INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

A Systems Perspective to Commuter Cycling in Urban Mobility

Ashwani Kumar
Singapore-MIT alliance (SMART)
Kwong Meng Teo
National university of Singapore (NUS)

Outline

- Motivation
- Challenges in cycling policies
- Description of the proposed approach
- Identifying the key policy levers
- Policy analysis framework
- Future Work

MOTIVATION

Motivation

- Challenges in urban mobility: rapid urbanization and motorization, especially in developing cities
- Lack of a systems approach across modes and policy domains often leading to poor/ unintended results
  - *Despite commissioning of a new city-wide metro rail system in 2002, public transport modal share declined by more than 12% during 2001-2008 in Delhi*
  - *Construction of an elevated highway increases traffic congestion in downtown Seoul, finally its demolition reduces congestion and increases public transport usage*
- Limited use of systems approach to the 'apparently' simple issues such as cycling policies

Motivation

Why Systems perspective required in urban mobility?

INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

- Multiple Stakeholders with conflicting objectives
  - Stakeholders: Governments; commuters; operators; politicians
  - Different stakeholders have multiple, often conflicting, objectives

    Example: *Congestion in transits is good for the operators as it increases the margins but undesirable from commuters' point of view*

Governments	Commuters	Operators	Politicians
Productivity, pollution, Subsidies	Cost, comfort, travel time, safety	Margins, lower investment, O & M cost	Popularity, Image, Big ticket item

Motivation

INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

Why Systems perspective required in urban mobility?

- Competing alternatives
  - Rail based transit; bus rapid transit; suburban rail; normal buses; electro-mobility; bike-sharing

  - cannibalization of demand
  - inter-modal issues
  - Competition vis-à-vis collaboration

Motivation

Why Systems perspective required in urban mobility?

- Diversity of context across cities
  - Different income level, density, urban design, climate, culture, politics

Each city is unique

Mobility solution for one city can't be just copied for others

Motivation

Why Focus on Cycling in Urban Mobility?

INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

Clear Benefits:

- Non-polluting
- Small physical footprint
- Cheap, decentralized/private
- Efficient for short city trips (Pucher 2007, Marten 2010)

But gets little policy attention as a transportation mode *apparently due to:*

- ❑ *Slow speed, weather, limited reach, low tech (Tiwari 2007; Mohan 2010; Pucher 2007)*
- ❑ *At times, even considered a nuisance on roads (Mohan 2010)*

Motivation
Why 'Commuter' Cycling?

- Commuting represents a big fraction of all city trips (30-40%) (Martens 2010, Vuchic 2007)
- Most of commuting trips occur during peak congestion
- Commuting efficiency impacts productivity
- Predictable patterns (*O-D flows*); amenable to planning
- Weather during commuting hours generally more suitable for cycling (especially in tropical cities)

Hence commuter cycling is more important from public policy perspective

CHALLENGES IN CYCLING POLICIES

Challenges in Cycling policies

- What Role for cycling ?
  - Marginal/ significant or pivotal; Utilitarian/ recreational;
  - How to combine it with transits?
- What, where, when and how much infrastructure?
  - Shared space with cars, pedestrians or separate
  - In suburbs, city centers, at transit stations, everywhere or wherever
  - Infrastructure first or cyclists first
  - Budget, cost-benefit

Challenges in Cycling Policies

- Policymaking/Financing/Implementation roles:

  Who should do what?

  - Federal, provincial and city governments
  - Transit agencies
  - Private sector, advocacy groups/Non profit
- Policies cut across policy domains
  - Transport
  - Urban planning; land-use
  - Environment; energy
  - Education; policing..

  How to coordinate and synergize?

Hence systems approach is essential in this case to identify all the things that need to be considered and analyzed at the same time to make policies that encourage cycling to achieve broader urban mobility objectives

DESCRIPTION OF THE PROPOSED APPROACH

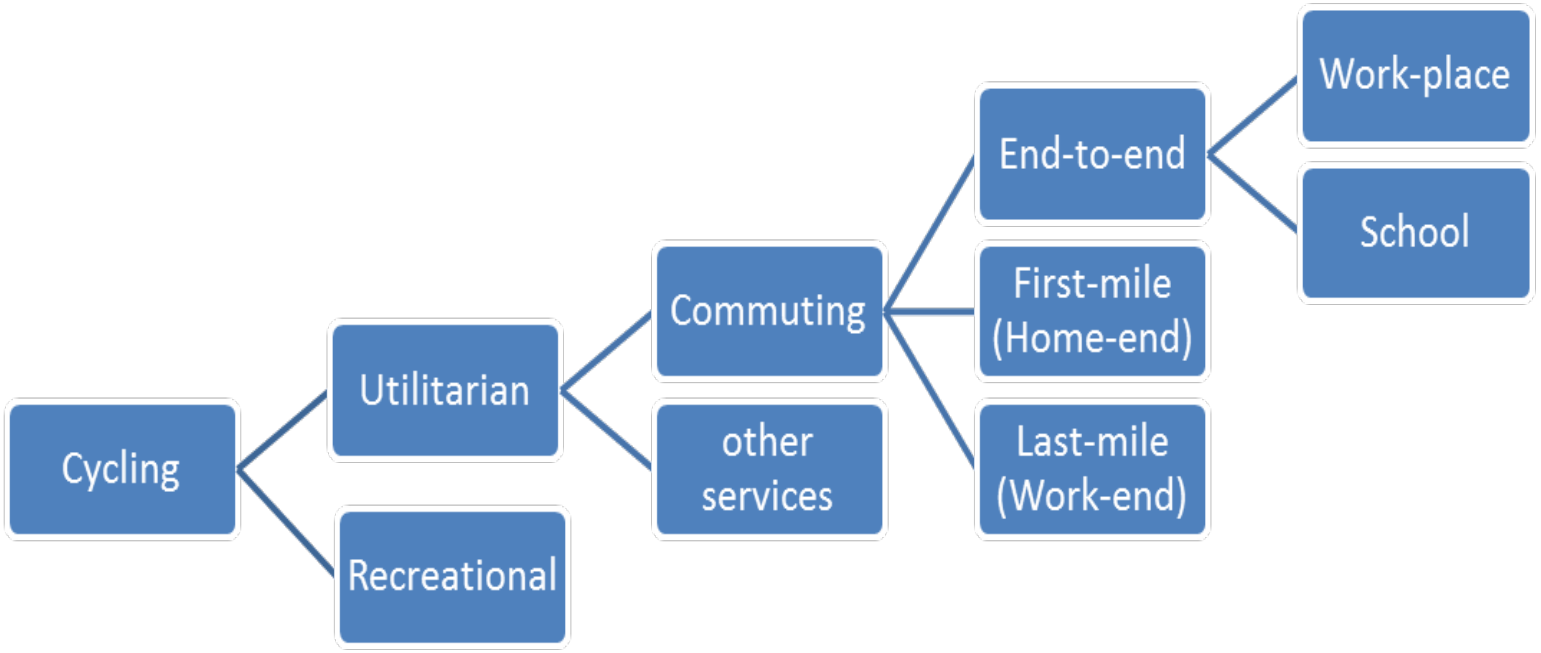
Proposed Systems Approach to Cycling Policies

- Identify the targeted forms of cycling and understand their specific features and requirements
- Figure out the key policy levers and inter-linkages
- Identify effective policies under classify them under common constraints

At all stages:

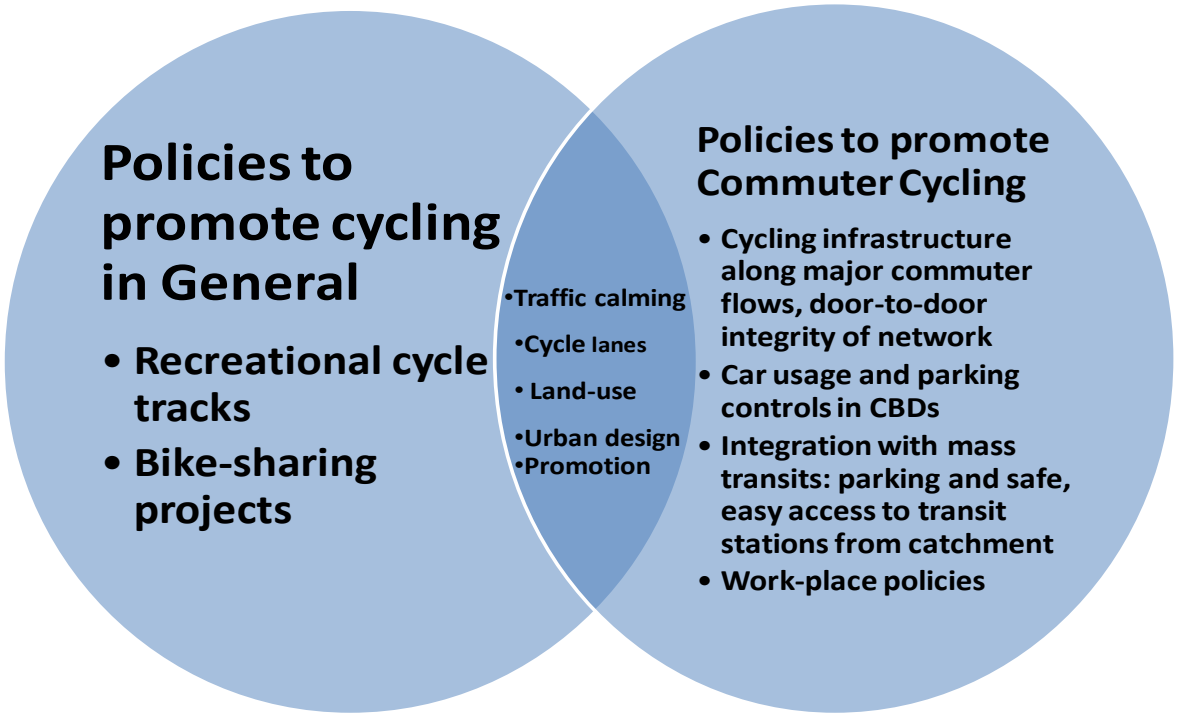
- ➢ Apply the Pareto principle (80-20 principle)
- ➢ Make effective use of the existing knowledge/research
- ➢ Alternate between reductionist approach and helicopter view

Types of Cycling



Policies need to assess demand and focus on the relevant forms of commuter cycling

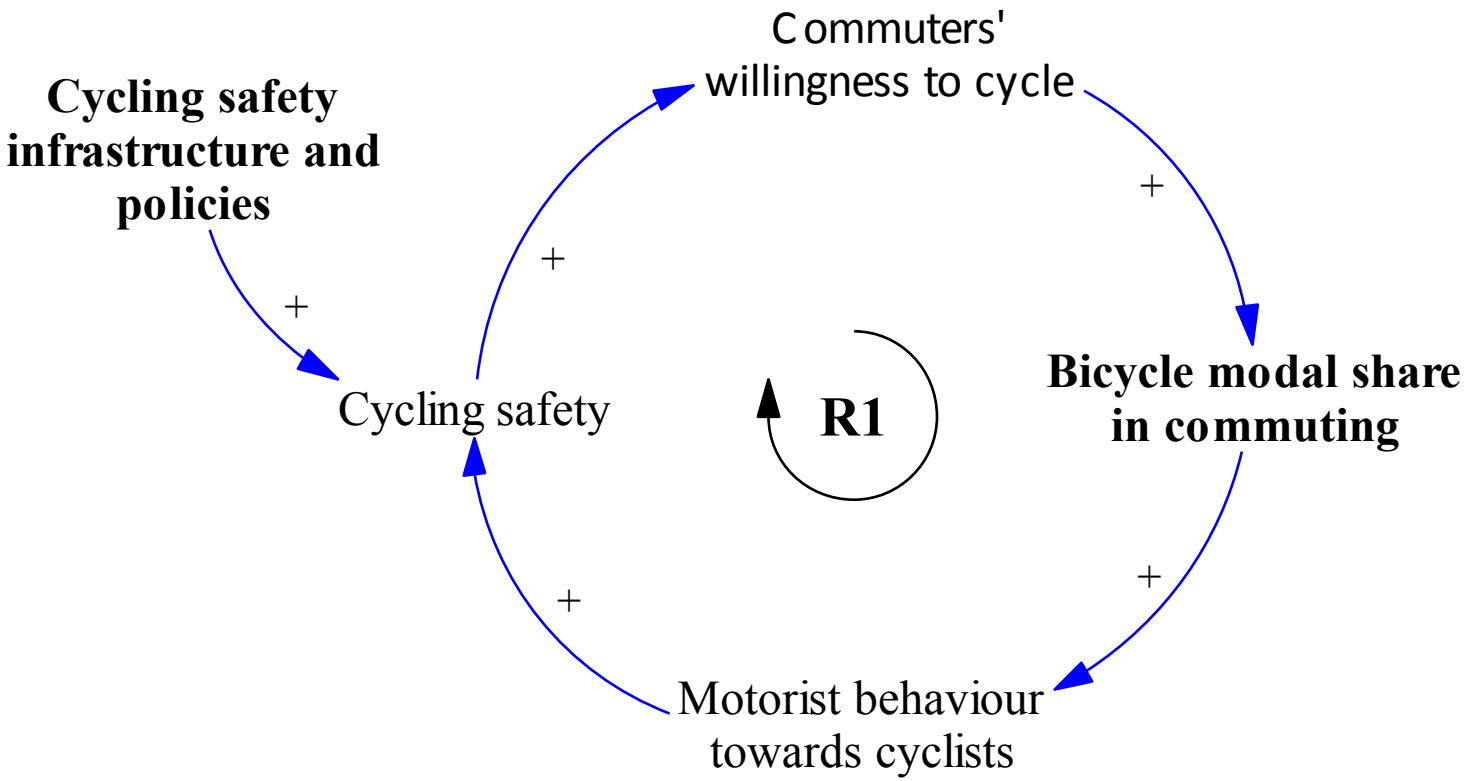
Cycling and Commuter cycling Policies



Important to make this distinction

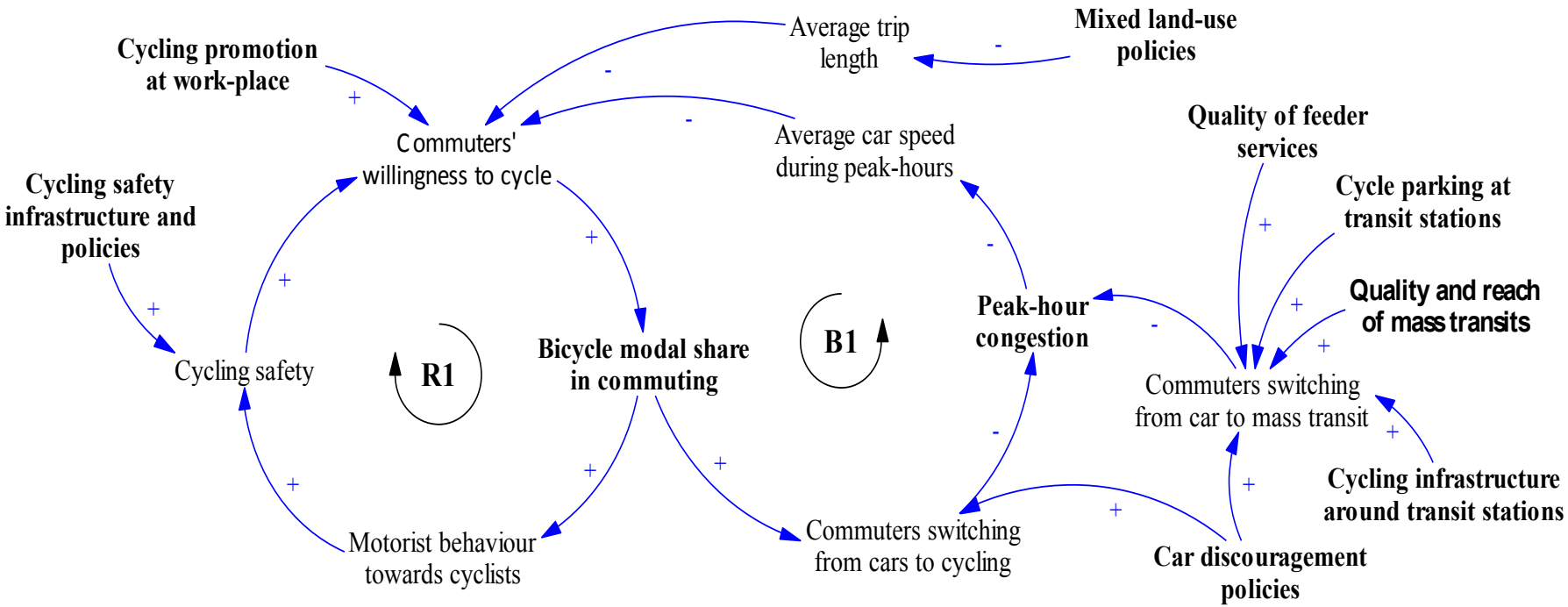
IDENTIFYING THE KEY POLICY LEVERS

Cycling Safety: Key Virtuous Loop



Understanding Policy Linkages

INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013



Just building cycling lanes would not do

POLICY ANALYSIS FRAMEWORK

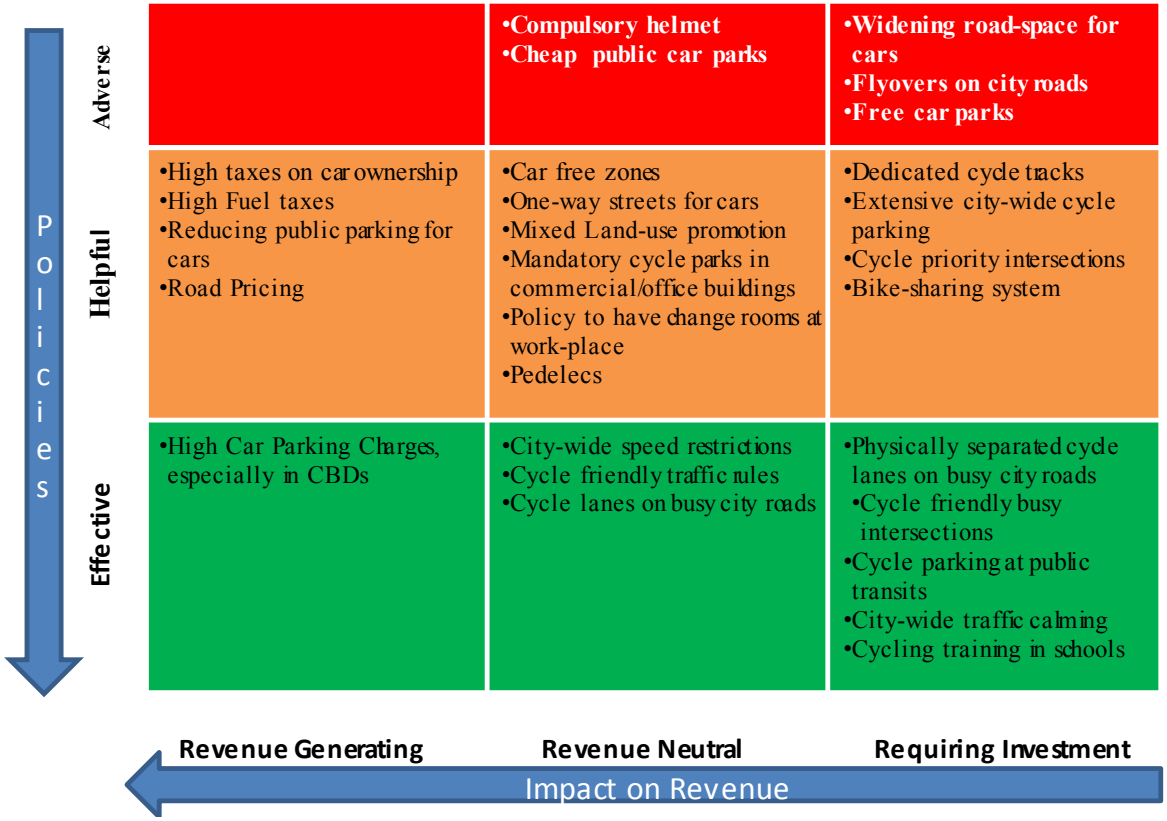
INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

Classify policies under common constraints

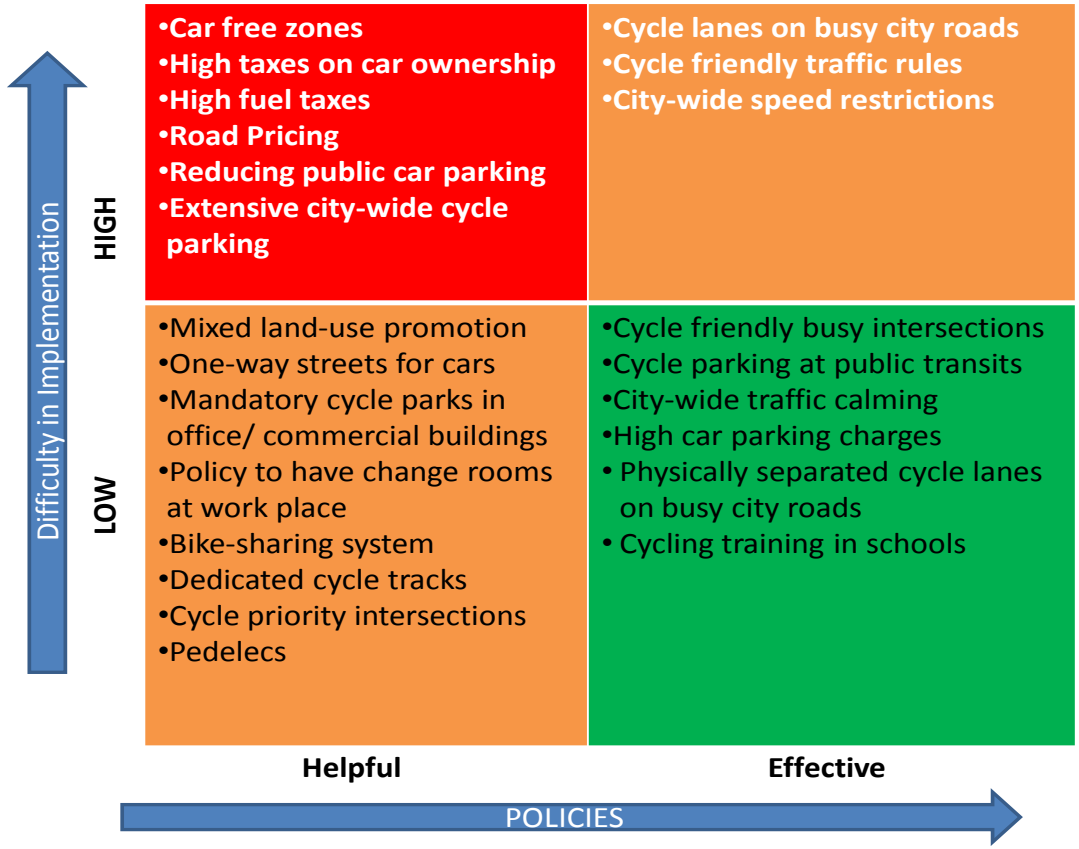
by making

"Effective use of the existing knowledge"

Revenue vs Effectiveness



Implementation Difficulty vs Effectiveness



Policy Making Strategy: Salient Points

- Be clear about the context, constraints and role of cycling
- Do city-specific policy classification under the key constraints
- Start with the effective policies with minimal constraints; build support for resource intensive, unpopular policies
- Avoid the trap of popular, high cost but ineffective policies
- Institutional mechanism to co-ordinate across policy domains

Future Work

- Case studies with real data
- Quantification/fine-tuning of the methodology
- Adoption of systems approach to other policy questions