Regional innovation systems as catalysts of knowledge seeking multinational enterprises

NIGEL DRIFFIELD, JIM LOVE AND STEFANO MENGHINELLO
Why our study on the location of MNE knowledge-intensive MNE activities is relevant for this WPTI workshop?

- **Conceptual proximity**: The determinants of territorial attractiveness for foreign direct investment roughly mirror the drivers of territorial competitiveness (Camagni, 2002). In particular, we address links between regional innovation systems and MNE location decisions.

- **New modelling framework**: The adoption of more complex empirical design, in effect multilevel modelling, is suitable to shape the multiple drivers as well as cross-level interactions that characterize a regional innovation system.

- **New data**: The scope of official territorial statistics for the analysis of regional innovation systems can be expanded if these data are complemented by commercial databases. In particular, we focus on the extent to which a commercial firm level database can be used to examine spatial patterns and location determinants of firms.
Large literature on firm location


- This literature crucially generated models that allowed activities to be distributed spatially – so R&D did not have to follow manufacturing.

- → agglomeration and location, Krugman and Venables.
- → technology spillovers and co-location.
- → FDI and comparative / competitive advantage.
Firm level analysis of location of high tech activities

- Many firms carry out R&D outside their home country
- Large literature on “listening posts”
- Generally linked to strength of sector at home
- R&D is internationalised and feeds into the global production network of the firm
# Factors influencing location decision

<table>
<thead>
<tr>
<th>Level</th>
<th>Factors</th>
<th>Knowledge-related factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>Labour costs, material infrastructure endowment, country risk, market</td>
<td>National education system, innovation policies</td>
</tr>
<tr>
<td></td>
<td>structures and domestic demand</td>
<td></td>
</tr>
<tr>
<td>Regional</td>
<td>Regional taxes and incentives, Regional differences in wages and other</td>
<td>Key component of a regional innovation systems</td>
</tr>
<tr>
<td></td>
<td>costs, regional material endowments</td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>Characteristics of the local labour markets and competitiveness of local</td>
<td>Presence of high tech business clusters and/or universities or</td>
</tr>
<tr>
<td></td>
<td>suppliers, metropolitan area facilities.</td>
<td>research labs</td>
</tr>
</tbody>
</table>
Is the regional dimension properly considered? Knowledge creation and Regional Innovation Systems

- **Coherence** - an innovation system will exist when the array of organisations and their relationships in a region or nation form a *coherent whole*, which has properties different from the properties of the constituents.

- **Unified function** - an innovation system has a *function*, i.e. it has identifiable objectives or aims to which all elements of the system contribute.

- **Bounded** - it must be possible to discriminate between the system and the rest of the world i.e. it must be possible to identify the *boundaries* of the system.

  *(Edquist 2004)*
A regional innovation system as a complex and multilevel system of knowledge creation

Key processes of knowledge generation, diffusion and exploitation which are shaped by the capabilities of organisations and the strength of their relationships. Supporting these activities are other aspects of the commercial, technological and regulatory environment within which firms operate.

Source: OECD 1999
Recent developments in RIS literature

1. Internationalization of innovation systems (Carlsson 2004)

- There is evidence of increasing internationalization of NIS.
- The internationalization of NIS appears to be speeding up.
- Note, this is not just about internationalization of corporate R&D, but about the actual elements of the IS themselves.
- Despite this process of internationalization, national IS remain important, largely because the institutions that support them are generally country-specific.
- There is little work on the internationalization of RIS as opposed to NIS.
2. Openness in RIS (ORIS)

“.. Characterised by the firms’ adoption of an open innovation strategy, which overcomes not only the boundaries of the firm but also the boundaries of the region.” (Belussi et al 2010)

Perkmann (2006) Predominance of extra-regional production linkages is not detrimental to the regional economy of the South Tyrol in Italy, and may actually help compensate for a weak RIS in this relatively peripheral region.
3. The link between regional innovation systems and knowledge flows within MNEs

- Nature of MNE internal knowledge flows and their capacity to generate productivity ‘spillovers’ to local economies is linked to the characteristics of affiliates they set up (Driffield et al 2010).

- MNEs follow a hierarchical pattern in their choice of the location of their innovative activities that varies with the nationality of the corporation. This hierarchical pattern depends more and more on the peculiarities of the regional centres and of their localised capabilities. (Cantwell and Iammarino 2003)
The data issue on MNE location modelling

A number of OECD research papers look at similar issues, but they only partially exploit the territorial information available from official as well as commercial databases:

- Sachwald (2007)
- Mataloni (2007)
- Hatem and Py (2008)
- Py and Hatem (2008)
- Belderbos and Sleuwaegen (2007)
The “competitive advantage” of our approach

- Multilevel modelling of location determinants of high tech firms. All available explanatory variables at all levels are exploited: Firm level / industry level, Regional / local level, National level

- International comparability based on OECD territorial database

- Use of alternative data sources, in effect commercial databases, to exploit “new information”. “New information” concerns both new variables and additional territorial and industry breakdowns

- Alternative data sources are integrated in a unique dataset, which allows to check data coherence and consistency
More information on “additional variables” from international commercial databases

- Our data on the location of foreign affiliates is taken from ORBIS, provided by Bureau van Dijk, which is an electronic publishing and consultancy firm.

- This database is currently used by OECD, Eurostat as a complementary source of information with respect to official statistics to expand business data etc.…

- The ORBIS data are then linked to various local, regional and national level data included in the OECD official statistical portal, to capture agglomeration of activities, and regional characteristics, designed to capture then many issues expected to impact of firm location.
Disadvantages

Nevertheless, it presents some potential drawbacks in terms of data quality and consistency. These limits, which include problems of coverage, potential structural breakdown or selection effects, and misleading information on plants location based on the company legal location, have to be carefully assessed in order to consistently exploit MNE location analysis.

The spatial distribution of firms within a country drawn from the commercial database can be consistent with the real distribution of firms, under the relatively mild conditions that the sources of bias of the dataset are significant only at the national level.
Classification of industries

Manufacturing
- Pharmaceuticals
- Aircraft & spacecraft
- Medical, precision & optimal instruments
- Radio, television & communication equipment
- Office, accounting & computing machinery

Services
- Post and telecommunications
- Computer and related activities
- Research and Development
Figure 5.1 – Spatial agglomeration of high tech foreign affiliates in the USA
Figure 5.1 – Spatial agglomeration of high tech foreign affiliates in the USA conditional on high tech firms
Figure 5.1 – Spatial agglomeration of high tech foreign affiliates in the USA conditional on universities
Modelling location choice

- Common approach is conditional logit or nested logit.

- Head et al – omitted variable bias causes violation of the IIA

- Guimarães et al. (2004) state that with very disaggregated spatial data, the potential for violating IIA increases, with contiguous regions being close substitutes.

→ Generalised Linear Latent And Mixed Models (GLLAMM), provide an appropriate data modelling framework for location data available at different levels of territorial breakdown.
Results – local factors

Local measures of agglomeration and urbanisation highly correlated with location of high tec

- Dense population not associated with high tech (nonlinearity)
- No additional “top 200” university effect
Results – regional factors

- Regional agglomeration important
- Regional unemployment –ve effect
- High tech firms not attracted by low skilled labour
Results – national factors

- High levels of business R&D attract more firms
- High levels of public R&D attract firms
- Public sector R&D synonymous with well trained scientists and engineers
- % of workforce with only high school education – very associated with high tech location
Conclusions

- Can Orbis be used to model high tech location or to analyse regional innovation systems? Yes, under mild conditions and after consistency check with official territorial data sources.

- Multi-level analysis is suitable to explore the complex nature of regional innovation systems since it allows to consider all relevant factors across different levels of territorial breakdowns as well as to explore inter level interactions: local factors interaction with regional factors.

- Importance of local agglomeration → endogenous high-tech clusters attract more high tech firms.
Extensions

- Stocks and flows – longer time period needed for flows.
- We could do this for *AMADEUS* (Europe) but not *ORBIS* (worldwide)
- Model inter-regional effects more explicitly
- Direct comparison with other approaches (eg CLM)
- Inter- industry effects
- → links to analysis of cluster formation – endogenous or exogenous