A diversified Global Innovation Network – the geography of innovation in the case of Novozymes

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- European MNE in Biotechnology

- A Global lead firm in enzymes

- One of the most globalized industries in terms of innovation

Motivation

- Understand the **economic geography of MNE's** internationalization of innovation.
- MNE's development of a global innovation network **beyond the Triad.**
- Significance of **Emerging Market** locations in R&D strategies
- Typologies of global reorganisation of R&D
  - taking the point of departure from some of the existing typologies

Methodology

Case Study Approach

- In-depth case study of Novozymes, specifically on innovation networks established in India and China.
- 8 in-depth semi-structured interviews in total:
  - HQ (Denmark),
  - Research facilities in China (Beijing) and
  - Research facilities in India (Bangalore).

- Validation of the the data from interviews
  - HQ and Subsidiary Perspectives,
  - Press Releases, Corporate Website

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R&D

- R&D facilities in 8 countries
  – HQ, Europe, US, China, Japan, India, Brazil.
- Each of its R&D center Location is a strategic decision based on 2 main considerations:
  1) whether the location can offer a strong research environment
  2) whether it can offer significant sales potential.

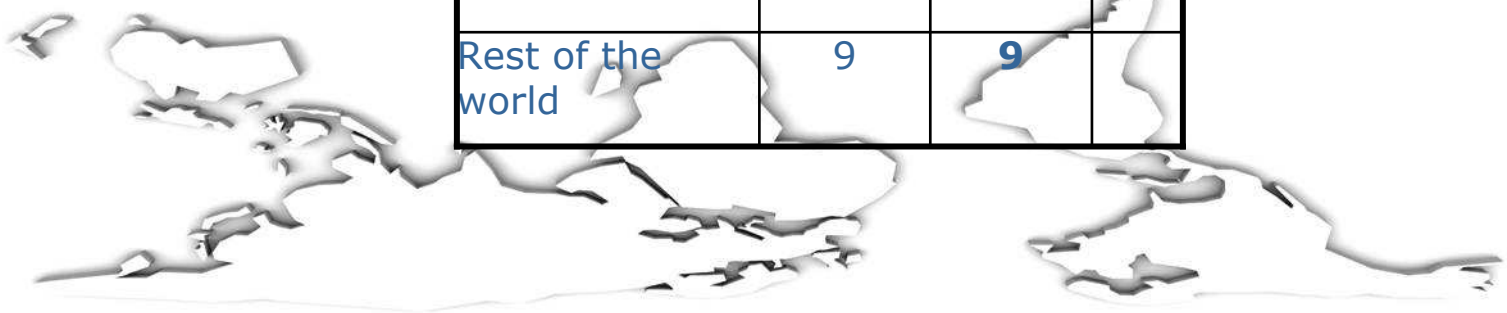
- Undertakes 2 types of R&D:
  - **basic technology development** developed in locations hosting the relevant capabilities and which supplies many different products.
  - **application technologies** how to apply basic technology development Inventions to industries such as food, textile etc.

R&D

- Relative decrease in importance of **Traditional** locations, growth in **Emerging Markets**.

R&D spending

	1995	2004	
Home	36	34	↓
Western Europe	30	28	↓
US	19	**16**	↓
China	2	9	↑
India	4	**5**	↑
Rest of the world	9	**9**	



R&D

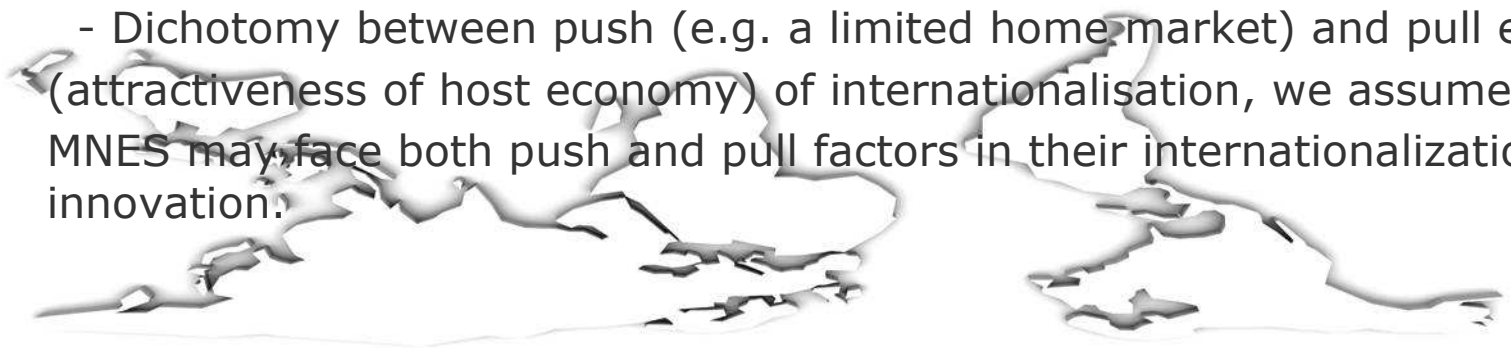
- Over 6,000 patent in 1018 patent families
- 9 new products introduced in 2009
- A significant share of the innovations is new-to-the-world innovations.
- Most important technologies:

  - Gene technology, microbial techniques, fermentation technology.
- Enzymes account for 92% of its sales and a considerate portion of R&D expenditure, particularly within enzymes for second generation bio-fuel.

Typologies of Global reorganisation of R&D

1. Current approaches to internationalisation of innovation stems from strategic management of innovation. Here the terminology of: ***home-exploiting*** and ***home-augmenting*** innovation strategies relates to the competitive ***push*** and ***pull*** factors companies experience, respectively (*Kuemmerle 1999*).
   - Home-exploiting strategies dominate when MNEs face limited home market for their increasing expenses on R&D,
   - Home-augmenting strategies relate to MNEs' need to tap into new knowledge which is not readily available in their home settings.

- Challenge this underlying proposition
  - MNEs tend to engage with both strategies.
  - Dichotomy between push (e.g. a limited home market) and pull effects (attractiveness of host economy) of internationalisation, we assume that MNES may face both push and pull factors in their internationalization of innovation.



Taxonomy for Internationalization of Innovation (Archibugi & Michie 1995)

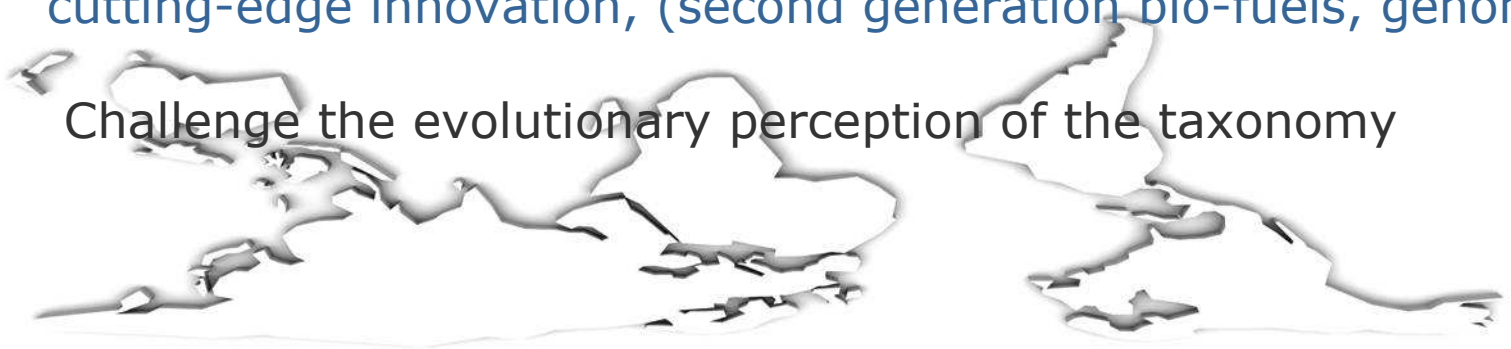
- 3 categories -not necessarily mutually exclusive but are understood to emerge in successive stages (*Archibugi & Iammarino, 1999*).

  - ***International Exploitation -*** implies marketing of nationally generated innovations beyond MNE's home market, (off-shoring of production, etc).

  - ***Global generation of innovation -*** entails MNEs re-organizing activities beyond their home economy and (re-)locating R&D activities both within the home country *and* in host countries, (intra-firm off-shoring of R&D to adjust products to local conditions, tastes, host country regulation, etc.)

  - ***Global techno-scientific collaboration -*** joint scientific projects, innovation networks across countries and continents, involves MNEs, research institutes, universities collaborating for cutting-edge innovation, (second generation bio-fuels, genomics).

- Challenge the evolutionary perception of the taxonomy



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Taxonomy for Internationalization of Innovation (Archibugi & Michie 1995)

- Challenge the evolutionary perception of the taxonomy
- we assume that companies engage in all 3 types of internationalization of innovation simultaneously, depending on:

1. location specificities

   - location attractiveness such as institutional framework, risk, human resources and market size,

2. history of engagement in a given location

   - a long term relationship with actors in the host economy such as a well established production network.

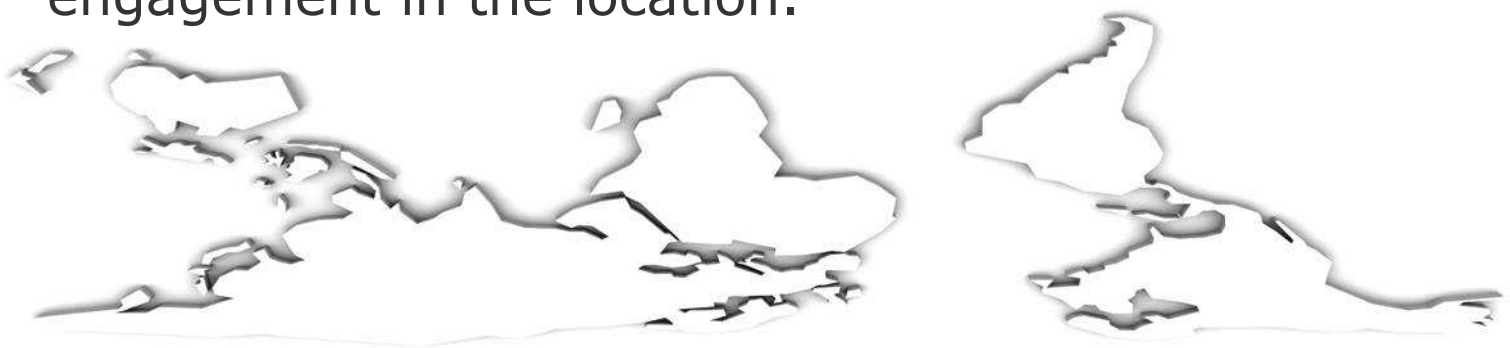
Two main assumptions

- We take both these terminologies into consideration, however with the aim of challenging two of their underlying prepositions.

  This leaves two main assumptions:

  1. Firstly, that MNCs' R&D internationalisation strategies are based at factors both at home and in the host economies.

  2. Secondly, that one MNC might engage in different types of internationalisation according to the capabilities in the host economy and the history of the company's engagement in the location.



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	India	China
Establishment of local R&D	- Acquisition of external complementary strengths in key markets. - Pull = local capabilities	- Add-on to existing production facilities in key markets. - Green-field investments
R&D Strategy, drivers	- Home augmenting / Opportunistic - Internalise external competence for future competitiveness - Leverage skills for exploration strategies Develop specialised capabilities	- Exploitation Strategies - Increase local capabilities to serve local market efficiently - Second largest market - Later: joint research with key stakeholders on emerging technology areas, biofuel.

	India	China
Embeddedness in Local Networks and national innovation system	- Strengthening local networks to find new Technology Applications, -Collaboration with global & local companies and MNEs -Both within sector and in adjacent sectors, -Collaboration with research institutes is on primary research.	- Outpost to scan technology development in the country. - Collaboration with local research institutes, - Developing institutional framework around the products, - Take advantage of government initiatives on emerging technology.
Integration of location into global research strategy	- Immediate integration into the global innovation network. - an existing laboratory with competencies at global level.	- Though the engagement in China was early, the R&D activities have been integrated into the global R&D operations only recently.

- We show that MNEs engage in different types of internationalization of innovation according to 2 main dimensions:

  - the attractiveness of the location,

  which can be perceived as either as a large potential market or as a pool of competencies.

  - the evolution of the company's presence in the location,

  whether the MNC has been engaged in production or marketing in the specific location.

Thanks for your attention/questions

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