STUDYING MICRO AND MACRO EFFECTS OF REGIONAL ECONOMIC DEVELOPMENTS IN THE ENERGY SECTOR IN THE WESTERN ISLES OF SCOTLAND

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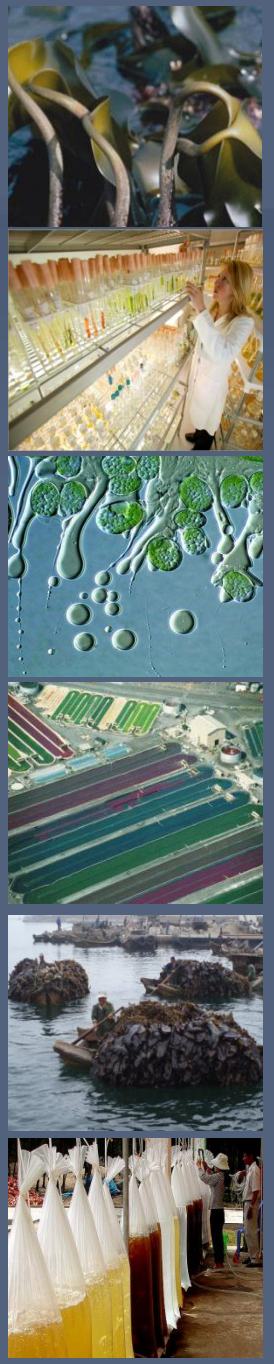

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Aims of the project

- Modelling the local economic impacts of algae production in the Western Isles Region.
- We model and measure the potential economic benefits, for the local community, of using Seaweeds to generate bio fuel via anaerobic digestion.
- Do this using conventional impact modelling approaches
  - Input-Output
  - Computable General Equilibrium (CGE)
- Link multisectoral model to a microsimulation model

- Microsimulation can provide a link between macro models and individual households and firms that make up the region.
- Impacts can be analysed not only by changes to regional GDP, income etc, but on the basis of which households will be impacted in which areas
- This will allow planners to understand the loss of household incomes, welfare benefit payment changes, multiplier impacts on local shops etc, all at the small-area level.

Seaweed production

- Part of EU investment in renewable energy production (Scotland self-sufficient by 2050?)
- Seaweed (algae) ample in Scottish waters
- Biofuel that doesn't displace food production
- 'simple structures to convert to fuel'
- Potential for 'remote areas' (nb also possibility for later modelling the impacts of wind farms)

Results from impact modelling

MACRO ASPECTS

Macro supply chain

The supply chain is simple:

1. Seaweed is harvested and sold to the AD facility,
2. which uses it to produce biogas,
3. which in turn is used to produce electricity.
4. The electricity is then exported to the national grid.

These export earnings (price + subsidy) are obtained by the AD facility, which in turn uses the income to pay seaweed harvesters, which use their income to purchase intermediate inputs and labour – hence the multiplier process is set in train

Type-I and Type-II impacts of algae harvesting on the Western Isles

	Type-I			Type-II		
	Output	GRP	FTE Emp.	Output	GRP	FTE Emp.
Impact (£000's, FTEs)	4,154	1,407	95.86	4,633	1,848	100.13
% of ES total	0.63%	0.39%	1.04%	0.70%	0.52%	1.08%

Input – Output/CGE models

- IO strong in intersectoral linkages
  - Lacks supply side
  - Particularly problematic if factor mobiliy is limited
    - Crowding out
- Supply-side addressed in CGE
- Neither approach strong on spatial issues
  - Possible to disaggregate
  - But well known problems
- Multiplier effects rarely disaggregated locally
- New research agenda, more focus on local effects

Microsimulation model of the population of the Western Isles

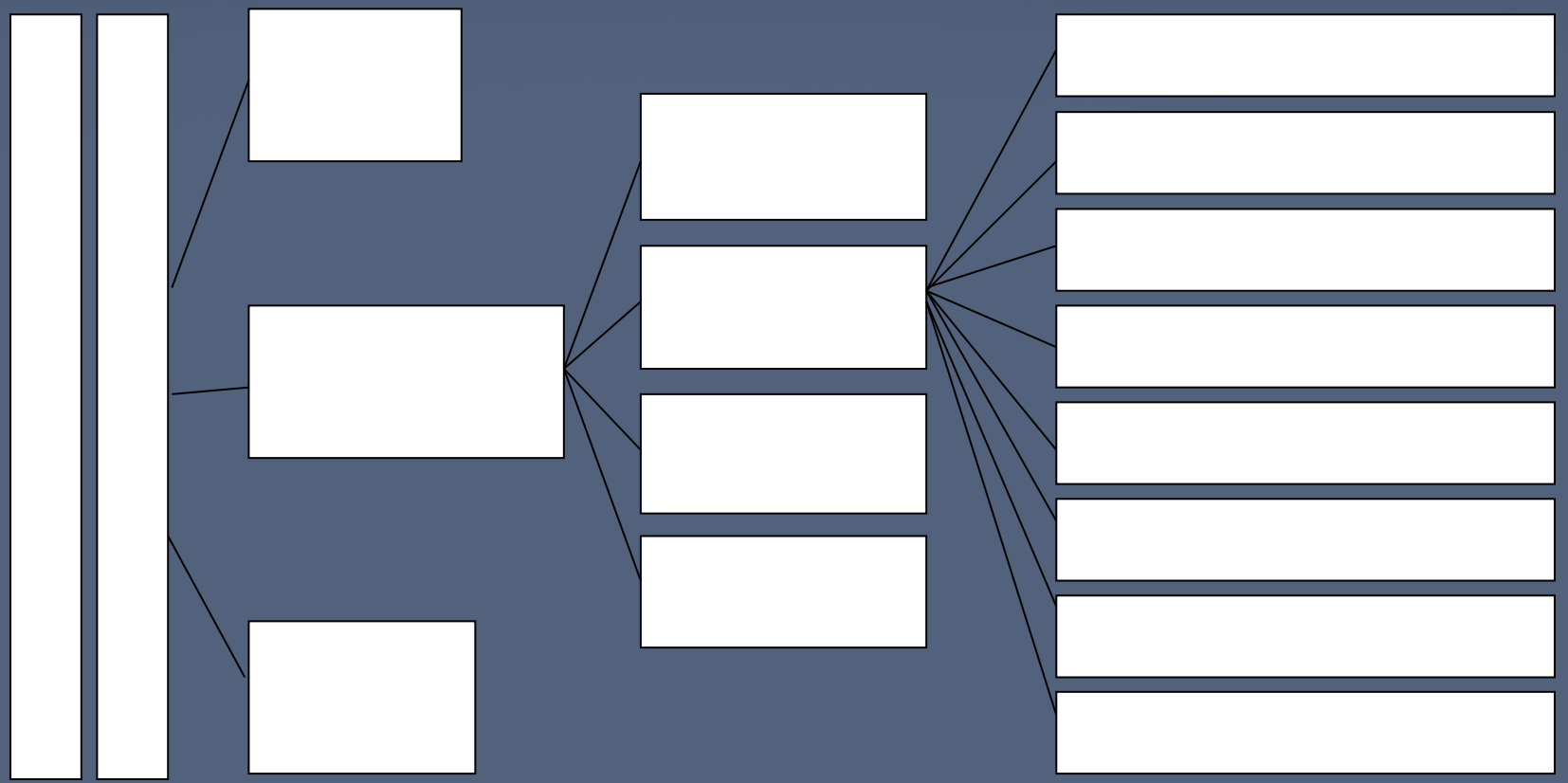
MICRO EFFECTS

Data availabilty

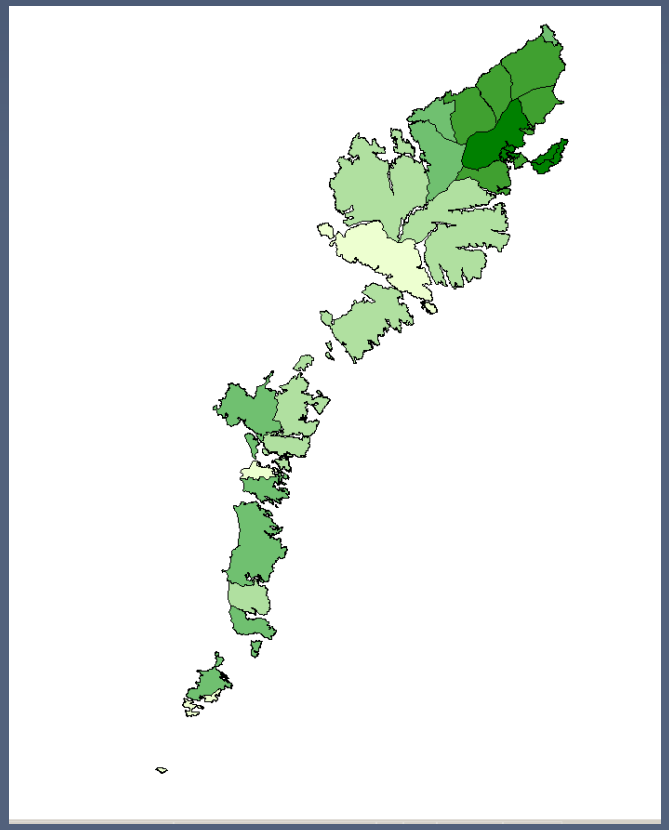
Western Isles consists of 36 regions with in total 20.000 persons between 16-74. Regions have 400-800 persons

- SARS of 966 working age persons
- Census Data (for 2001), on SEC, occupation, sector, age, sex etc.
- Journey to work data including age, sex, occupation, sector, region

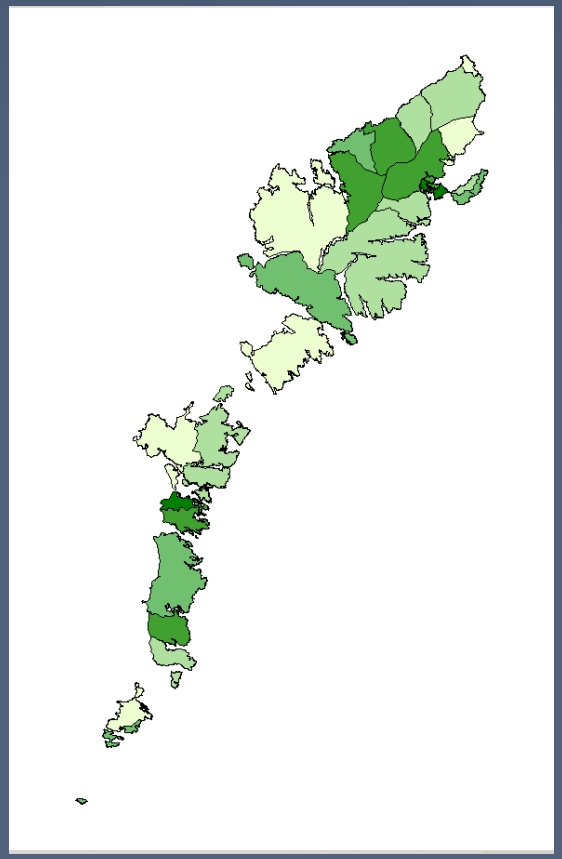
Data structure



Out and In commuting



Out-commuting



In-commuting

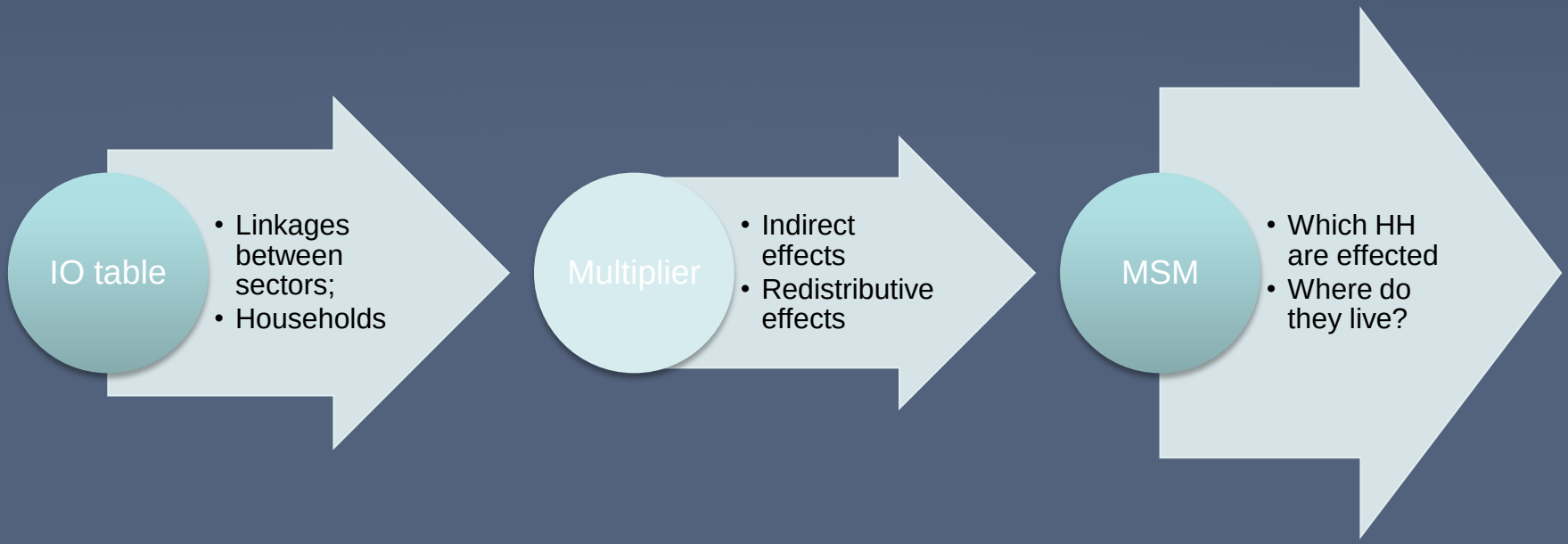
Linking sector and location of work

- We use conditional probabilities with a Monte Carlo approach to link individuals to jobs and locations.

Next steps in the project

LINKING MICRO TO MACRO

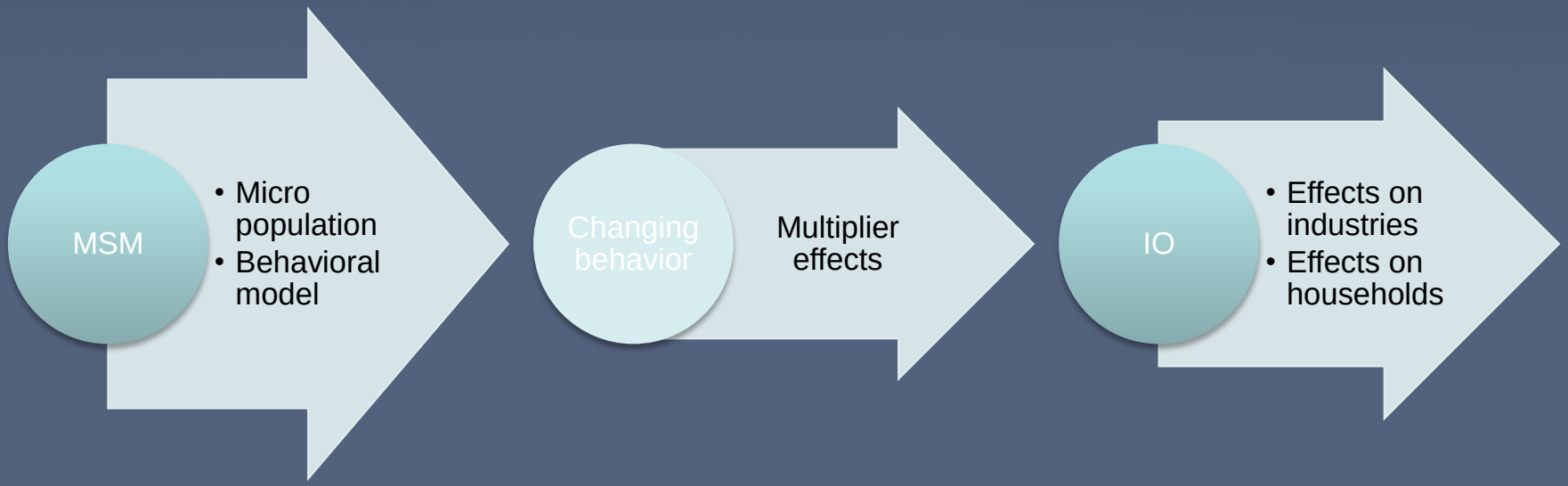
1. Top Down



Used to analyze:

- Micro effects of changing macro behavior;

2. Bottom-up


MSM
• Micro population
• Behavioral model
Changing behavior
Multiplier effects
IO
• Effects on industries
• Effects on households

Stages in top-down linkage

- Database of households and attributes (microsimulation)
- Database of key firms by industry type
- Link households to firms using journey to work (JTW) models
- Use GCE (macro) models to model impact of changes on industrial sectors and hence firms
- Link back to households via JTW model
- Look at LOCAL impacts of (regional) policy

Conclusions

- Micro: study of the behaviour of households and individual economic units.
  - advantages: level of detail, ‘real’ behaviour.
  - disadvantages: difficult to measure redistributive effects
- Macro: study of relations between economic aggregates
  - advantages: capturing a wide variety of developments
  - disadvantages: lack of distributional detail

We need a combination of micro and macro approaches!

THANK YOU!

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