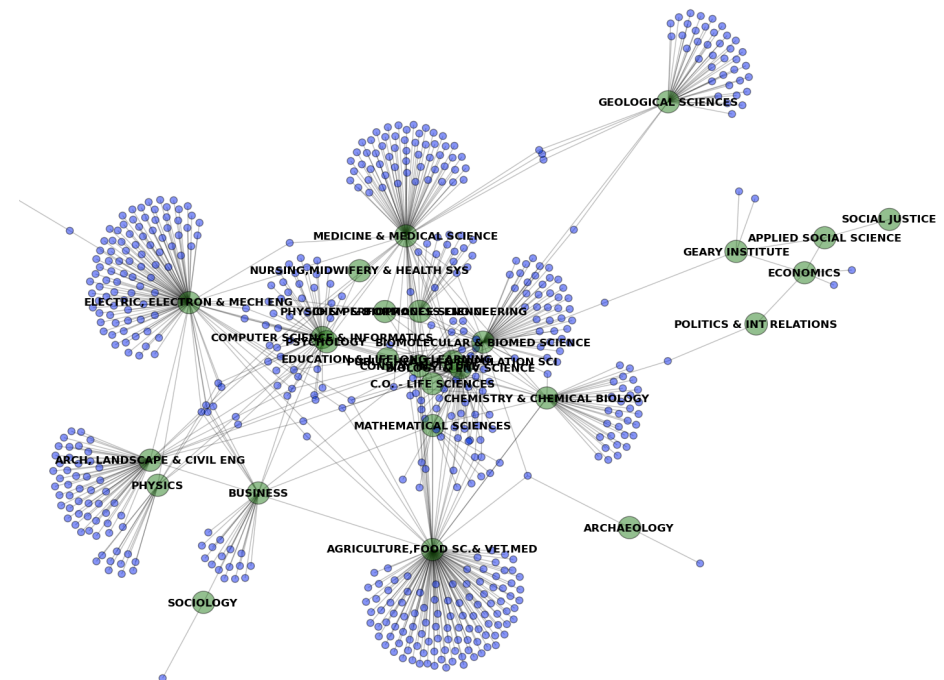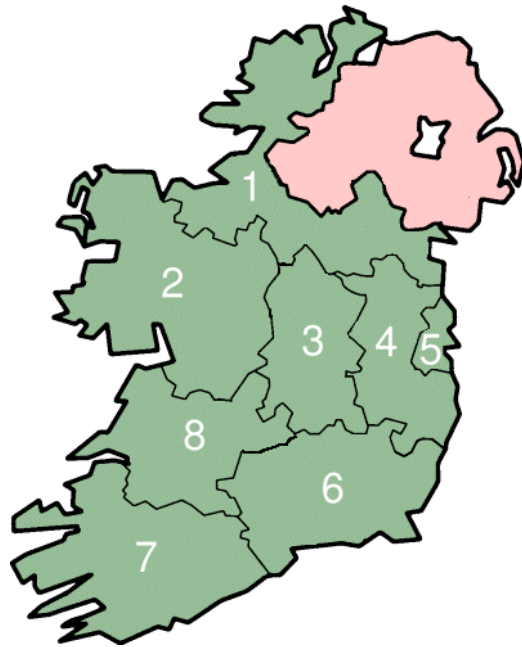# The role of MNEs
for innovation networks

Petra Ahrweiler
Michel Schilperoord
UCD Innovation Research Unit IRU

Simulating the role of MNEs
in Irish innovation networks

- "The question **of host economy impacts from FDI** have been thoroughly scrutinized, not least through different econometric attempts at measuring the extent to which technology is transferred in either direction and spill over into (…) host contexts. The **empirical evidence from this is at best mixed**. (…)
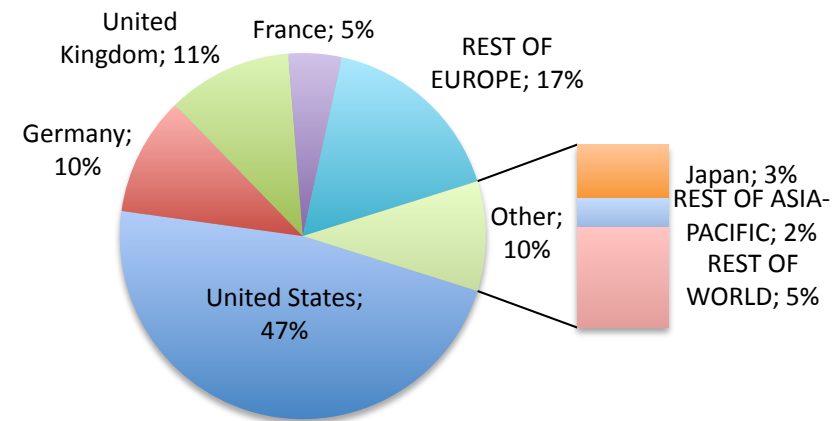
Attempts at **identifying the impact of MNE activity on different territorial systems, using aggregate data, should therefore be supplemented with a more fine-grained analysis of structurally contextualised innovation behaviour**" (Asheim, Ebersberger, Herstad 2010: 4)

- To shed light on the assumed beneficial relationship between MNE subsidaries and their host countries´ indigenous industry,

  we want to investigate how important the knowledge hub and financial magnet function of MNEs is for regional innovation networks.

  How important are MNEs, i.e. their subsidiaries in host countries, for the local environment of the indigenous industry?

Ireland´s dual economy and R&D-oriented MNE policies

- (Policy) problem:
- indigenous SMEs do not experience much benefit from the Irish-located MNEs (low-tech, operate in local markets, do not engage in R&D)
- innovative MNEs show a low R&D integration into Irish networks, clusters, and innovation centres
- To prevent MNEs from leaving Ireland for competing manufacturing locations (see DELL!), and to help indigenous industry to benefit from MNEs, Irish policymakers try to convince MNEs to locate their R&D in Ireland and to cooperate with Irish organisations, for example with Irish universities

United Kingdom; 11%
France; 5%
REST OF EUROPE; 17%
Germany; 10%
Japan; 3%
REST OF ASIA-PACIFIC; 2%
Other; 10%
REST OF WORLD; 5%
United States; 47%

Home countries of MNEs in Ireland

# Empirical research on MNE R&D in Ireland

UCD Innovation Research Unit (IRU)

- Identifying and mapping by empirical research (emerging) knowledge and technology sectors using patent, publication and other quantitative data (e.g. NanoBioTech in Ireland)

- Analysing the corresponding industry structures emerging around these technological innovation networks using social network analysis (SNA) supported by quantitative and qualitative data

- Simulating the processes and mechanisms in these innovation networks using theoretically-grounded agent-based modelling (ABM) calibrated and validated by quantitative and qualitative data

Using social network analysis

Preliminary results due
to partial data (grants-DB & ISI)
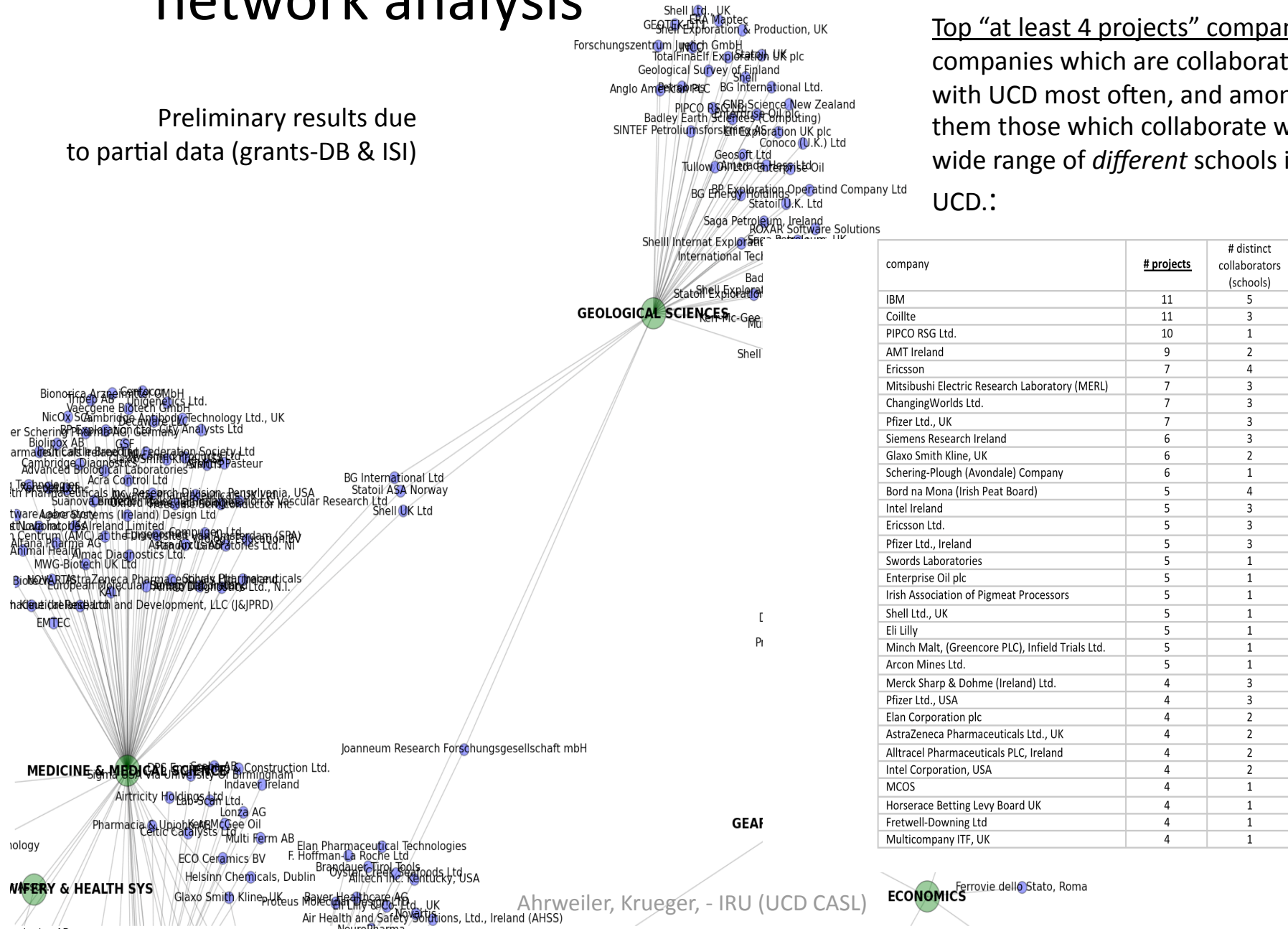
Top "at least 4 projects" company companies which are collaborating with UCD most often, and among them those which collaborate with a wide range of *different* schools in UCD.:

company	# projects	# distinct collaborators (schools)
IBM	11	5
Coillte	11	3
PIPCO RSG Ltd.	10	1
AMT Ireland	9	2
Ericsson	7	4
Mitsubishi Electric Research Laboratory (MERL)	7	3
ChangingWorlds Ltd.	7	3
Pfizer Ltd., UK	7	3
Siemens Research Ireland	6	3
Glaxo Smith Kline, UK	6	2
Schering-Plough (Avondale) Company	6	1
Bord na Mona (Irish Peat Board)	5	4
Intel Ireland	5	3
Ericsson Ltd.	5	3
Pfizer Ltd., Ireland	5	3
Swords Laboratories	5	1
Enterprise Oil plc	5	1
Irish Association of Pigmeat Processors	5	1
Shell Ltd., UK	5	1
Eli Lilly	5	1
Minch Malt, (Greencore PLC), Infield Trials Ltd.	5	1
Arcon Mines Ltd.	5	1
Merck Sharp & Dohme (Ireland) Ltd.	4	3
Pfizer Ltd., USA	4	3
Elan Corporation plc	4	2
AstraZeneca Pharmaceuticals Ltd., UK	4	2
Alltracel Pharmaceuticals PLC, Ireland	4	2
Intel Corporation, USA	4	2
MCOS	4	1
Horserace Betting Levy Board UK	4	1
Fretwell-Downing Ltd	4	1
Multicompany ITF, UK	4	1

Ahrweiler, Krueger, - IRU (UCD CASL)

Policy-relevant questions for research

The Irish case sets the scene for a study concerning the benefits of having MNEs in the local economy.

How important is the knowledge integration function of MNEs as "knowledge hubs" and financial magnets for regional innovation networks?

Does a firm population containing MNEs perform better in terms of knowledge diffusion and innovation performance than a uniform-size population of small and medium firms would do?

What exactly are the effects of MNE presence and activities?
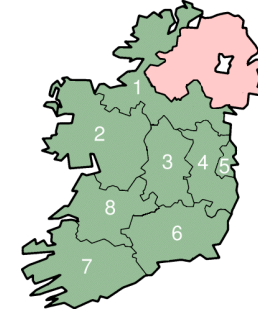
Our MNE-related research questions largely refer to **knowledge flows**, which are **hard to observe empirically**.

Furthermore, innovation networks around MNEs consist of many **heterogeneous actors** following diverse rule sets located in a large parameter space of environmental conditions..

Agent-based Models

Agent-based Modelling is a computational methodology that allows the analyst to create, analyse, and experiment with artificial worlds populated by agents (computer programs) that interact in non-trivial ways.

- Agents are units that have behaviour
- They act within a (simulated) environment
- Agents can
  - react to other agents,
  - pursue goals,
  - communicate with other agents,
  - move around within the environment
- Macro-level features can emerge from the interaction of agents
- Scenario modelling
- Second Life of innovation networks
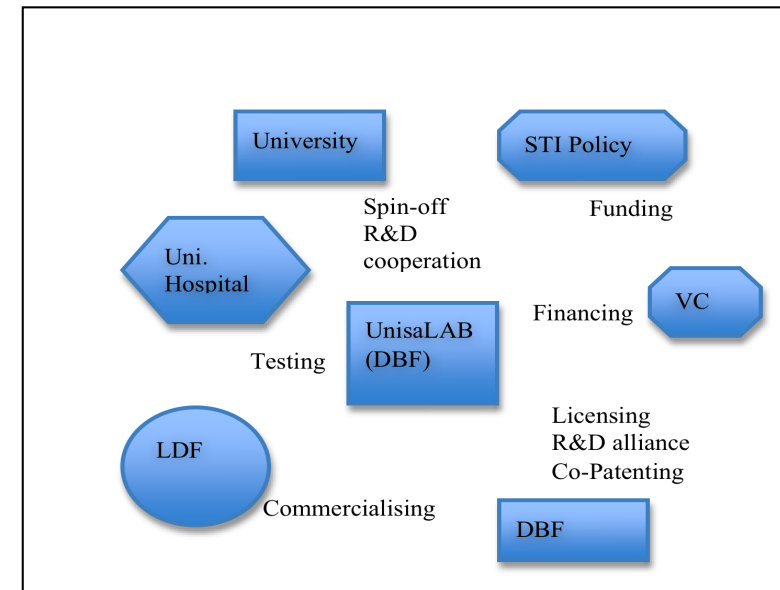
Agent-based modelling of innovation networks

EU project SEIN (1998-2001):
Simulating **se**lf-organizing **i**nnovation **n**etworks

- Biotech (F)
- Telecommunication (UK)
- KIBS in Webdesign (UK)
- Combined heat and power technologies (NL, D, UK)

EU project NEMO (2006-2009)
Network models, governance, and R&D collaboration networks

- R&D projects in European Framework Programmes 1-7
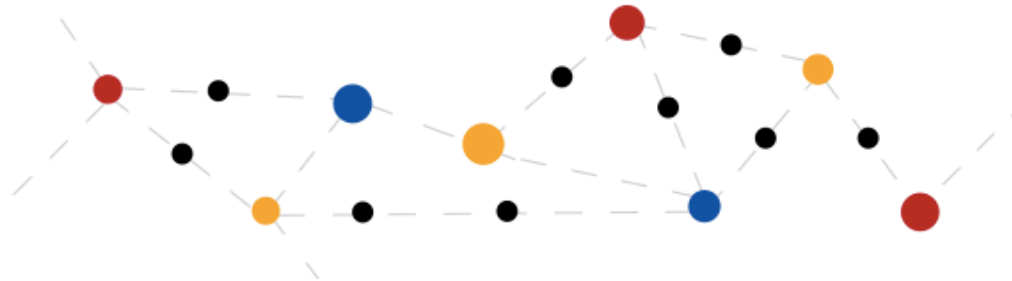
BioTech Pharma project with a big UK firm

NEMO

NETWORK MODELS, GOVERNANCE AND
R&D COLLABORATION NETWORKS
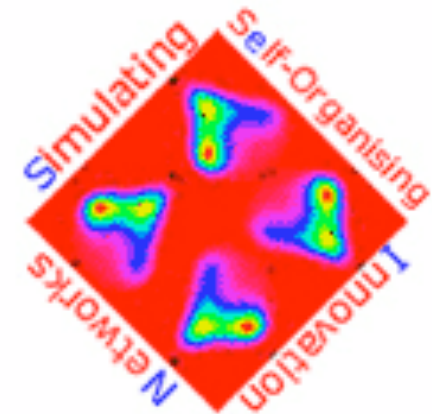
http://cress.soc.surrey.ac.uk/SKIN/

SKIN - Simulating Knowledge Dynamics in Innovation Networks

SKIN is an agent-based model to simulate the behaviour of innovation networks in complex social systems.

Learning about innovation processes and networks

Using conceptual models based on robust empirical studies, SKIN is the ideal platform for learning about different processes for creating, transferring and distributing knowledge, collaborating for innovation, models of innovation networks and governance of these processes, collaborations and networks. Read more...

Applying ABM to real-world policy contexts

Developed in European studies with case studies in different technological and institutional contexts, SKIN is one of the leading platforms for applying agent-based modelling (ABM) to innovation networks found in a variety of different, real world contexts. Read more...

Combining innovation research methods

Add SKIN to the innovation policy-making toolbox. The mix of traditional analytical methods and the powerful SKIN approach, combining robust empirical studies, computational network analysis and ABM, allows for cross-fertilization

Scenario comparisons

Scenario 1: Model without MNEs
Scenario 2: MNEs just follow go-it-alone strategies
Scenario 3: MNEs have R&D cooperations with the surrounding innovation network

Evaluating the parameters:

On the knowledge level:

***increase of knowledge*:**
   We compare the two populations in terms of knowledge amount (*knowl*)

increase of knowledge diversity:
   This is the knowledge variance of all firms (*sig_knowl*)

knowledge flows (*knowledge diffusion*):
   We use an adjacency matrix that contains the knowledge flow for each cooperation (*flow_knowl*)

On the capital level:

***increase of innovation performance*:**
   We compare the two populations in terms of success (*number of innovations*)

***increase of capital*:**
   We compare the two populations in terms of capital amount (*cap*)

sustainability of industry:
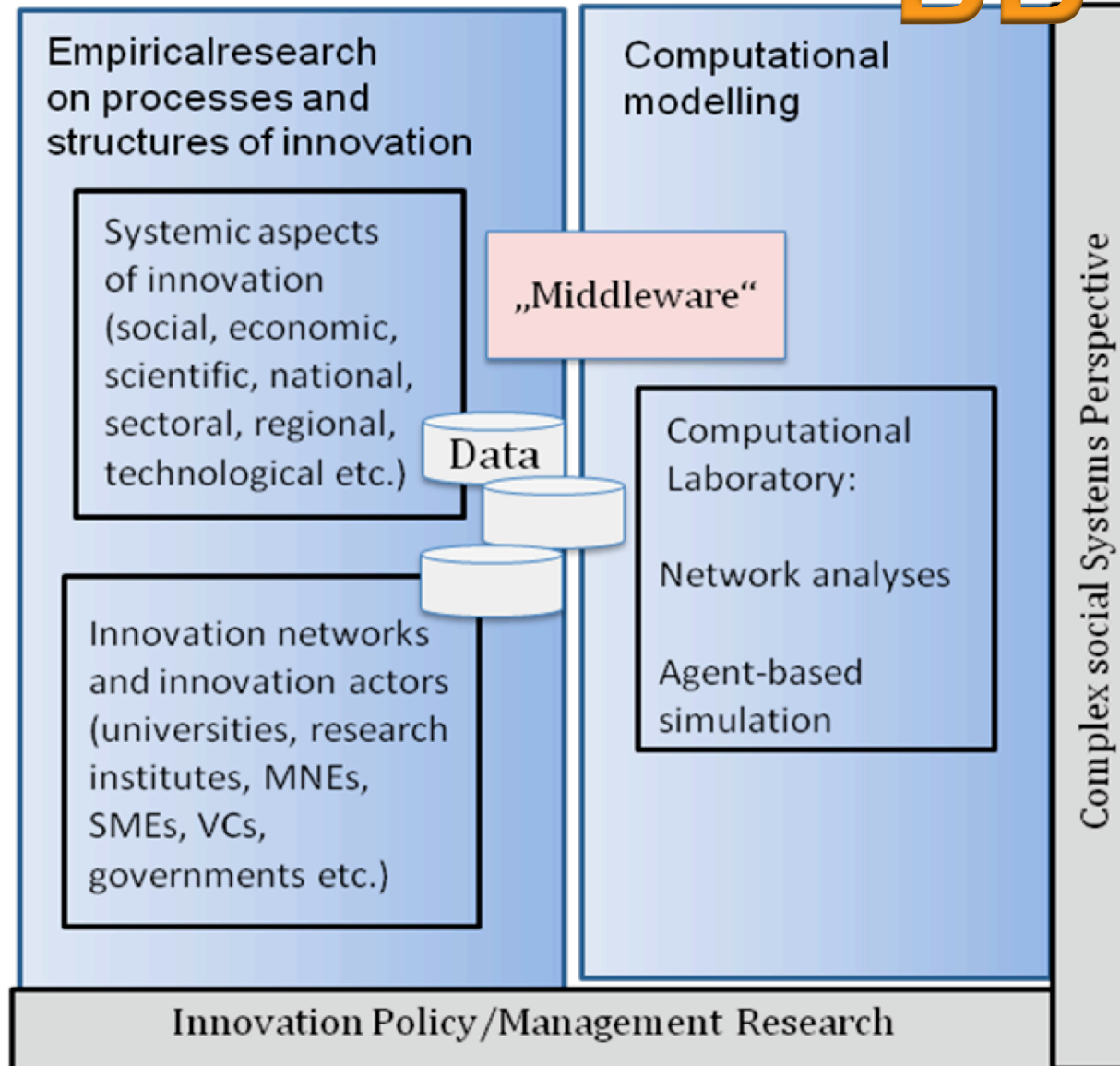   We compare the two possible model variants in terms of the lifetime of the firms (*average-age-at-death*)

IRU concept

Details in:

Ahrweiler, P., Schilperoord, M., et al., Simulating the role of MNEs for knowledge and capital dynamics in Irish innovation networks, in: M. Heidenreich (ed.): Innovation and Institutional Embeddedness of Multinational Companies, London: Routledge (forthcoming)

Details on simulating university-industry links in:

Ahrweiler, P., A. Pyka and N. Gilbert (2011): A new model for university-industry links in knowledge-based economies.
In: Journal for Product Innovation Management JPIM (Special Issue on ABM).

Details about the IRU approach and results in:

Ahrweiler, P. (ed.) 2010, Innovation in complex social Systems, London: Routledge

Please visit our website
http://casl.ucd.ie/iru
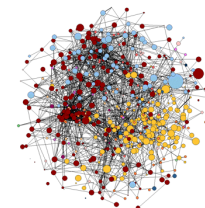
Focus: the role of MNEs in innovation networks

- *Simulating the Role of MNEs in Irish Innovation Networks* **Petra Ahrweiler and Michel Schilperoord, IRU/UCD**

- *MNCs Between the Local and the Global: Knowledge Bases, Proximity and Distributed Knowledge Networks* **Bjorn Asheim, Lund University and Bernd Ebersberger, Management Center, Innsbruck**

- *The Role of MNCs in Knowledge Accumulation, Absorption and Utilisation in Indigenous Irish Firms: A Case Study of The Galway Medical Technology Cluster* **Satyasiba Das, Paul Ryan and Oner Tulum, NUI Galway**

- *Local Entrepreneurs in Global Clusters: The Significance of Spatial and Relational Propinquity in New Firm Formation* **Majella Giblin, NUI Galway**

- *Academic Reflections and Future Challenges in Building Collaborative Networks in the Pharma Industry* **Peter Robbins, The Innovation Foundation and Julian Birkinshaw, London Business School**