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Content

1. Categories of technology transfer
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3. Policies to support technology
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Categories of Technology Transfer



General Definition

International technology transfer is the geographical relocation of technical and organizational knowledge between states.

Knowledge is embodied in machines, codified or carried by humans

A company perspective

International technology transfer is the transfer of commercially exploitable knowledge between companies between companies against payment or other forms of compensation

Peters 1987

An economic perspective

Shifting information across borders and its effective diffusion into recipient economies ... ranging from innovation and international marketing of technology to its absorption and imitation

Maskus 2004

Intended technology transfer

Mutually agreed and controlled knowledge transfer between two parties

Unintended technology transfer

The uncontrolled, unintended transfer of knowledge from a supplier to a recipient

Legal or illegal

Hypothesis

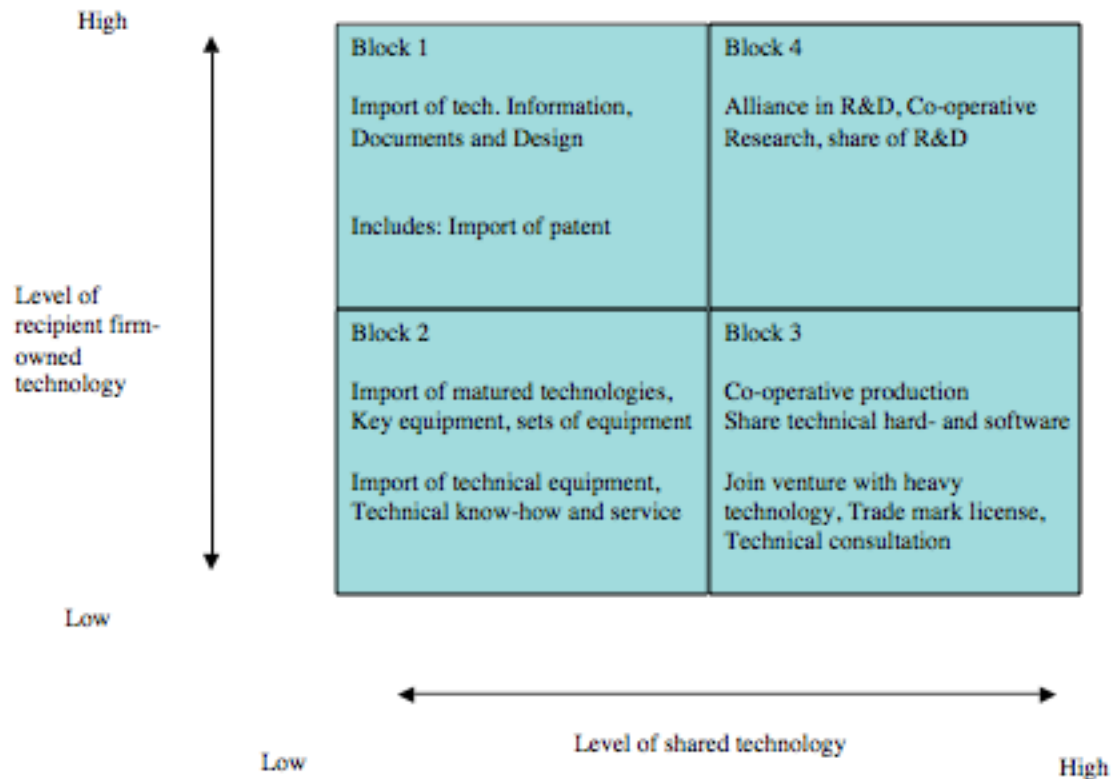
- Different actors have different perspectives on technology transfer
- Different perspectives often conflict
- Conflict is usually resolved through power
- Should be resolved through mutually beneficial agreements

Hypothesis

- Suppliers source wind technology in relation to business goals
- Main goal has so far been market access
- Other goals will become increasingly important: local, innovative knowledge
- Suppliers will not source key technologies unless adequately compensated
- Suppliers cannot source key technologies unless recipient holds relevant technological capacities



A map of technology transfer

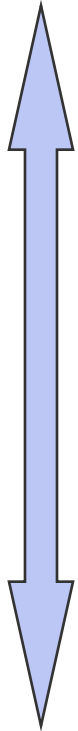


Mechanisms and Capabilities

Mechanism	Recipient Capability	Supplier Compensation
Technology Import	High	Low
Foreign Direct Investment	High	Low
Joint Venture	Medium/ High	Medium/ High
Licenses	Medium/ High	Medium/ High
R&D Corporation	High	Low

Ownership models China

**RETAIN
INTELLECTUAL
PROPERTY**



Maintain Foreign Ownership

- Imported technology
- Import core components, buy a few low-tech local components
- Import minimum needed, mostly buy local components
- Manufacture entire system in China (remain a 100% foreign-owned company)

Nordex, Vestas

NEG Micon

(Vestas, Nordex)

GE Wind

Establish Joint-Venture

- Set up JV, import some components and transfer technology to locally-manufacture others
- Transfer a full turbine model and maintain ownership through JV
- Transfer a technology license to produce a turbine, collect royalties but give up ownership to local company

**NEG Micon-
Goutou**

Xi'an-Nordex

Source: Joanna Lewis: China's Emergence in the Global Wind Power Industry, 2006

**REpower/
(Goldwind)**

www.wilsoncenter.org/events/docs/CEF.Talk.Lewis.10.06.ppt

**TRANSFER
INTELLECTUAL
PROPERTY**

Technology transfer, drivers, and markets



Windpower Markets

- Harnessing the resource wind
- Developing and financing policy to support wind in the energy mix
- Develop physical and administrative infrastructure

Drivers of wind technology transfer

- Prospective markets main drivers in for technology transfer
- Institutional and legal context matters
- Growing markets increase FDI
- FDI = local manufacturing = technology transfer?
- Answer depends on perspective

Hypothesis

Country	Capacity MW 2008	Added Capacity 2008	Rate
Chile	20,1	0	0
China	12.210,0	6298,0	106,5
Egypt	n.a.	n.a.	n.a.
Morocco	125,2	0	0
Mexico	85,0	0	0
South-Africa	21,8	5,2	31,4

WWEA 2009

Stagnating, slow growing markets will see little technology transfer unless other incentive given

Instruments for international technology transfer

A plethora of instruments

- Instruments to increase technological capabilities (FDI follows capabilities)
- Investment incentives
- Instruments to increase access to technology
- Trade related investment measures

Local Content Requirement

- Forces investor to source knowledge to domestic suppliers
- Statistical evidence that backward linkages leads to technology transfer to suppliers
- Possible that it affects FDI behaviour of firms
- Open what kind of knowledge is transferred
- Canada, Spain, Brazil, China have wind LCR



Mini case studies China and India

Case Study China

- A number of policies to support technology transfer applied (JV, LCR, duties and tariffs)
- Local content requirements currently 70%
- LCR tied with pre-arranged sales opportunity
- Rapidly growing, tendered market development through policy

Results China

- Growing Chinese wind industry
- Production by Chinese firms increases
- Lead in cost reduction, lag in design
- LCR does not promote transfer of essential know-how, IPR, and innovative capabilities
- LCR: possible WTO infringement

Generalisation from China?

- Special case: huge market for wind power
- LCR requirements tied to preferential market access
- Result of LCR based technology transfer matches results in other industries

LCR not necessary for successful technology transfer

- India has never applied LCR
- Strong government market development
- Manipulating custom and excise duties
- Fostering innovation system
- Suzlon strategy: strategic acquisition and accessing foreign knowledge base



Results India

- Suzlon large international and competitive player
- 52 % installation of domestic production
- However: Suzlon is also a special case

Alternative Scenario

- Policies to support demonstration, testing & certification of local technology
- further develop channels for informal knowledge transfer and learning
- Invest in R&D (domestic and abroad)
- Purchase IPR (licenses)
- Increase technological capabilities