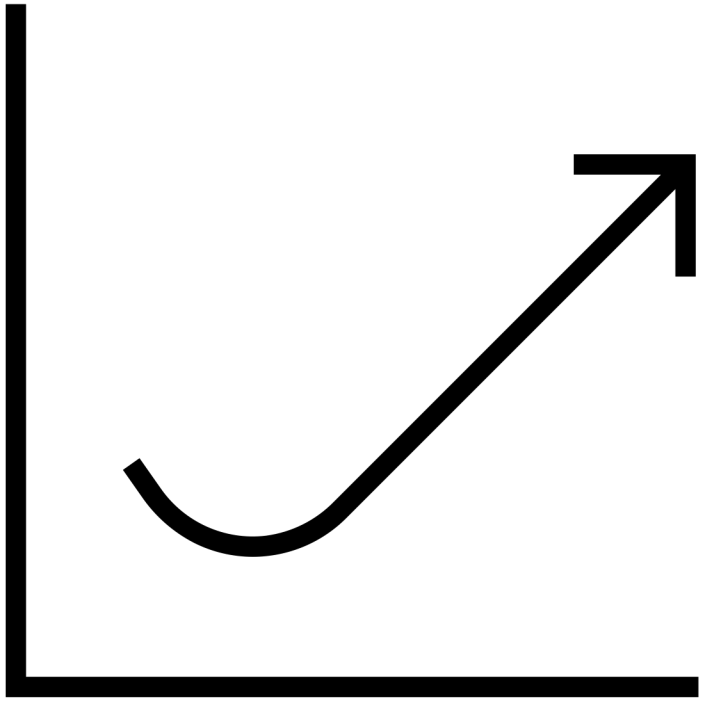


# The Rebound Effect

Digitalisation and the Rebound Effect seminar

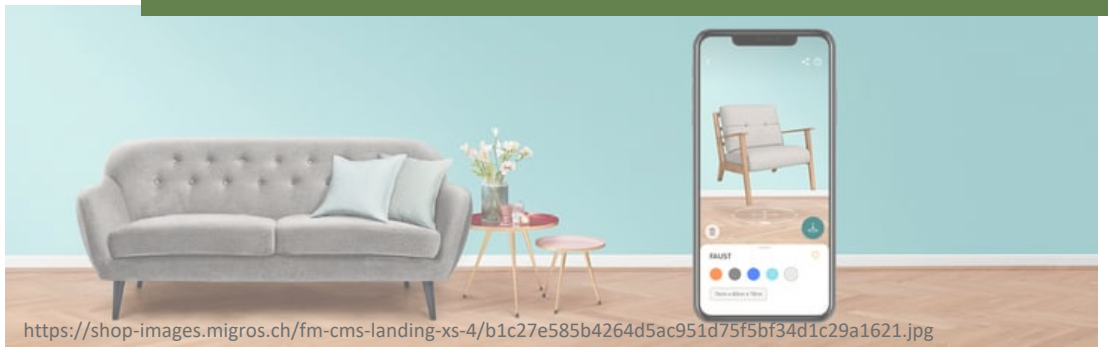
AS2020

Diana Steffen

# Motivation

s-ai.

common ground



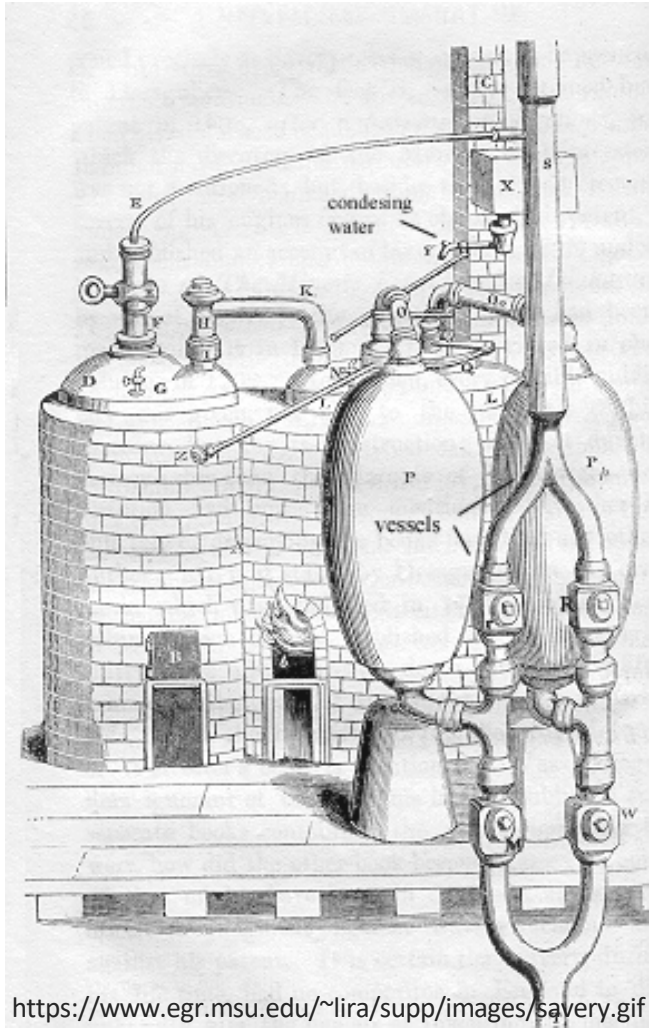
https://shop-images.migros.ch/fm-cms-landing-xs-4/b1c27e585b4264d5ac951d75f5bf34d1c29a1621.jpg

https://inteng-storage.s3.amazonaws.com/images/NOVEMBER/sizes/11_Robots_Agriculture_Farming_Robotics113_resize_md.jpg

# Overview

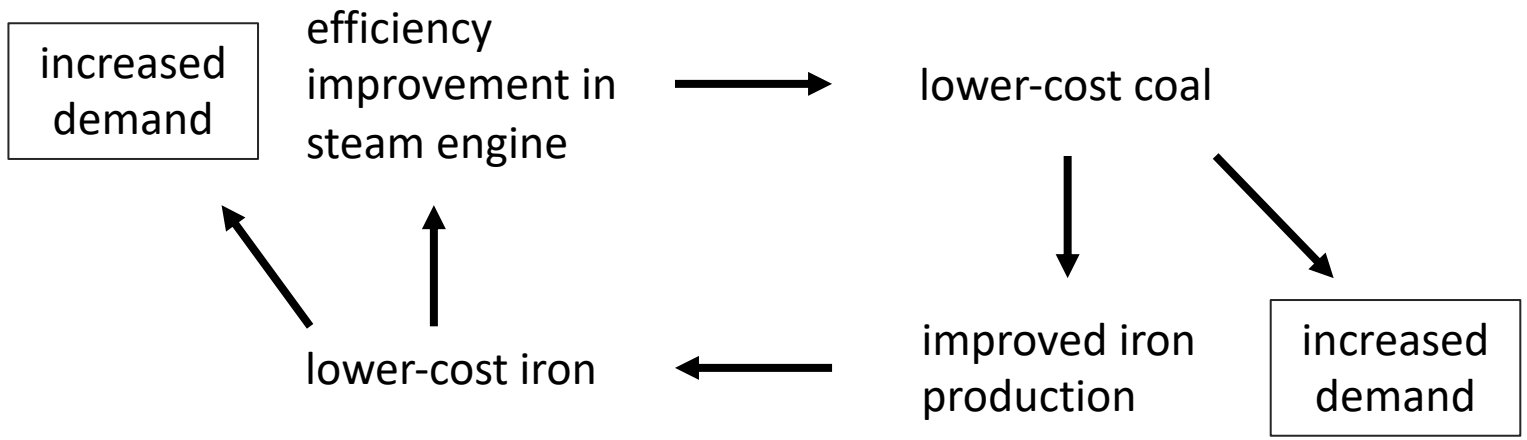
- Historical Context
- Concept of Rebound Effect
- Quantifying Rebound Effect
- Rebound Effect in ICT
- Measures to Address Rebound Effect

# Rebound in Energy Markets




https://www.egr.msu.edu/~lira/supp/images/savery.gif

- 1865: *The Coal Question* by William Stanley Jevons
- early Savory engine: positive feedback circle




- 1980: J. Daniel Khazzoom: *Implications of Mandated Efficiency in Standards for Household Appliances*

Steve Sorrell: Jevons' Paradox revisited: The Evidence for backfire from improved energy efficiency, Energy Policy 37 (2009), 1456 - 1496,
Blake Alcott: Jevons' paradox, Ecological Economics 54 (2005), 9-21

# Rebound in Energy Markets

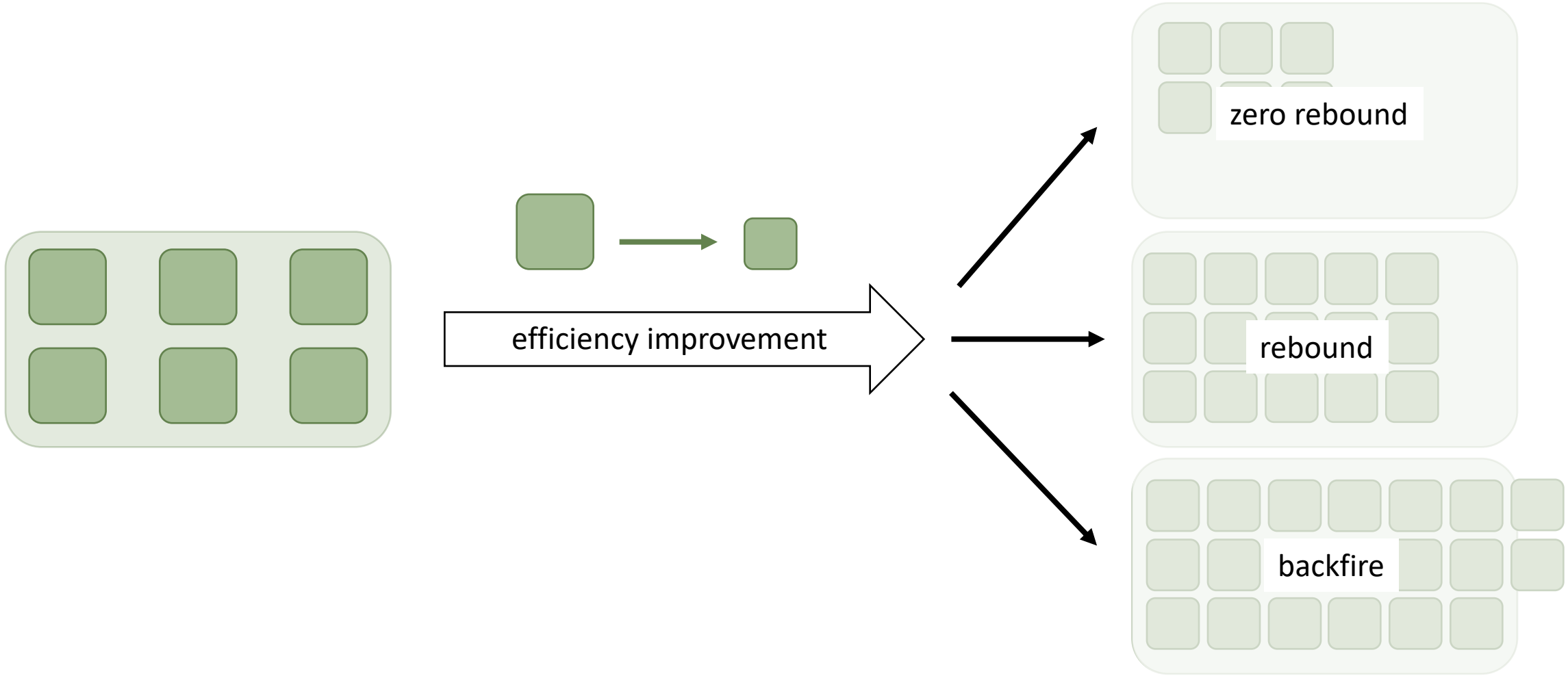
“ with fixed real energy prices, energy-efficiency gains will increase energy consumption above what it would be without these gains”

- Khazzoom-Brookes postulate

backfire

S. Steve Sorrell: Jevons’ Paradox revisited: The Evidence for backfire from improved energy efficiency, Energy Policy 37 (2009), 1456 - 1496,

# A Closer Look on Direct Rebound Effect



Concept

# Direct, Indirect and Overall Rebound Effect

| direct rebound effect | |
|---|---|
| *single* service model | • economy with one good<br>• smaller cost → increased demand |

| indirect rebound effect | |
|---|---|
| *multi* service model | • economy with many different goods<br>• smaller cost → increased demand for other goods |

overall rebound effect + backfire

Mathias Binswanger: Technological progress and sustainable development: what about the rebound effect?, Ecological Economics 36 (2001), 119-132

Concept

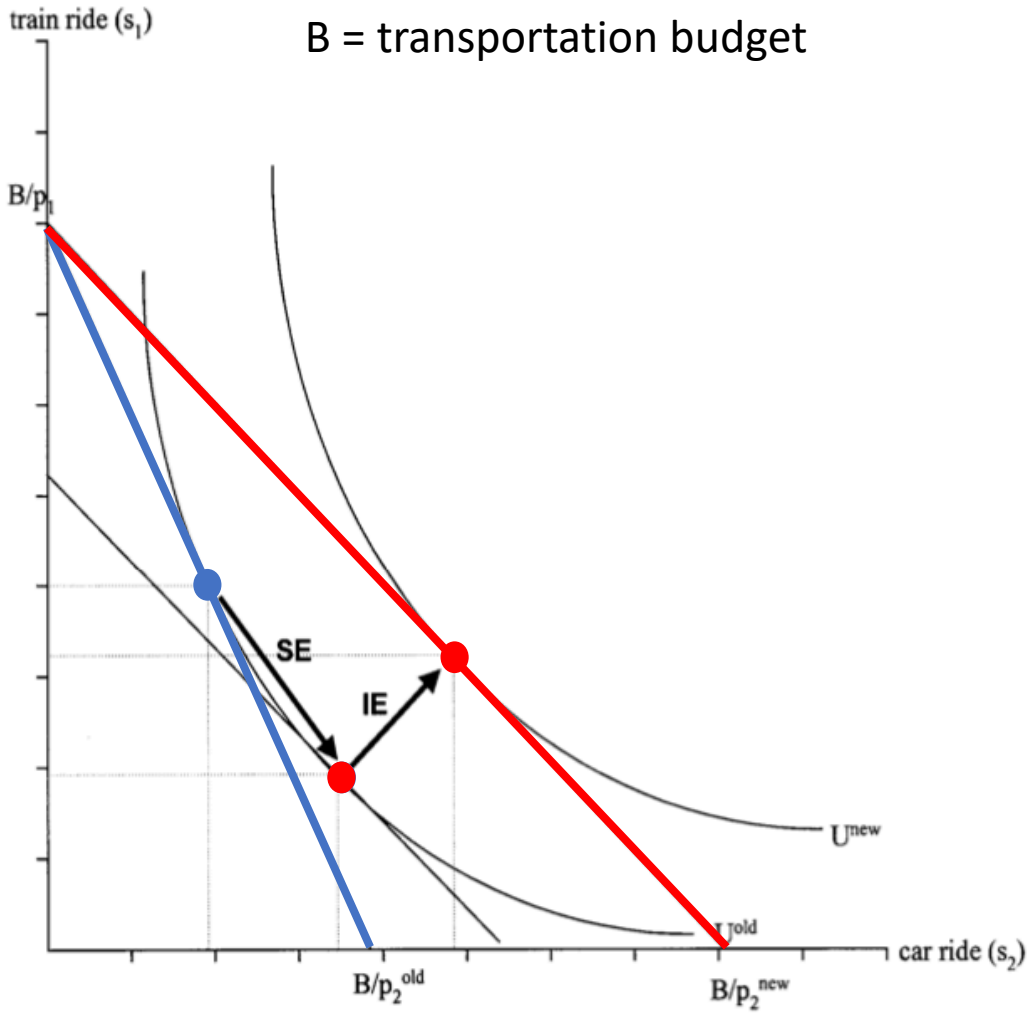
# A Closer Look on Indirect Rebound Effect

## SE: substitution effect

replacement of one good for another

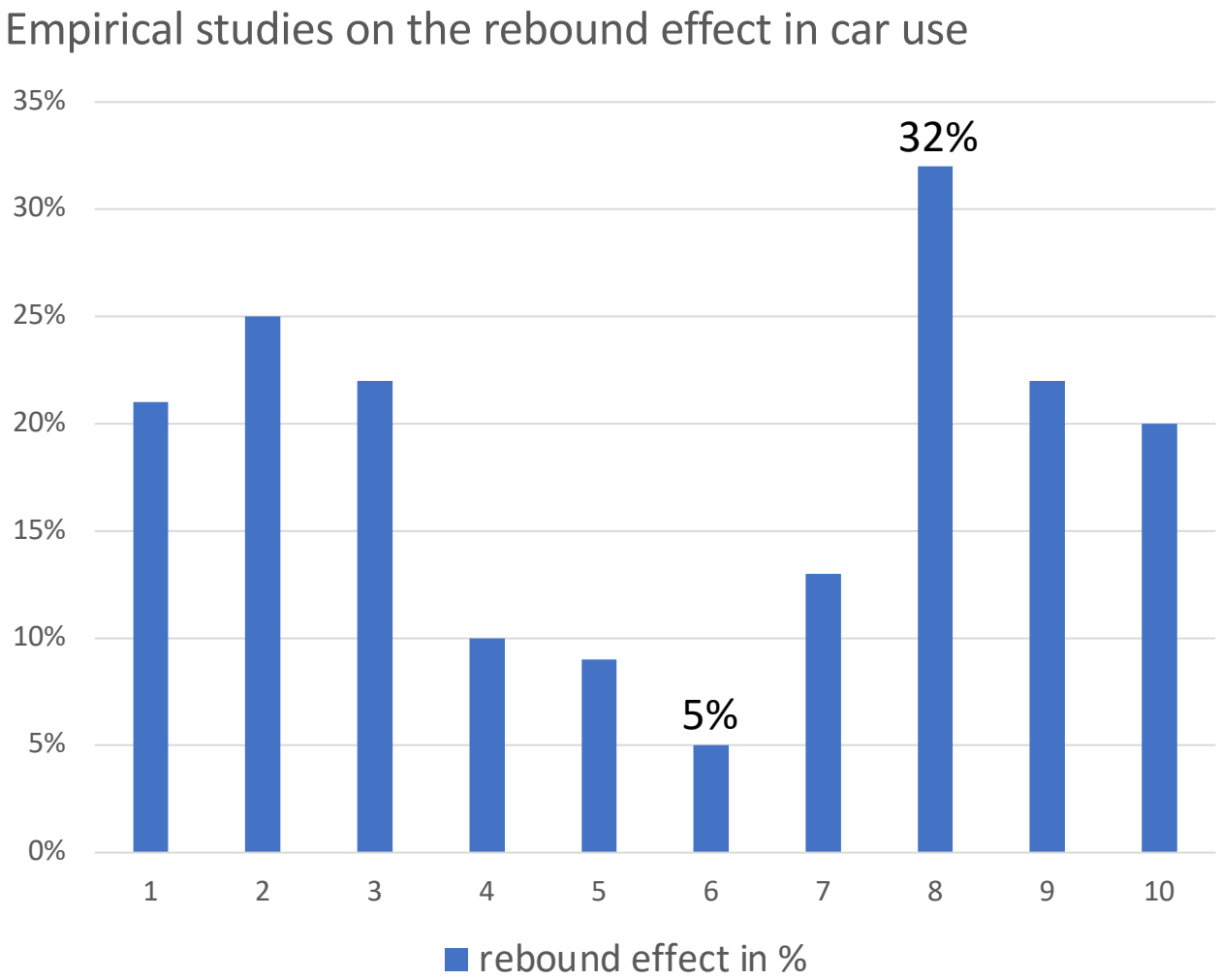
## IE: income effect

change in income -> change in behaviour (more/less consumed)




Mathias Binswanger: Technological progress and sustainable development: what about the rebound effect?, Ecological Economics 36 (2001), 119-132

# Empirical Observations




- effect of empirical relevance
- size dependent on method and data
- ~ 5 – 30 %
- no backfire

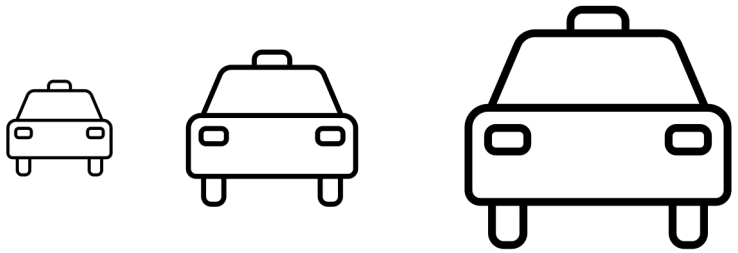
Mathias Binswanger: Technological progress and sustainable development: what about the rebound effect?, Ecological Economics 36 (2001), 119-132

# Assumptions and Problematics

neo-classical economic principles

- rationality
- insatiable preferences
- need to optimise
- complete information
- no uncertainty
- negligible adjustment-costs

## Rebound Effect or preference change?



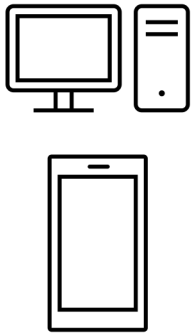
Peter H.G. Berkhout et al.: Defining the rebound effect, Energy Policy 28 (2000), 425-432

# General Purpose Technology

wide scope for improvement

many use-cases

used in products and processes



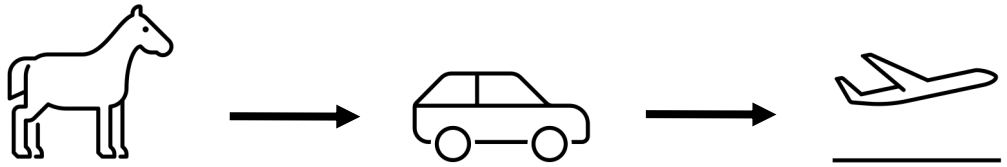
→ economic growth
→ innovation
→ productivity
→ increased manufacturing cost

big potential for rebound effects in ICT

Steve Sorrell: Jevons' Paradox revisited: The Evidence for backfire from improved energy efficiency, Energy Policy 37 (2009) ,1456 - 1496,
Eric Williams: Environmental effects of information and communication technologies, Nature (2011)

# Rebound Effect with Respect to Time

**transportation**



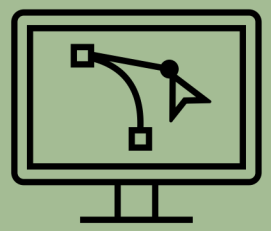
**shopping**

- time saved?
  - longer commuting distances
  - inefficient distribution of goods
- energy saved?
  - production and usage consume more energy

→ 2x rebound effect

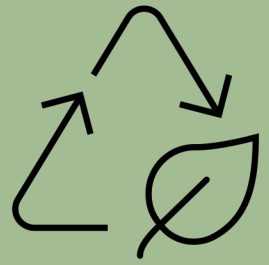
# Measures to Address Rebound Effect

# Recommended Measures to Address Rebound Effect

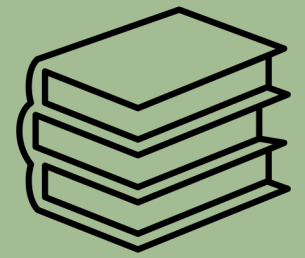


account for rebound effect in design and evaluation of policies

mix of fiscal, behavioural and technological instruments



sustainable lifestyles & behaviour in *customers*



awareness raising & education for behaviour change in *business*

Maxwell, D., Owen, P., McAndrew. L, Muehmel, K., Neubauer, A., Addressing the Rebound Effect, a report for the European Commission DG Environment (2011)

# Summary

- rebound effect in energy efficiency
- different levels: direct, indirect and overall rebound effect
- income effect and substitution effect
- (zero) rebound or backfire: difficult quantification
- general purpose technologies
- rebound effect with respect to time