Decision Factors for Individual Photovoltaic Systems Adoption – An Agent-based View

Tina Balke, Nigel Gilbert

University of Surrey
Centre for Research in Social Simulation
t.balke@surrey.ac.uk

CompSust'12 Conference

Background

EU directive 20-20-20: objective for 2020

- 20% reduction of CO_2 emissions
- 20% energy comes from renewable resources

Background

EU directive 20-20-20: objective for 2020

- 20% reduction of CO_2 emissions
- 20% energy comes from renewable resources

$\rightarrow$ Total renewable energy requirement for 2013: 177 kTOE (Tonnes of Oil Equivalent) of electrical energy from renewable sources (e.g. photovoltaic, biomass, wind generators, hydroelectric plants,...)

Policy Question

What should we do in order to produce a defined amount of energy with the lowest social, economic, environmental impact?

Policy Question

What should we do in order to produce a defined amount of energy with the lowest social, economic, environmental impact?

What are the effects of policy instrument A and/or B on the uptake of domestic photovoltaic (solar panels) in the Emilia Romagna region with respect to:

- CO_2 emission
- Costs of the policy instrument
- . . .

Influencing Behaviour

Two approaches to how humans (agents) make decisions:

1. cognitive model ("changing minds")
2. context model ("changing contexts")

Influencing Behaviour

Two approaches to how humans (agents) make decisions:

1. cognitive model ("changing minds")
2. context model ("changing contexts")

MINDSPACE = mnemonic to gather most robust effects that help "changing contexts" (Dolan et al.: Influencing Behaviour - The Mindspace Way, Journal of Economic Psychology, 33(2012), pp. 264–277)

MINDSPACE

Mindspace cue	Behaviour
Messenger	We are heavily influenced by who communicates information to us
Incentives	Our responses to incentives are shaped by predictable mental shortcuts such as strongly avoiding losses
Social Norms	We are strongly influenced by what others do
Defaults	We "go with the flow" of pre-set options
Salience	Our attention is drawn to what is novel and seems relevant to us
Priming	Our acts are often influenced by subconscious cues
Affect	Our emotional associations can powerfully shape our actions
Commitments	We seek to be consistent with our public promises and reciprocate acts
Ego	We act in ways that make us feel better about ourselves

Implications for individual PV Decision Making

- Location and Housing Situation (mind)
- Financial Situation (mind)
- Environmental Identity (mind/context (Ego,Affect))
- Feeling of Belongingness to a Group (Neighbours) (context (Norms))
- Trust in Own Future (mind/context (Ego,Incentives))
- Trust in Regulating Body (mind/context (Messenger))
- Perceived Bureaucracy (mind/context (Defaults,Ego))
- Awareness (mind)

Agent-based Social Simulation

- Social simulation is the idea that one can build a computer program that models the behaviour of some social phenomenon
- Social simulation strengths:
  - Non-linearity
  - Complexity
  - Emergence
  - Bounded rationality
- Agent-based: actors are represented with the help of software agents that interact in an environment

Future Work

- quantitative empirical analysis to test whether these factors are important
- ABM architecture incorporating both mind and context

Thanks you.
Any questions?

Tina Balke
Centre for Research in Social Simulation
t.balke@surrey.ac.uk