



Technology Needs and Transfer in South Asia: An Overview

Dr Mahfuz Kabir

Senior Research Fellow, Bangladesh Institute of International and Strategic Studies (BISS), Dhaka
E-mail: mahfuzkabir@yahoo.com

Presented at “Regional Consultation on Trade, Climate Change and Food Security in South Asia”
Organized by SAWTEE
Kathmandu, 20-21 December 2012



Economics of Technology Needs and Transfer

- **South Asia – Growth Centre**
- Knowledge, technology, entrepreneurship, and innovation are positioned at the center rather than seen as independent forces
- Technology – long-term phenomenon
 - Costs are variable
- Central goal of economic policy (e.g., SFYP – BGD)
 - higher productivity through greater innovation
 - markets relying on input resources and price signals not always effective in encouraging higher productivity, and thereby economic growth



Economics ...

- Smith – technology and human capital
 - Schumpeter – institutions, entrepreneurs, and technological change at the heart of economic growth
 - Innovation economics - puzzle of TFP growth - theory of economic creativity
 - Paul Romer, Elhanan Helpman ...
 - Technology Transfer - TOT and TC
 - Process of transferring skills, knowledge, technologies, methods of manufacturing, samples of manufacturing and facilities among governments or universities and other institutions
 - Tech transfer – from developed to developing economies
 - Alternative route to economic growth
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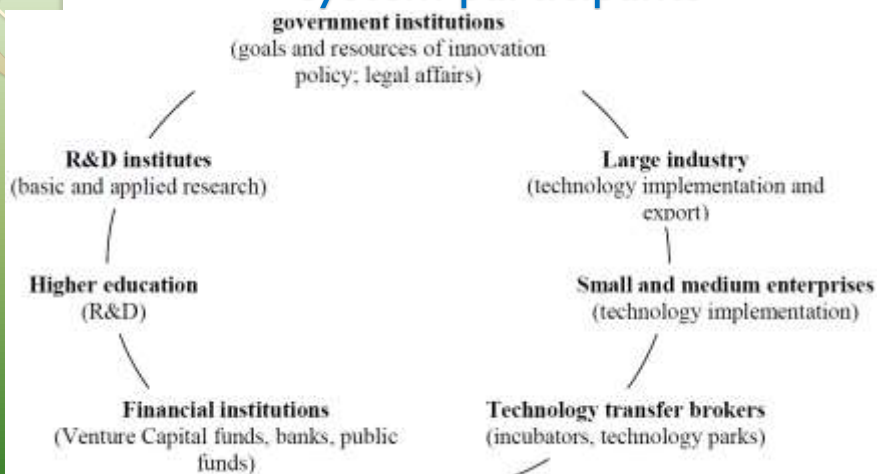
Growth, FDI and Tech Transfer

- Process of catching up by Asian Pacific developing countries in manufacturing production and exports
 - changes in the factor endowments of each country
 - Capital/labor ratios and technological levels have risen over time
 - Role of tech transfer in the industrialization
 - Relationship between FDI and tech transfer
 - Expansion of FDI as well as other channels of technology transfer
 - Push and pull factors
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Channels of Tech Transfer

- Vertical tech flow
 - R&D → implementation → production process → distribution → final buyer
- Horizontal tech transfer
 - lab ↔ lab; factory ↔ factory; country ↔ country
- Innovation process scheme
 1. R&D (basic and applied research) →
 2. invention (creation and documentation of technology) →
 3. innovation and technology implementation →
 4. learning of effective technology usage →
 5. optimization of production and organization methods →
 6. appearing of micro and macroeconomic effects of technology implementation (e.g. lower material and personal costs needs, higher productivity)

Technology transfer and innovation system participants



Source: Roman Gurbel (2002).

Technology acquisition schemes

| | | |
|-----|--|-----|
| 1. | Acquiring non-documented knowledge | I |
| 2. | Internal R&D | I |
| 3. | Reverse engineering | I |
| 4. | Secret acquiring through internal R&D | I+E |
| 5. | Contract R&D | I+E |
| 6. | Strategic R&D partnership | I+E |
| 7. | Licensing | E |
| 8. | Purchase (domestic or foreign) | E |
| 9. | Joint Venture | E |
| 10. | Acquisition of a company with technology | E |

I... technology transfer based mainly on internal R&D capabilities

E... technology transfer based mainly on external R&D capabilities

Source: Roman Gurbiel (2002).

Channels ...

- Technology is defined in a broad sense
- Production technology
 - hardware of production or knowledge about machines and processes
- X factors
 - management expertise, marketing skills, and other intangible corporate assets
- Channels: public and private
- Public
 - Public goods, transferred by governments of advanced countries and international agencies
 - Fields such as agriculture and government administration, where markets for technologies do not exist
 - conducted as a part of technical assistance or economic cooperation provided to developing countries



Channels ...Private

- Relate to technologies developed by private firms and transferred on a commercial basis
- Owners or suppliers of technologies are usually MNCs
- Channels: FDI, licensing arrangements, plant export, original equipment manufacturing (OEM), etc.
- FDI - package of managerial resources including production technology, management know-how, and marketing skill
- MNCs prefer direct investment with majority ownership to an arm's length transaction as it allows them to control use of technologies, preventing leakage to 3rd parties
- OEM – technological levels of recipient firms are crucial since the products made by the latter as a result of technology transfer will be sold under the brand name of transferring MNC

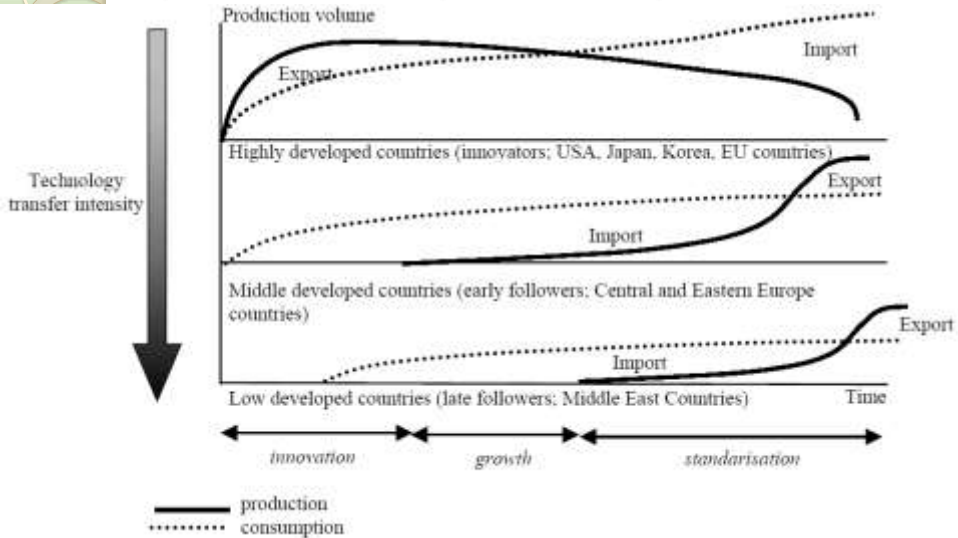


Channels ... developing recipients

- FDI may be the most-effective channel for the development of a new industry
 - Developing countries tend to be poorly endowed with management and marketing skills
- If the technology is standardized and product markets are stable, recipient countries may prefer other channels that do not involve control by foreign firms.
- When the preferences of MNCs and recipients do not coincide, their respective bargaining power will determine which channel of technology transfer is ultimately used



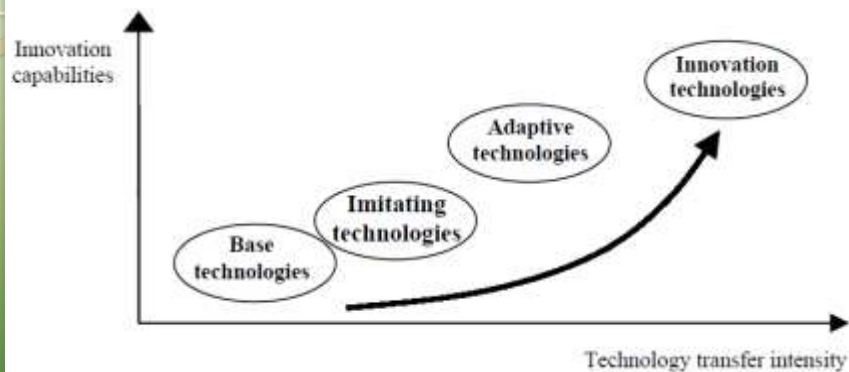
Intensity of technology flows in the product life cycle theory



Source: Vernon (1993).

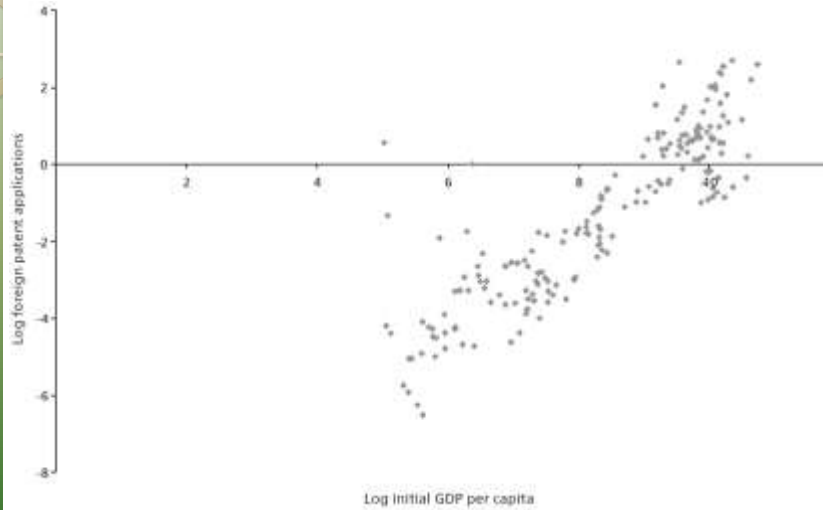


Technology inflow specifics and country's innovation capabilities



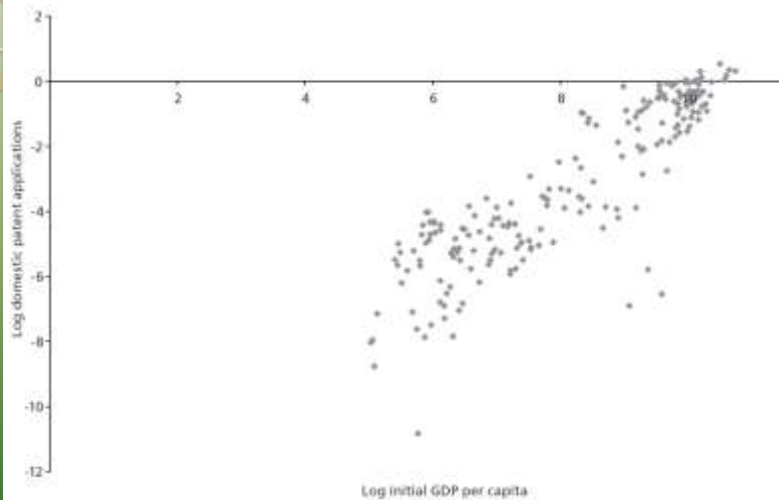
Source: *The Interrelationship Between Investment Flows and Technology Transfer*, UN, 1992

Non-resident patent applications per 1,000 of workforce against initial GDP per capita



Source: Rod Falvey and Neil Foster (2006).

Domestic patent applications per 1,000 of workforce against initial GDP per capita





Why tech needs and transfer: SA

- Productivity gains
 - Tech diffusion
 - growth-enhancing sectors
 - external sectors
 - Enhanced know-how and knowledge
 - Developing critical sectors
 - Green growth
 - Environment-friendly/sustainable development
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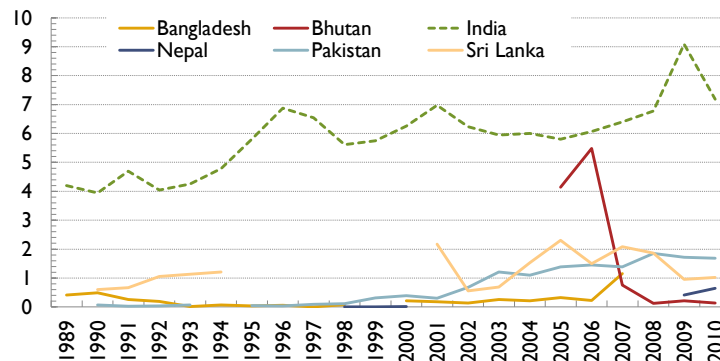
Areas

- Public-public
 - Public-private/PPP
 - Private-private (e.g.,)
 - University/research institutions
 - Regional approach (blocs)
-

Needs – Common ...

- Promoting pro-poor/inclusive growth
 - Agriculture (job releasing + towards high MPP_L)
 - High-tech output
 - Extension
 - Disaster resilience
 - Climate change adaptation + mitigation
 - Manufacturing (job creating)
 - Local market and export (e.g., Pharmaceutical Productive Capacity)
 - Other industry
 - Power & energy
 - Services (job creating)
 - ICT
- Science and technology - emphasises on tech competence and self-reliance
- Lacks common strategy in tech diffusion through FDI

High-tech exports (% of manufactured exports)

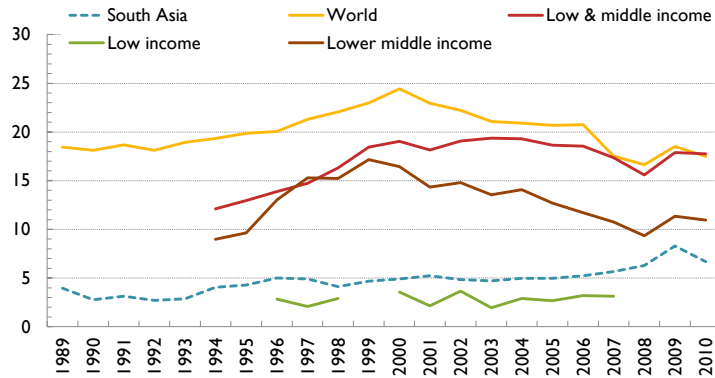


In 2010
(2007 for
BGD)

| Country | % of manufactured exports |
|------------|---------------------------|
| Bangladesh | 1.15 |
| Bhutan | 0.14 |
| India | 7.18 |
| Nepal | 0.65 |
| Pakistan | 1.69 |
| Sri Lanka | 1.03 |

Source: WDI

High-tech exports (% of manufactured exports)

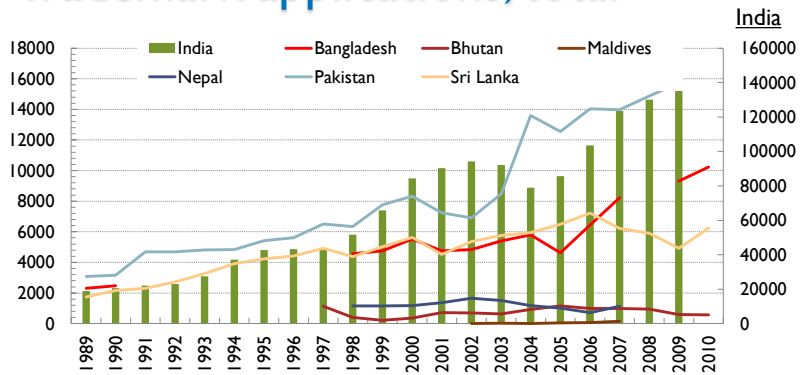


In 2010 (2007 for low-income countries)

| Country | % of manufactured exports |
|------------------|---------------------------|
| South Asia | 6.69 |
| World | 17.48 |
| Low & Mid Income | 17.74 |
| Low Income | 3.12 |
| Lower-mid Income | 10.94 |

Source:WDI

Trademark applications, total



| | 2007 | 2008 | 2009 | 2010 |
|------------|---------|---------|---------|-------|
| Bangladesh | 8,232 | 9,306 | 10,231 | |
| Bhutan | 986 | 946 | 599 | 560 |
| India | 123,514 | 130,172 | 141,943 | |
| Maldives | 155 | | | |
| Nepal | 1,132 | | | |
| Pakistan | 13,985 | 14,872 | 15,734 | |
| Sri Lanka | 6,217 | 5,907 | 4,927 | 6,244 |

Source:WDI

Technology in SAARC: Area of Cooperation in Science and Technology

- SAARC's primary/initial focus
 - technical cooperation, covering agriculture, environment and meteorology, ... , **science and technology**
- ICT
 - harness ICT for the social and economic upliftment of the region through infrastructure development by optimal sharing of **available resources**
 - enhanced cooperation in **technology transfer**, standardization and HRD
- Facilitates **technology transfer**, fuller deployment of human, capital and entrepreneurial potential which in turn bring the economies of scale

Technology transfer in SAARC: Environment & Climate Change

- Sixteenth SAARC Summit, Thimphu, 28-29 April 2010
 - capacity building and **transfer of eco-friendly technology** in a wide range of areas related to the environment
- SAARC Action Plan on Climate Change (2009-2011) identifies seven thematic areas of cooperation related to
 - adaptation; mitigation; **technology transfer**; finance and investment;
- Dhaka Declaration and SAARC Action Plan on Climate Change (3 July 2008)
 - enhancing South-South cooperation on **technology development and transfer**, as per established SAARC norms

Technology transfer in BIMSTEC

- Areas of cooperation – **technology** takes the 2nd position
- 2nd BIMSTEC Summit Declaration, New Delhi 2008
 - expanding the **technology base of Member States** through collaborations and partnerships targeted towards micro, small and medium scale enterprises
 - decide to establish a **BIMSTEC Technology Transfer/Exchange Facility** in Sri Lanka
 - continue cooperation in the field of agriculture and decide to initiate short and long term **joint research programmes to increase productivity and yields** in the region
- 12th BIMSTEC Ministerial Meeting, Myanmar, 2009
 - reiterated the need to enhance cooperation in advanced areas of fundamental and applied scientific and technological research
 - revised concept paper submitted by Sri Lanka establishing BIMSTEC Centre for Technology Transfer/Exchange Facility

Technology ... BIMSTEC

- 1st BIMSTEC Energy Ministers' Conference 2005, New Delhi
 - Agree to develop institutional linkages among the member countries to **facilitate joint R&D activities**
- 2nd BIMSTEC Energy Ministers' Meeting, Bangkok
 - capacity building of human resources, **technology transfer**, information and knowledge sharing, and other energy relevant issues among the members
- 12th BIMSTEC Ministerial Meeting, Myanmar, 2009
 - emphasized the importance of further collaboration in **research and development, technology transfer** and private sector participation among the Member States



Technology ... BIMSTEC

- 2nd BIMSTEC Ministerial Meeting on Poverty Alleviation, 2012, Kathmandu
 - Promote regional cooperation among BIMSTEC Member States **in technology transfer, capacity building and sharing of best practices**



Way forward

- Promotion of country-level industrialization by intensive flows of technologies
- Facilitation of SA's further industrialization by increasing availability of various levels of technologies
- Cross-fertilization and synergies
 - South-South technology transfer in the context of **appropriate technology**
 - gap in factor endowments among southern countries is much smaller than that between North and South
 - Identify **optimal technological gap**
 - varying degree of differences in economic and tech levels



Way forward ...

- Develop common strategy to FDI-induced tech transfer
 - Regional approach – within and beyond SAARC-BIMSTEC
 - Trade-related techXfer – SAFTA and BIMSTEC FTA
 - Attract from beyond and diffuse within
 - Promote R&D
 - Strengthen collaboration among universities, think-tanks and GO-to-GO
 - Networking – civil society
 - Greater understanding of needs
 - Set priority areas to address common challenges – within and beyond growth (e.g., climate change and food security)
 - Make use of “India as Regional Tech Hub”
 - Learn from good practices
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Many Thanks
