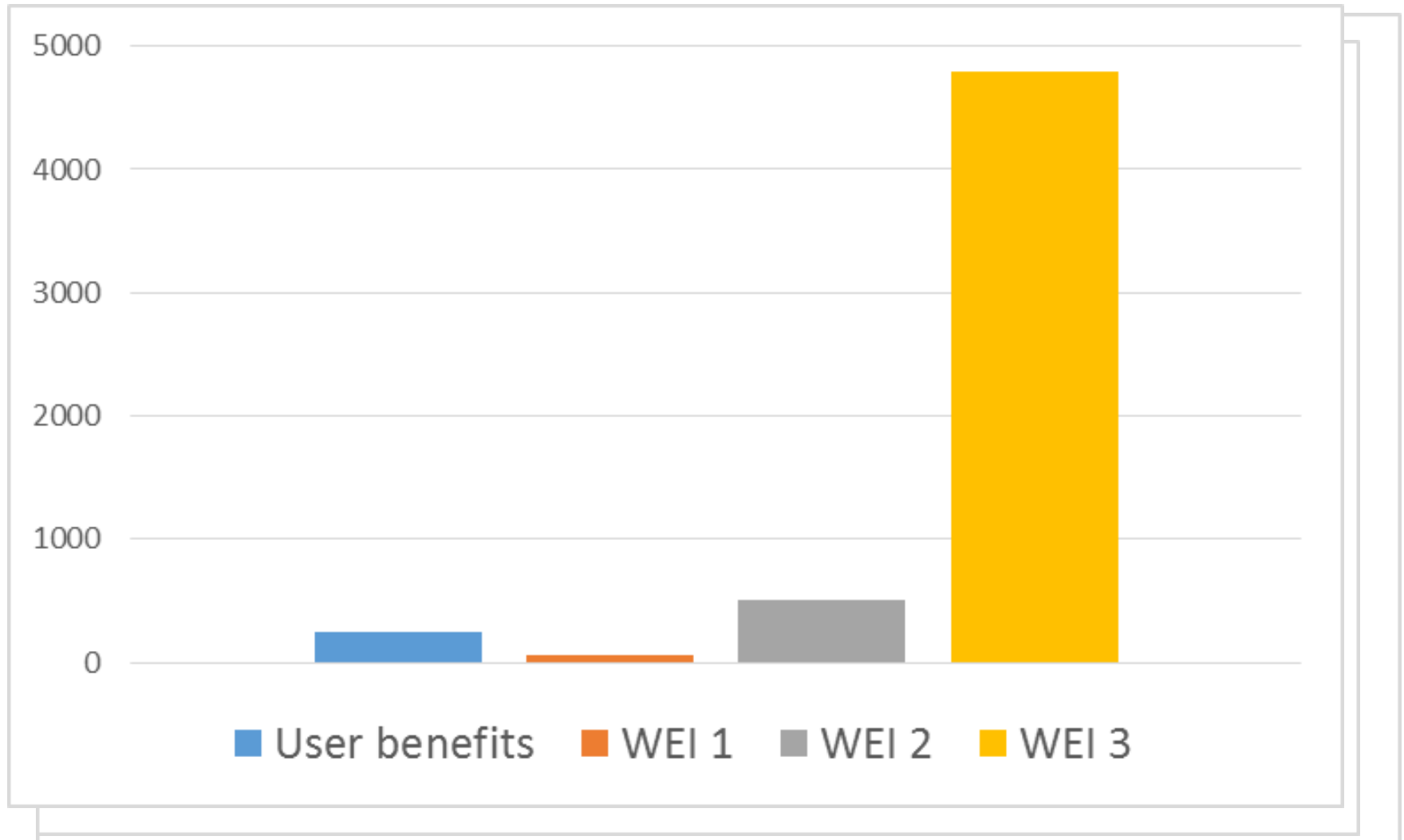


# Supplementary tools

- The ATP-model
- Gravity models
  - *Potentials for regional enlargement*
- Qualitative methods
  - *(SWOT-analysis, questionnaires, etc)*
- Macro- and regional economic models
- Calculation of productivity effects by use of density elasticities
- LUTI -models
- **SCGE -models**



# Different tools – different results



# SCGE-modelling

- Spatial Computable General Equilibrium models = general equilibrium models, with a spatial dimension, that are **numerically solvable**
- In contrast to partial equilibrium models that only consider a single market, take all other prices in the economy for given and disregard the effects in the rest of the economy, general equilibrium models **capture the interplay between all sectors in the economy.**
- Builds on a **reference data set** containing all transactions in the economy in the base year
- The model is a **solvable system of equations** that reproduce the equilibrium dataset through assumptions on market structures, functional forms for the product- and utility functions, and parameter values for the elasticities in the model

# SCGE-modelling cont.

- **The system of equations** describes the behaviour of economic agents (households, firms) and institutions, the structure of the markets (goods, assets, production factors), and the interaction between these.
- The interplay between the actors in the economy are captured through the **prices**.
  - *The vector of prices that clears all markets simultaneously defines the equilibrium in the model*
- The spatial dimension is obtained by an explicit representation of the **commodity flows** between and within all zones in the model, and the **transport costs** for all trade relations



# Enough theory – now some results



# Limitations in the analysis

- WEI can be divided into 4 categories (remember):
  - *Agglomeration effects*
  - *Labour market effects*
  - *Increased production in imperfect markets*
  - *Increased competition in imperfect markets*
- Look only at the benefits, disregard the costs
- Disregard possible environmental effects
- Focus on permanent direct- and indirect effects
- Investment alternative 4: only new fixed links – no further road improvements

# The SCGE-model

- Main data sources
  - *National accounts*
    - SUT
  - *National accounts by county*
  - *Growth rates (MSG)*
  - *Commodity flows*
  - *Transport costs*
- Sectors, commodities and zones
  - *21 sectors*
  - *37 commodities*
  - *20 zones*

# First a look at the input data

*Changes in annual average daily traffic (AADT) in the toll and toll-free alternative.  
National transport modelling system*

	Alt4_toll	Alt4_toll-free
Domestic freight	- 95 m NOK	- 754 m NOK
Import	- 3.9 m NOK	- 35.2 m NOK
Export	- 2.8 m NOK	- 22.7 m NOK

- Toll-free fixed links will provide approximately 8 times higher reduction in domestic freight costs compared to the toll alternative

# SCGE-model results (freight only)

- Calculated total freight benefits 4x larger in the toll-free alternative compared to the toll alternative
- Additional benefits (WEI) 2.2x larger in the toll-free alternative
- Toll-alternative:
  - *Additional benefits (WEI) calculated to 9.2 % of freight user benefits*
  - *55% of the total benefits split between Rogaland and Hordaland*
- Toll-free alternative
  - *Additional benefits (WEI) calculated to 4.8 % of freight user benefits*
  - *47% of the total benefits split between Rogaland and Hordaland*

# SCGE-model results (freight only)

- Top 6 counties (total freight benefits)

	Alt 4 toll	Alt 4 toll-free
Rogaland	33 %	28 %
Hordaland	22 %	19 %
Oslo	11 %	10 %
Møre og Romsdal	7 %	10 %
Akershus	6 %	7 %
Sør-Trøndelag	4 %	8 %

# SCGE-model results (freight only)

- Top 4 WEI

	Alt 4 toll	Alt 4 toll-free
Oslo	20 %	18 %
Rogaland	19 %	17 %
Hordaland	12 %	13 %
Akershus	11 %	11 %

# Total freight benefits





# To summarize

- WEI only occurs when we have market imperfections in the secondary markets
- If so, we need supplementary tools to CBA in order to capture the total benefits of a project
- No consensus on which tool to use, different tools provide different results
- My opinion:
  - *Models with an explicit spatial representation is the only correct way to capture WEI*
  - *In order to capture rippling effects of a change in the derived demand for transport, a model which represents all sectors of the economy is needed*

# Summarizing .....

- By use of a SCGE-model, we have calculated notisable WEI of changes in freight transport costs due to a new ferry-free E39
- The model-calculated total benefits are sensitive to toll financing
- By use of a national covering model we find large benefits in remote regions
- Which leads us to the conclusion that the regional projects of a new ferry-free E39 benefits a larger part of the nation