

# **The Internationalization of R&D in India: Opportunities and Challenges**

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# Context of the Paper

- Part of the Private Sector Advisory Group constituted by the Ministry of Commerce, Government of India and the Office of the Trade Representative, US.
- Analyzing India's potential to be a global R&D hub
- Paper is largely a context paper because R&D investment in India by MNCs is nascent and is as yet proportionally very small, compared to other parts of the world

# Design of the Paper

- Global Trends in the spatial dispersion of R&D
- Conceptual Framework
- Benchmarking India's Innovation System
- Concluding remarks

# Global Trends

- Increasing Share of Global R&D is being carried out by **MNCs**, both in their home countries and internationally
- 700 largest R&D spending firms accounted for 50% of the world's R&D expenditure and about 70% of business R&D (UNCTAD: WIR 2005)
- 80 per cent of this group originated in five countries: US, Japan, Germany, UK and France.
- 296 firms (42%) were US based, 154 (22%) Japan based. EU countries here accounted for 21%.

# Global Trends (contd.)

- Classical model of spatial dispersion of MNC activity has been disturbed: while finance related activities are still largely retained in the home country, R&D is increasingly being moved out, particularly to developing countries.
- UNCTAD survey: EU firms are the most internationalized—spend 40 per cent of their budget overseas, while US and Japanese firms spend close to 24 and 15 per cent overseas respectively.

# Global trends..more

- Five sectors with the highest levels of internationalization: **Chemicals** (~50%), **pharmaceuticals** (~40%), **electronics** (30%), **IT hardware** (30%), **automotive** (30%).
- Most MNC related activity in R&D performed internationally is *adaptive*.
- Global R&D activity is predominantly located in East and Southeast Asia, India, select countries of Eastern Europe. Rest of the developing world has been largely bypassed.

# India as a global R&D hub

- EIU survey (2004) ranked India as an emerging R&D “hotspot”.
- Number of MNCs performing R&D in India has gone up from 100 in 2003 to 300 in 2007. (DST)
- Most R&D in India was in **IT and ITES**, but increasingly chemicals, life sciences and engineering specialties are seeing R&D related activity
- 53% of R&D activity in India was by US based companies.
- However, India does not figure prominently as an attractive destination for R&D in India: 76 per cent is carried out in 3 destinations: EU (59%), Canada (11%) and Japan (6%).
- Of the developing countries, China accounts for 3% followed by Singapore (2.8%), Brazil (1.4%), Mexico (1.3%), South Korea (0.8%)
- India accounts for *merely 0.4%* of US MNC driven R&D expenditure

# The Argument for Internationalization

- Discourse on internationalization of R&D closely mirrors that of FDI; i.e anchored in the 'eclectic' paradigm
- FDI is the most important form through which R&D is taking place, though there are other forms such as technology alliances, R&D joint ventures, R&D consortia university-industry linkages as well.
- UNCTAD bifurcated factors motivating FDI as '*push*' and '*pull*'. '*Push*' factors are essentially **global** in nature, while '*pull*' factors are **country specific**.



# Push Factors (global)

- Increasing technological intensity of products
- Global business environment has liberalized and has brought about an increase in competitive pressures to innovate fast and at the lowest possible cost
- Decreasing life cycles of products and increasing R&D costs
- Need to supply large and fast growing markets and be as close to the global manufacturing bases
- Increasing modularity of Products (Prencipe & Hobday (2003))

# Pull Factors (country specific)

- Availability of scientific and engineering skills at competitive wages
- Increased globalization of manufacturing processes
- Fast growing and increasingly discriminating markets.
- Circular movement of nationals—The New Argonauts: Saxenian (2004)
- National Innovation Systems (Lundvall, Nelson) focused on linkages between various actors in the S&T system of a country (private firms, universities, government laboratories, think tanks, consulting firms)

# The Ecosystem of Innovation in India

- S&T has always been central to development but innovation as the principal engine of growth is a recent addition to the policy discourse.
- Competitiveness Index (world economic Forum, 2005) placed India 55<sup>th</sup> out of 104 countries: Korea (29) and China (46)
- Policy Initiatives: Science Policy Resolution (1958), Technology Policy resolution (1983), Science, Technology & Innovation Policy resolution (2003).
- STI Policy resolution (2003) most comprehensive and includes: enhancing S&T governance and investment, developing S&T infrastructure, finding new funding mechanisms for basic research, developing human resources, increasing industry and scientific R&D, strengthening generation and management of intellectual property.

# Pull Factors in the Indian Context

- Availability of a critical mass of human capital at relatively low wages
- Infrastructure (especially in telecommunications)
- Institutional Framework
- Government Policy
- Market Size and proximity to International Markets.

# Estimated R&D Activity by Stakeholders (2006)

Stakeholders	Basic Research	Applied Research	Product Development	Process Development
Government, public enterprises and economic institutions	Medium	Medium	Low	Low
Domestic Companies	Low	Low	Medium	High
Foreign companies	Low	Low	Medium	High
By Sector				
ICT	Low	Low	Medium	High
Life Sciences	Low	Low	Medium	High
Engineering and related Industries	Low	Low	Medium	Medium
Space	Medium	Medium	Medium	Medium
Agriculture, Chemicals and Material sciences	Medium	Medium	Medium	Medium
Other R&D and knowledge processing industry	Low	Low	Medium	High

**Source:** Raja M. Mitra; *India's Emergence as a Global R&D Center*; Working Paper: R: 2007

# R&D as % of GDP

COUNTRY	1996	2001	2006
INDIA	0.65	0.75	0.89
CHINA	0.57	0.95	1.42
BRAZIL	0.72	0.96	0.82*
SOUTH KOREA	2.42	2.59	3.23
SOUTH AFRICA	0.6**	0.73	0.92*
RUSSIA	0.01	1.18	1.08
UNITED STATES	0.03	2.76	2.61

# Intellectual Property Rights Regime in India

- Patent ACT (1970) being modified in a series of steps since 1994 to make it more compliant with international agreements
- First reform took place in 1994 with rights of shareholders and punishments for infringement of copyright clearly documented.
- Legislation was primarily directed at pharmaceuticals but has been extended to include other sectors as well.
- IPR regime remains a work in progress with key concerns being inadequate protection for copyrights, trademarks & patents; lack of protection against unfair commercial use of undisclosed test data by pharmaceutical companies, limitations in connection with piracy of software.
- *Reference : Bruce Abramson's detailed study (2006) by World Bank*

# Impact of MNC activity in India

- Generally positive. However it still remains largely adaptive in that it involves modifying mature, largely standardized technology developed elsewhere.
- Mostly in IT/ITES, but life sciences and pharmaceuticals are increasingly attracting attention.
- Three main forms through which global R&D in India takes place: *in-house research, collaboration, contract research*.
- Too nascent for any distinct trend to be seen: However some studies highlight sector specific effects: Feinberg & Majumdar (2001): benefits of R&D activity by MNCs accrued more to other MNCs but not to local firms.
- Patibadla & Sanyal: larger firms with greater domestic ownership, with more extensive buying and selling operations in the domestic market did better than those with larger FDI component. Too, firms that could benefit from the economies of agglomeration did better than spatially isolated firms.



# Conclusions and Policy recommendations:

- Greater investment in the innovation infrastructure
- Promote clusters
- Improve inter-institutional linkages
- Attract FDI more effectively
- Create incentives for private sector involvement in R&D
- Effectively enforce IPR regime
- Improve the quality of physical infrastructure