Green Innovation: Examining Experiences in Low Carbon Technology Transfer and Green Patenting

Low-Carbon Leapfrogging? Examining Cases of Wind Power Technology Transfers

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Green Patenting

Ahmed Abdel Latif, Senior Programme Manager, International Centre for Trade and Sustainable Development

Reactions and lessons for implementation

Ancha Srinivasan, Principal Climate Change Specialist, Asian Development Bank

GEORGETOWN UNIVERSITY

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16:45-18:15

ICTSD
International Centre for Trade and Sustainable Development

Low-Carbon Leapfrogging?

Examining Cases of Wind Power Technology Transfers

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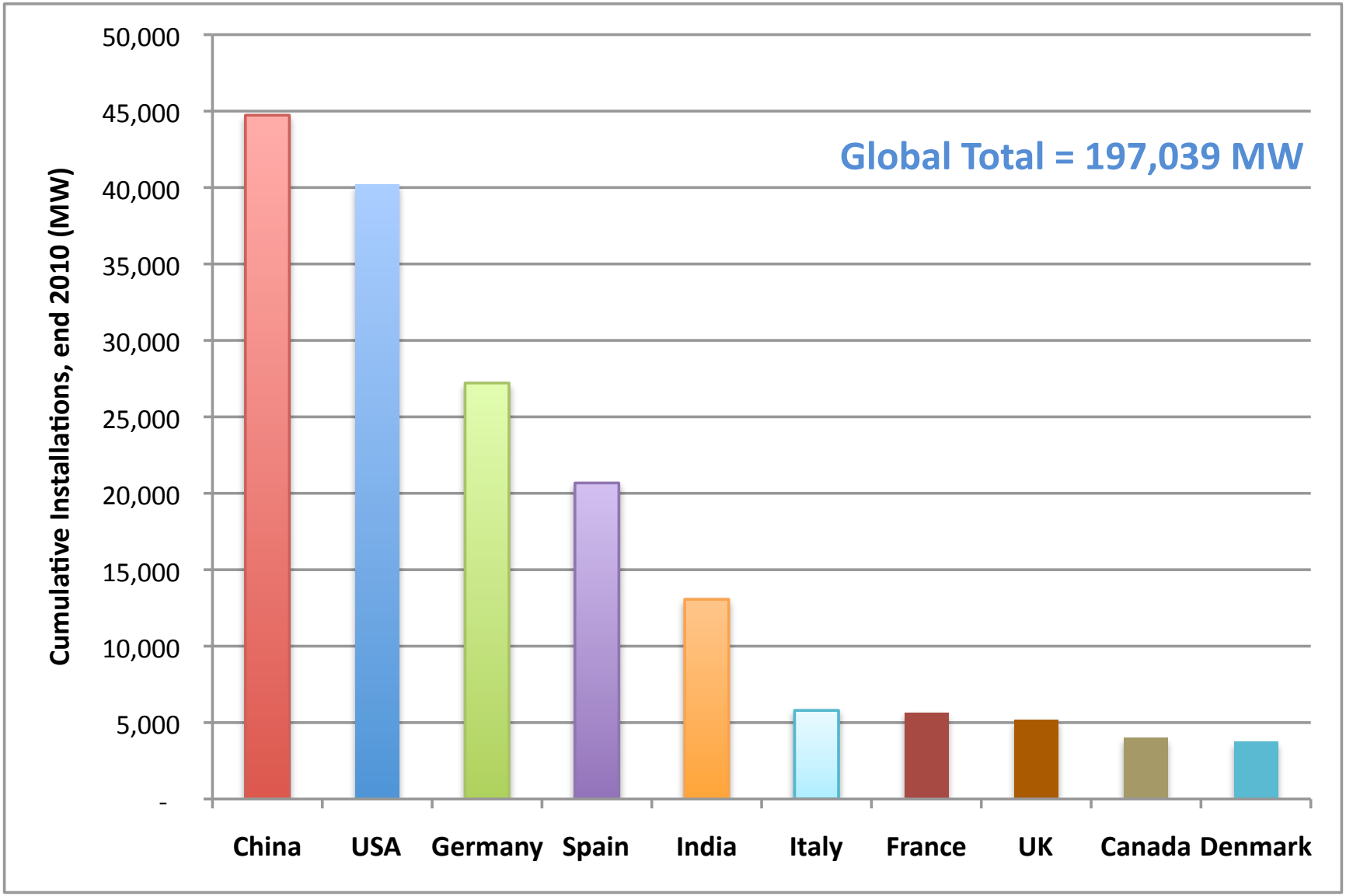
Low-Carbon Leapfrogging: Is it Possible?

1. Substantial technical advances are possible in relatively short amounts of time

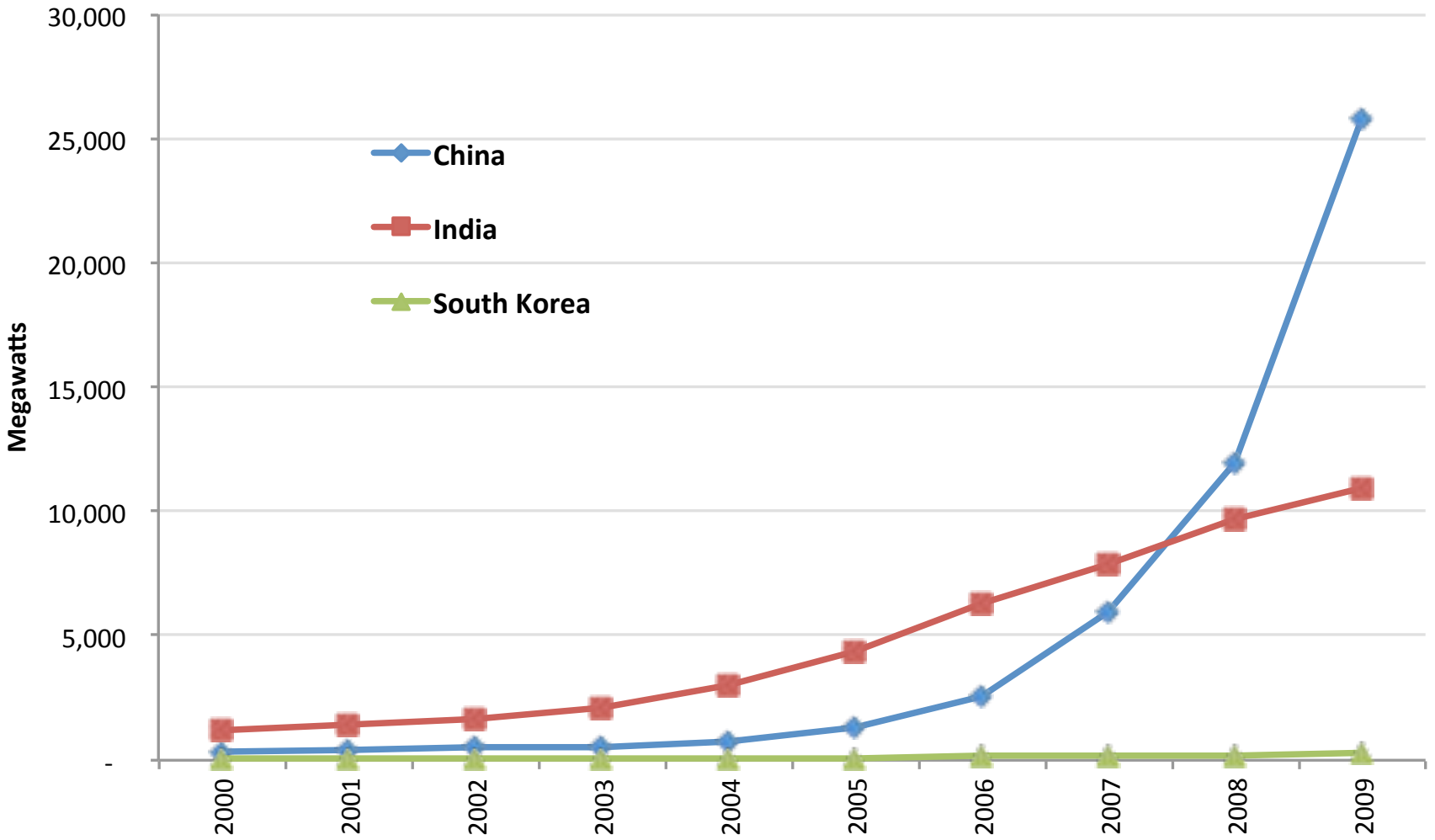
2. Firms in the South have used innovative technology transfer models to acquire technologies initially developed by and for the North

3. There are important roles for governments to play at the domestic and international level depending on the countries and the technologies involved

Top 10 Wind Power Capacity Leaders

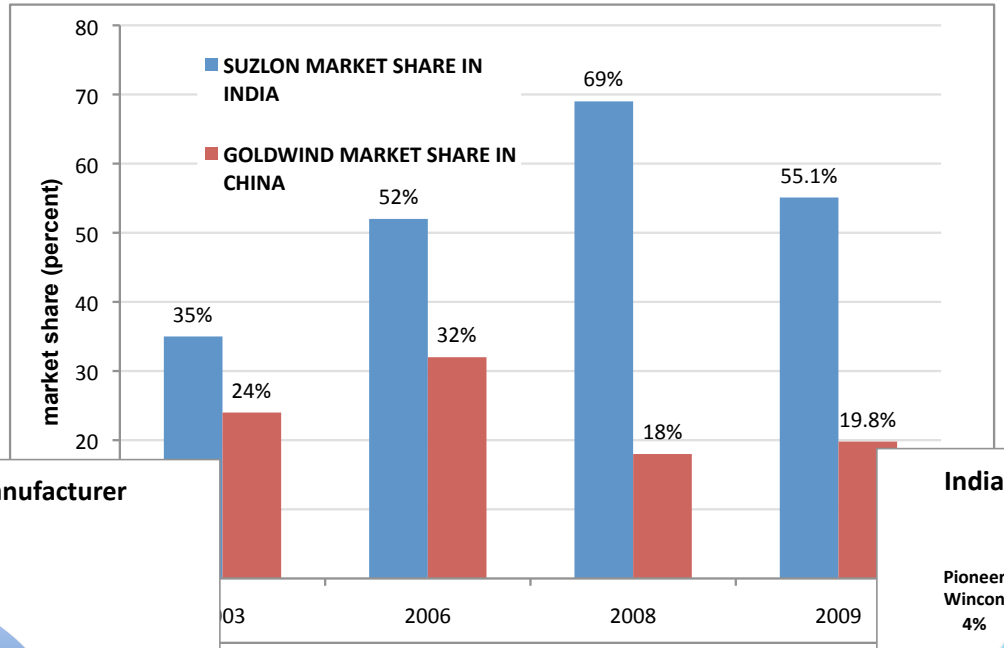


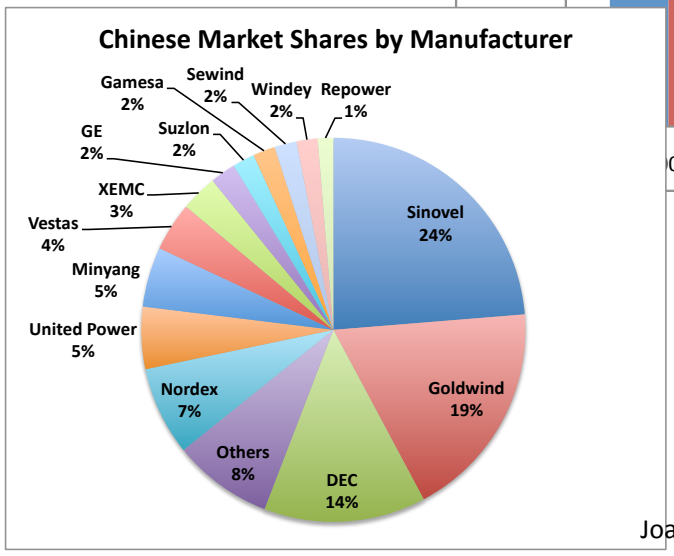
Wind Power Development in China, India, and South Korea

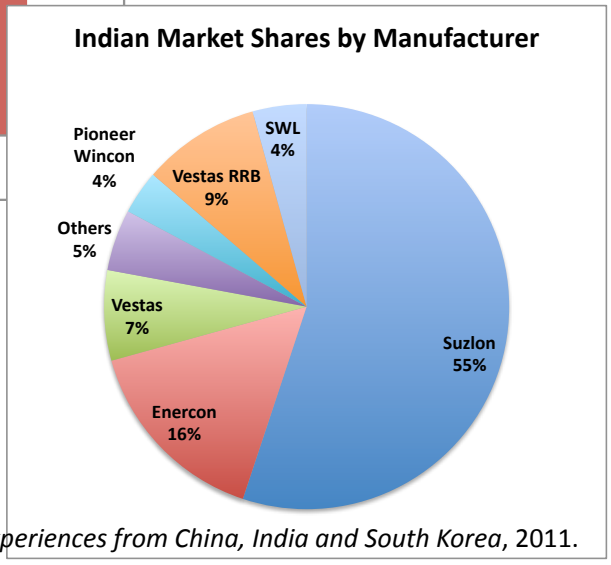


Company Case Studies:
Suzlon (India) and Goldwind (China)

- Both are leading manufacturers in their home country markets and have plans for further global expansions
- Both began manufacturing wind turbines around the same time (1990s)







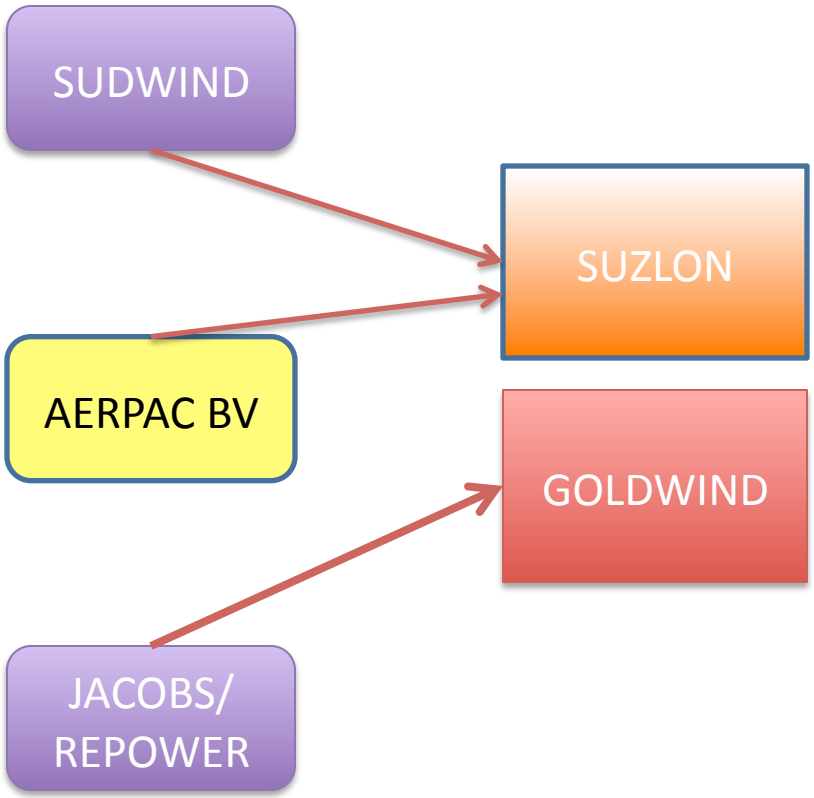
Joanna Lewis, *Building a National Wind Turbine Industry: Experiences from China, India and South Korea*, 2011.

Models of Technology Development
Advantages and Risks

- Licensing:
  - Advantages: obtaining a technology that has been field tested
  - Risks: often an older (smaller), outdated model; restrictions on IPR use (exports); others can license the same technology
- Mergers & acquisitions (M&A):
  - Advantages: obtain control over IPR
  - Risks: need sufficient financial resources; need ability to integrate new business knowledge into current business
- Joint development:
  - Advantages: no concerns about market competition; less concern about IPR (often design with multiple manufacturers)
  - Risks: Design firm has no manufacturing experience; manufacturers have no design experience

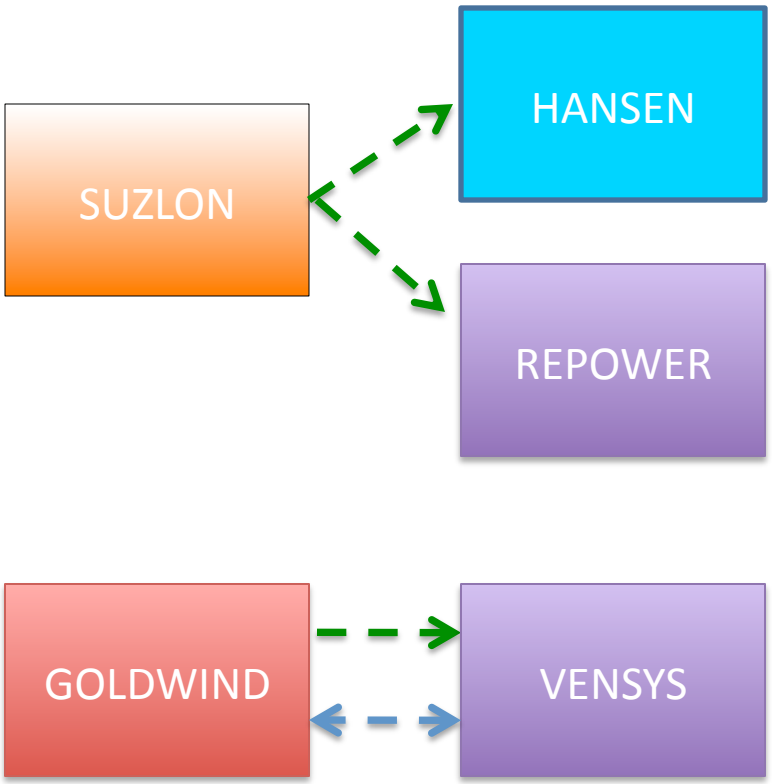
Early Years: *Licensing Technology*

- Both Suzlon and Goldwind began developing wind turbine technology with foreign licenses



Later Years: *M&A; Joint Development*

- As they became more successful they reached out to additional foreign partners, and acquired majority control of foreign companies



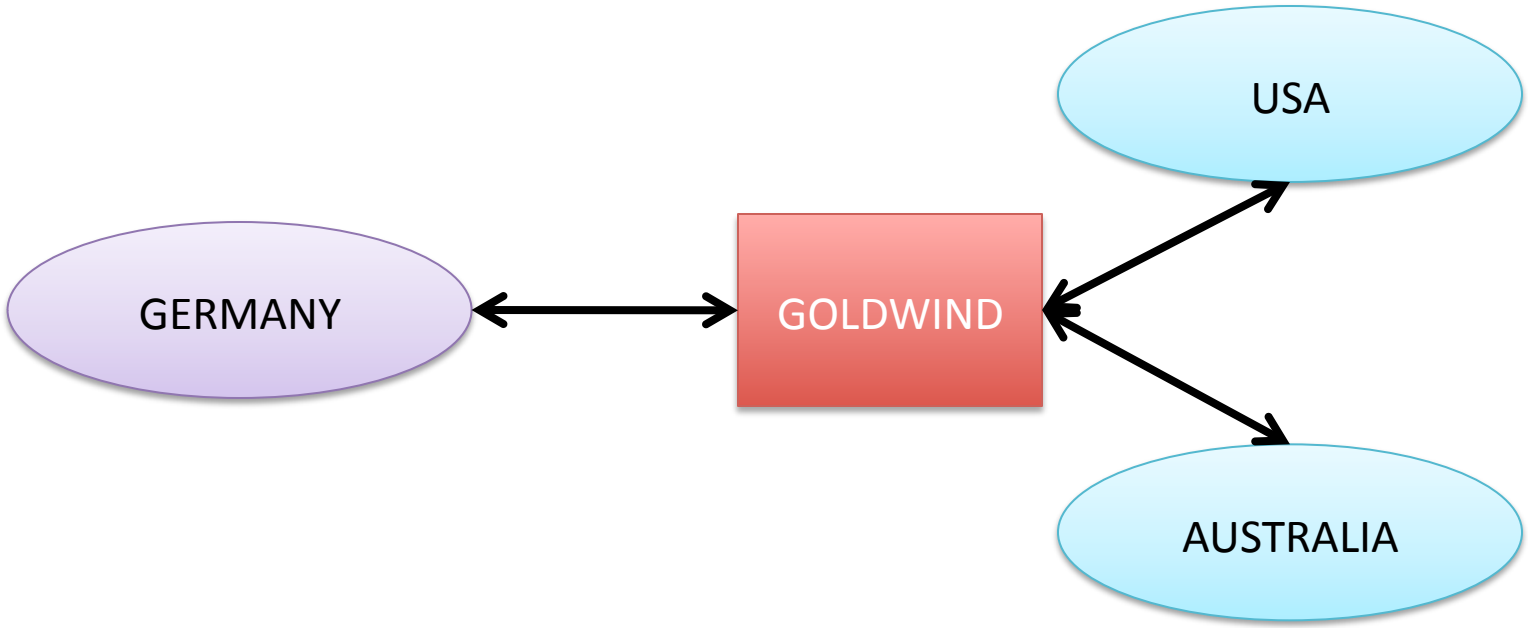
- With expanded know-how came ventures into joint technology development

Global Learning Networks

- Suzlon has an extensive global presence, allowing for an extensive global network for R&D, manufacturing and development experience

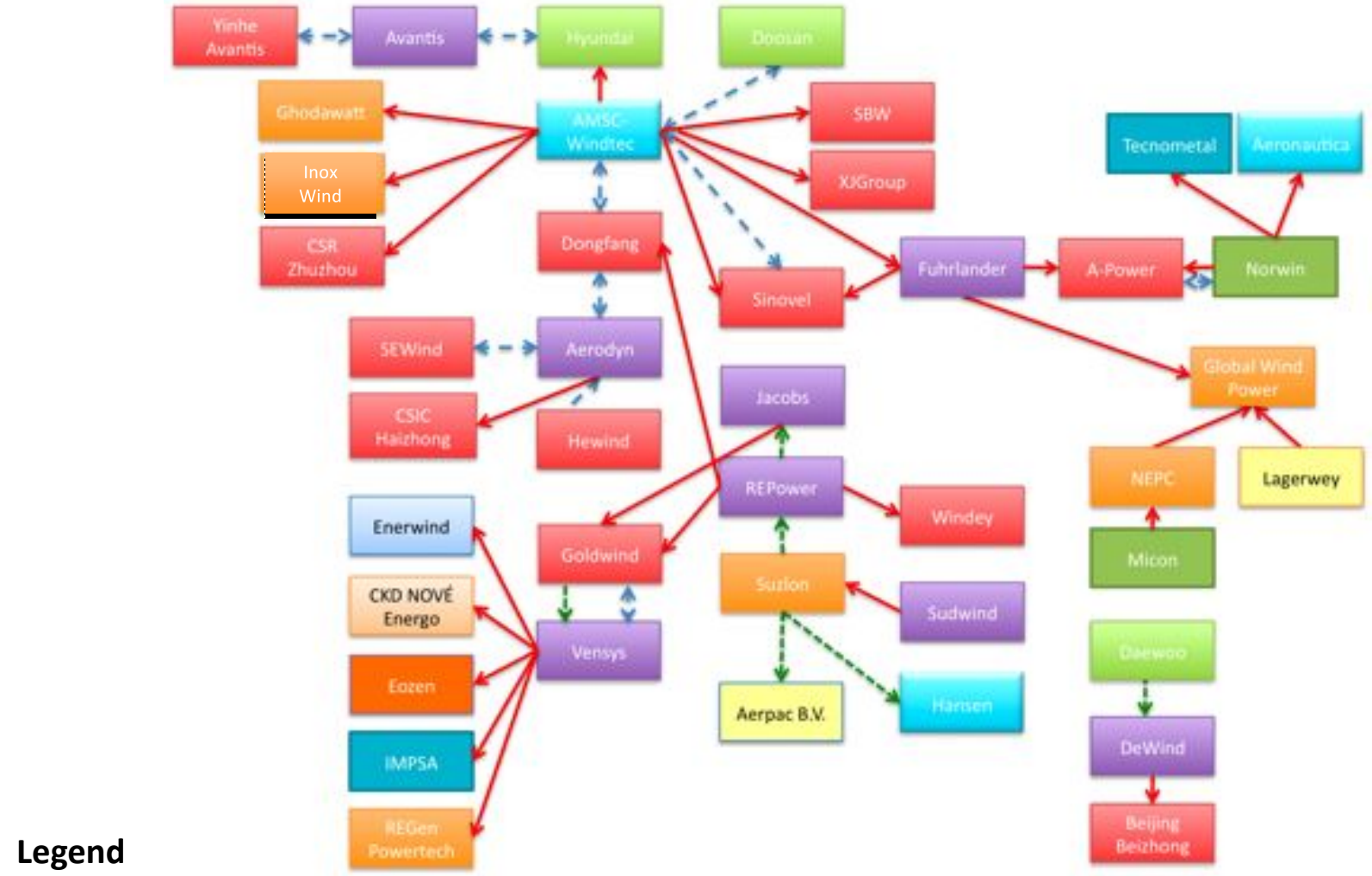
Global Learning Networks

- Goldwind's global presence is more limited, but it has plans to continue its R&D, manufacturing and project development overseas



Models of Wind Power Technology Transfer

China, India, Korea… and beyond



Legend

Joint development — M&A — License

Chinese Firm	Korean Firm	Indian Firm	German Firm	Danish Firm	US Firm
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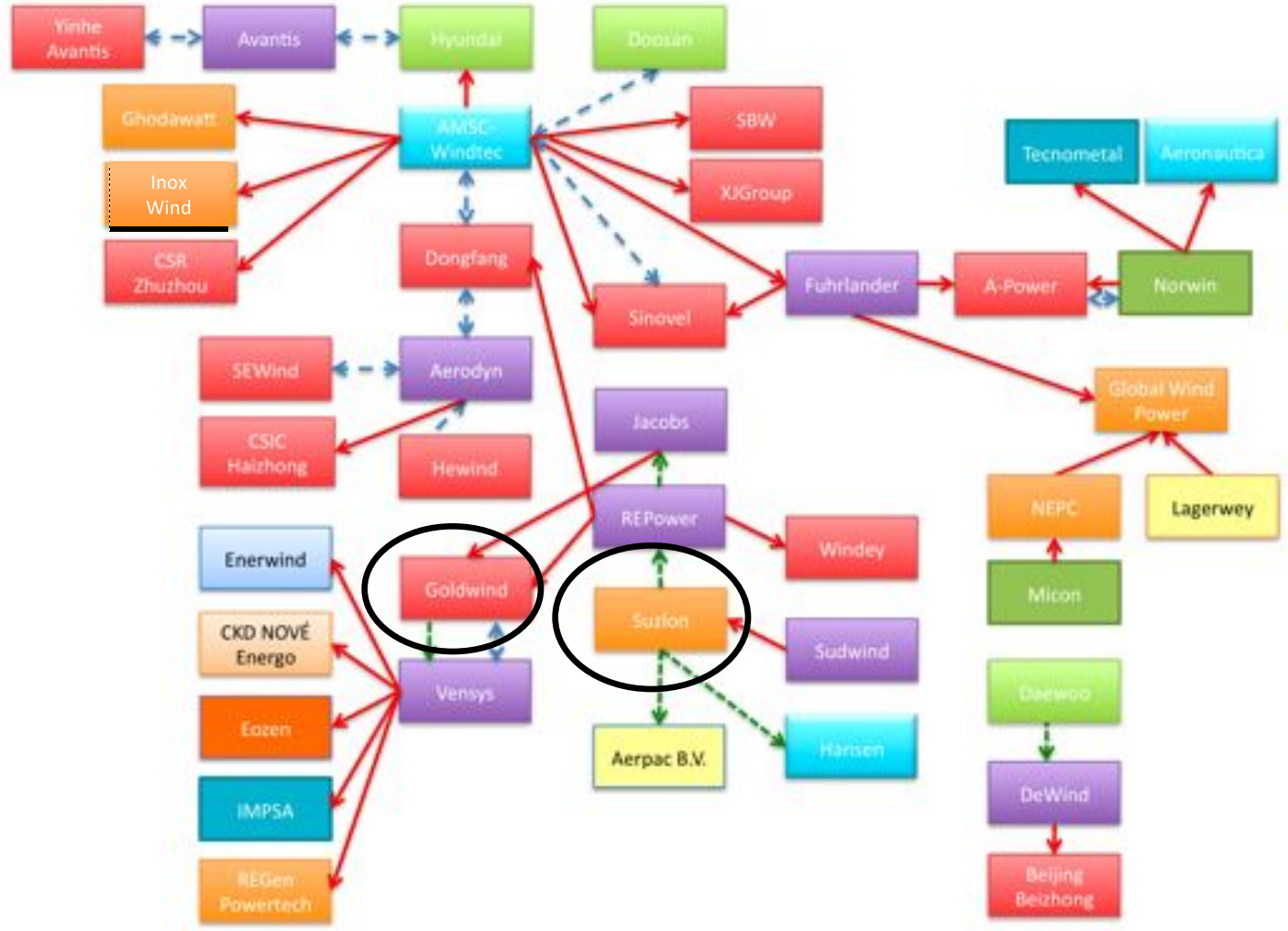
Models of Wind Power Technology Transfer

Suzlon & Goldwind



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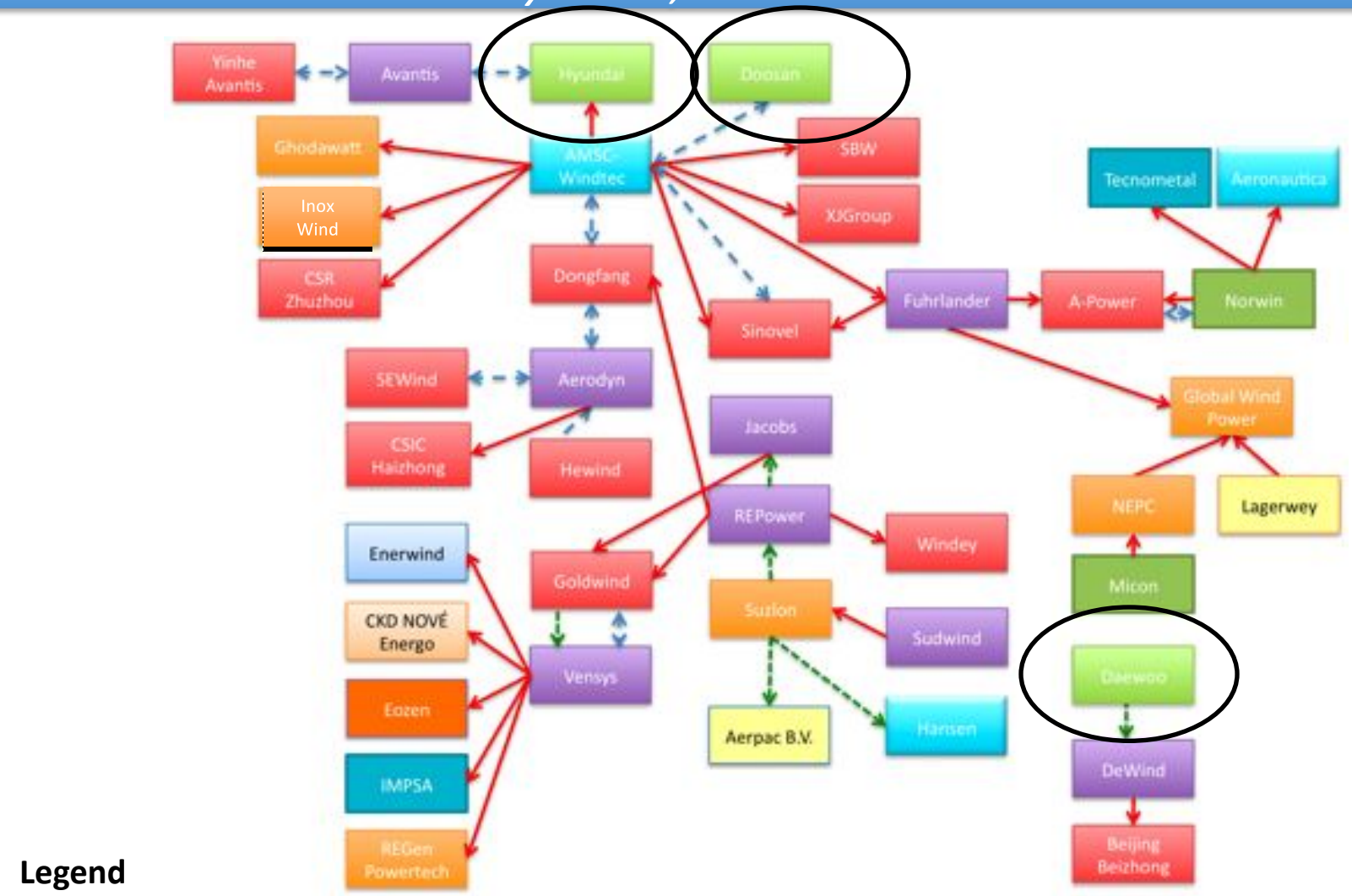
Models of Wind Power Technology Transfer

Hyundai, Doosan & Daewoo



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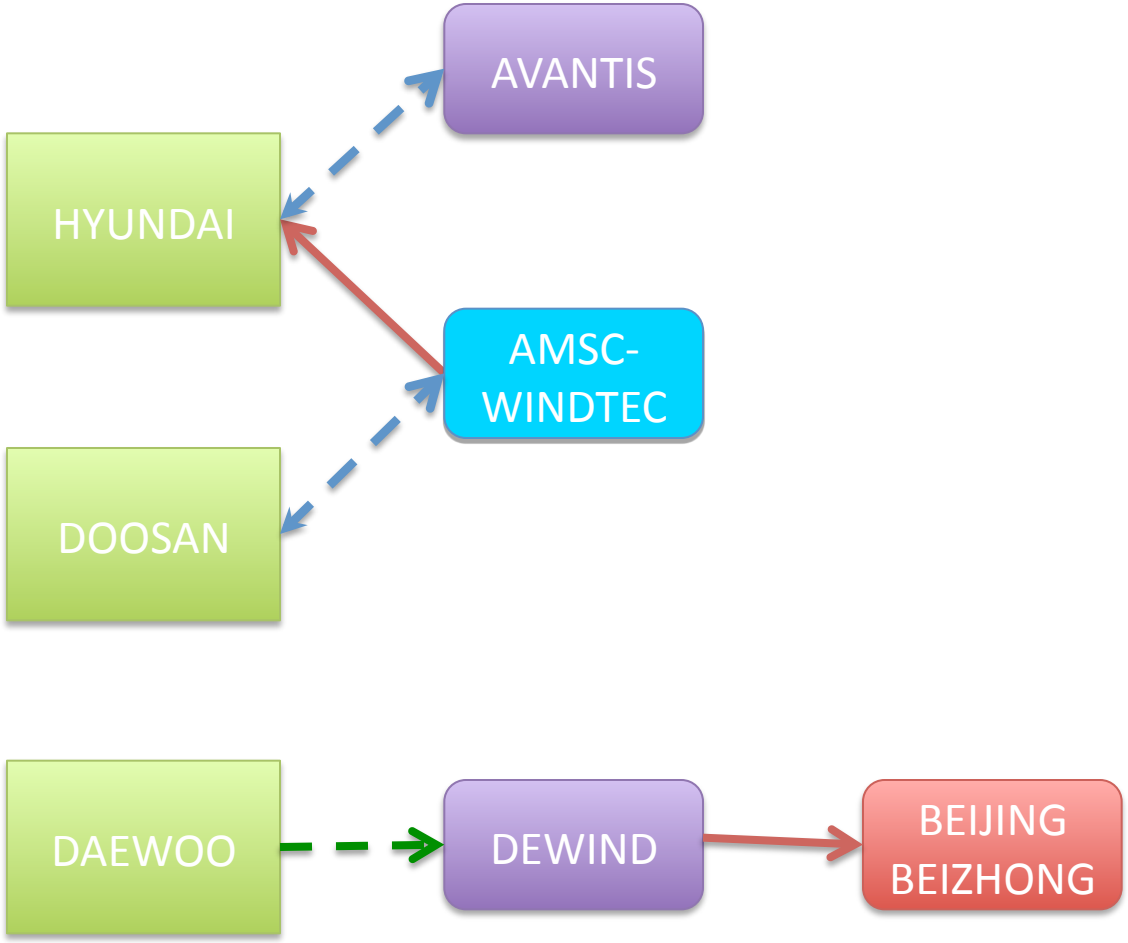
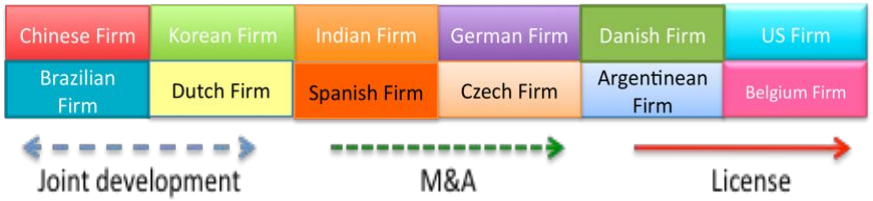
Korean Firm Wind Technology Development

- Later, larger entrants relying primarily on joint development and M&A for advanced technology, but still licensing





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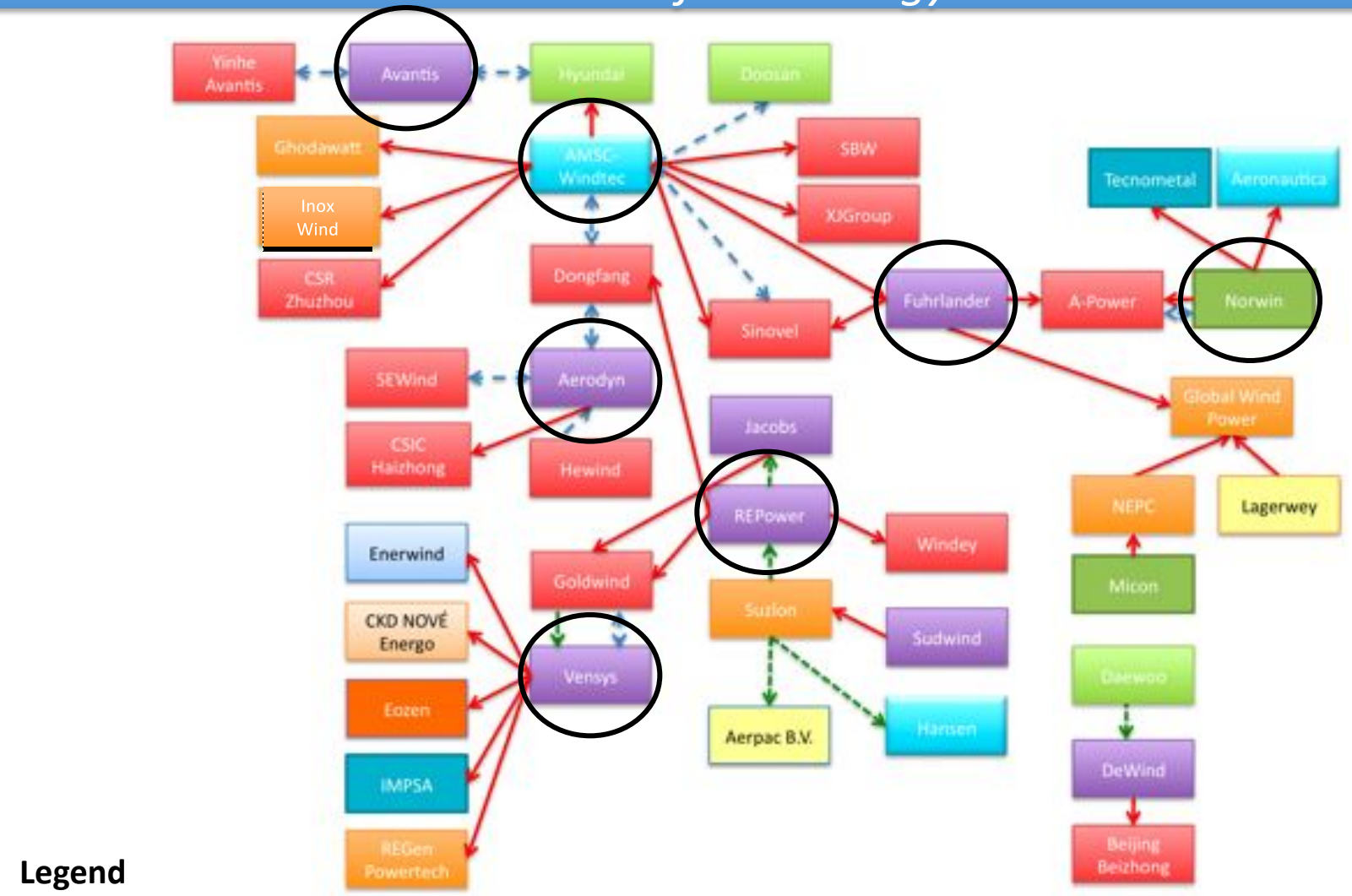
Models of Wind Power Technology Transfer

Common Sources of Technology IPR & Know-How



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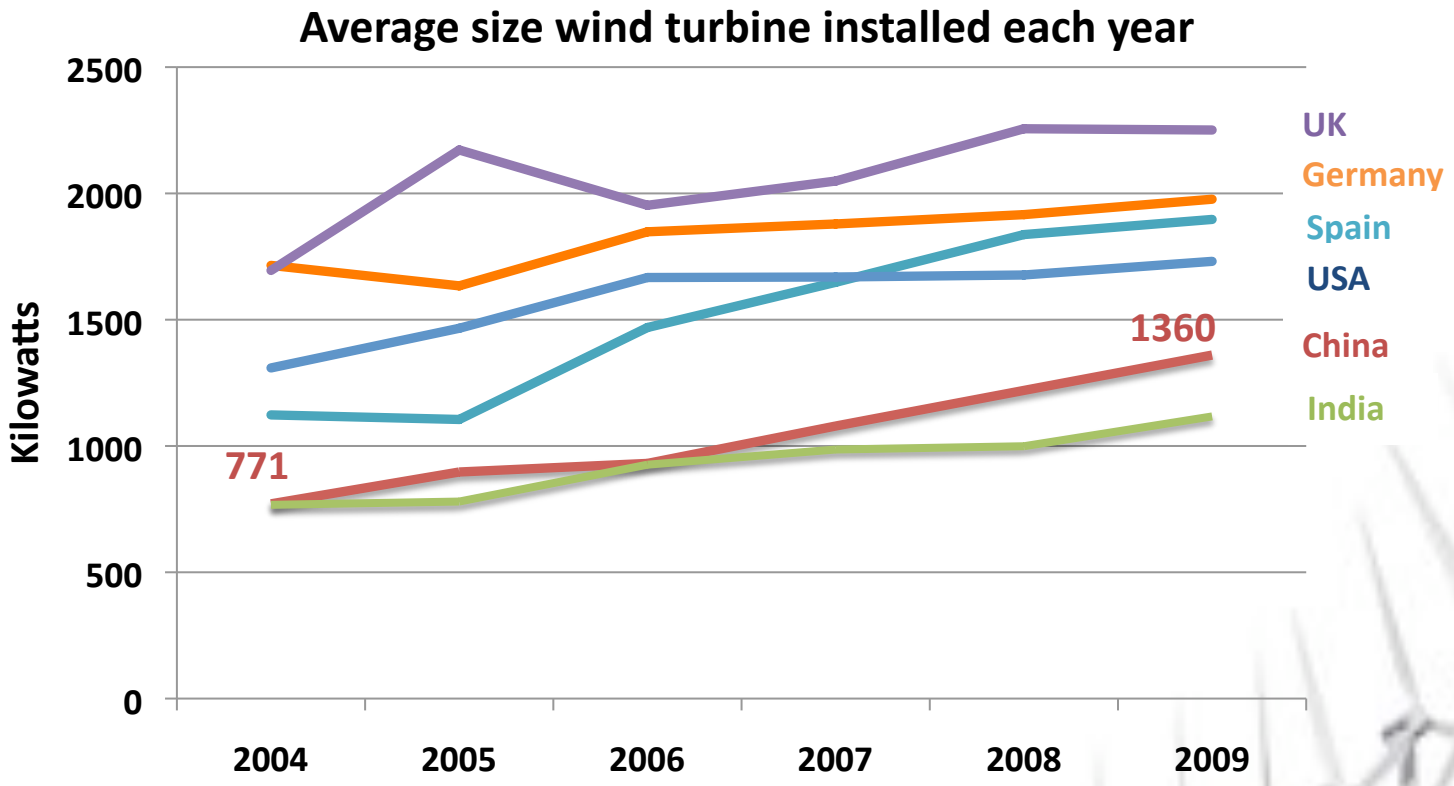
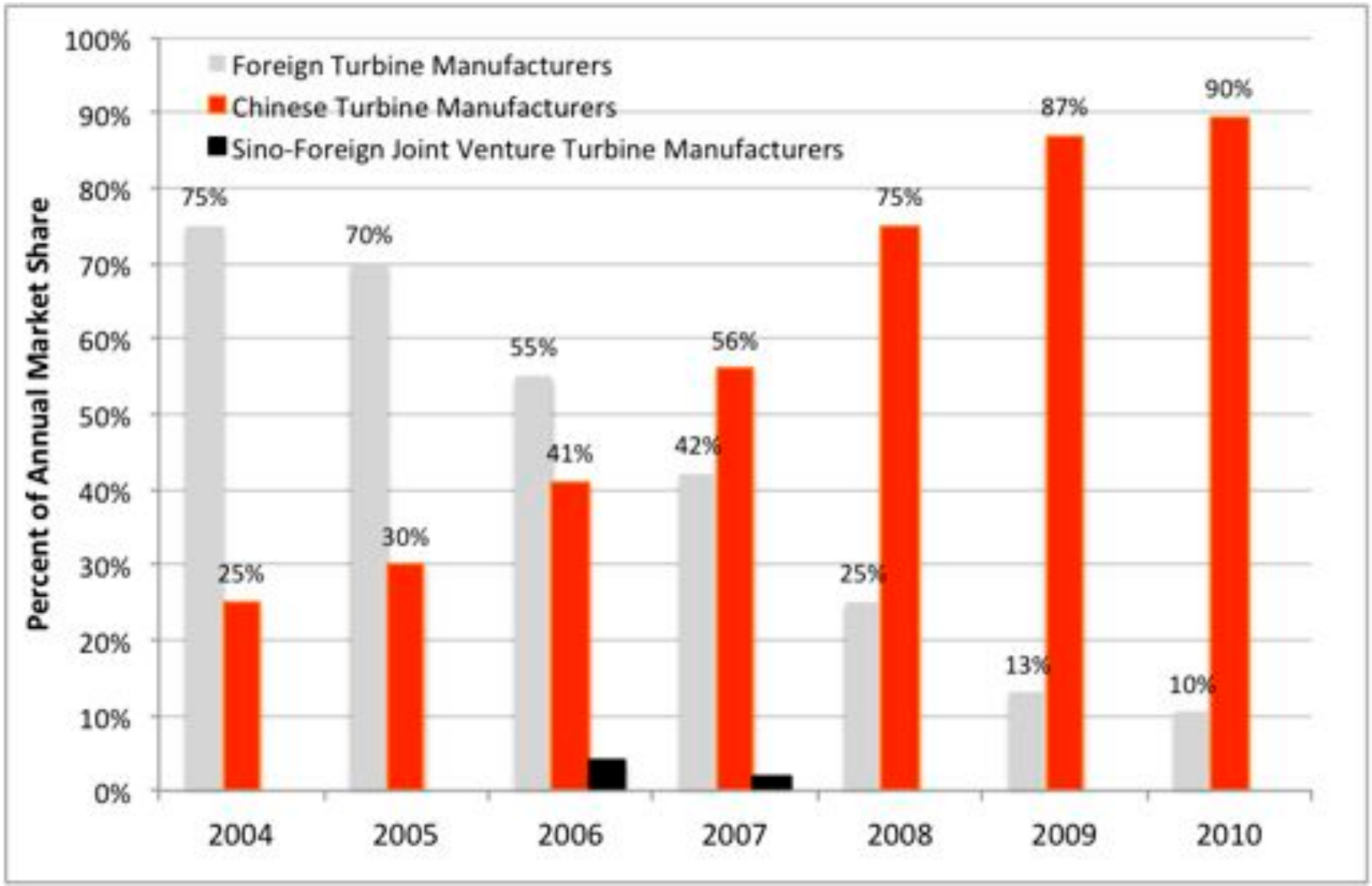
Technological Progress in the Wind Industry



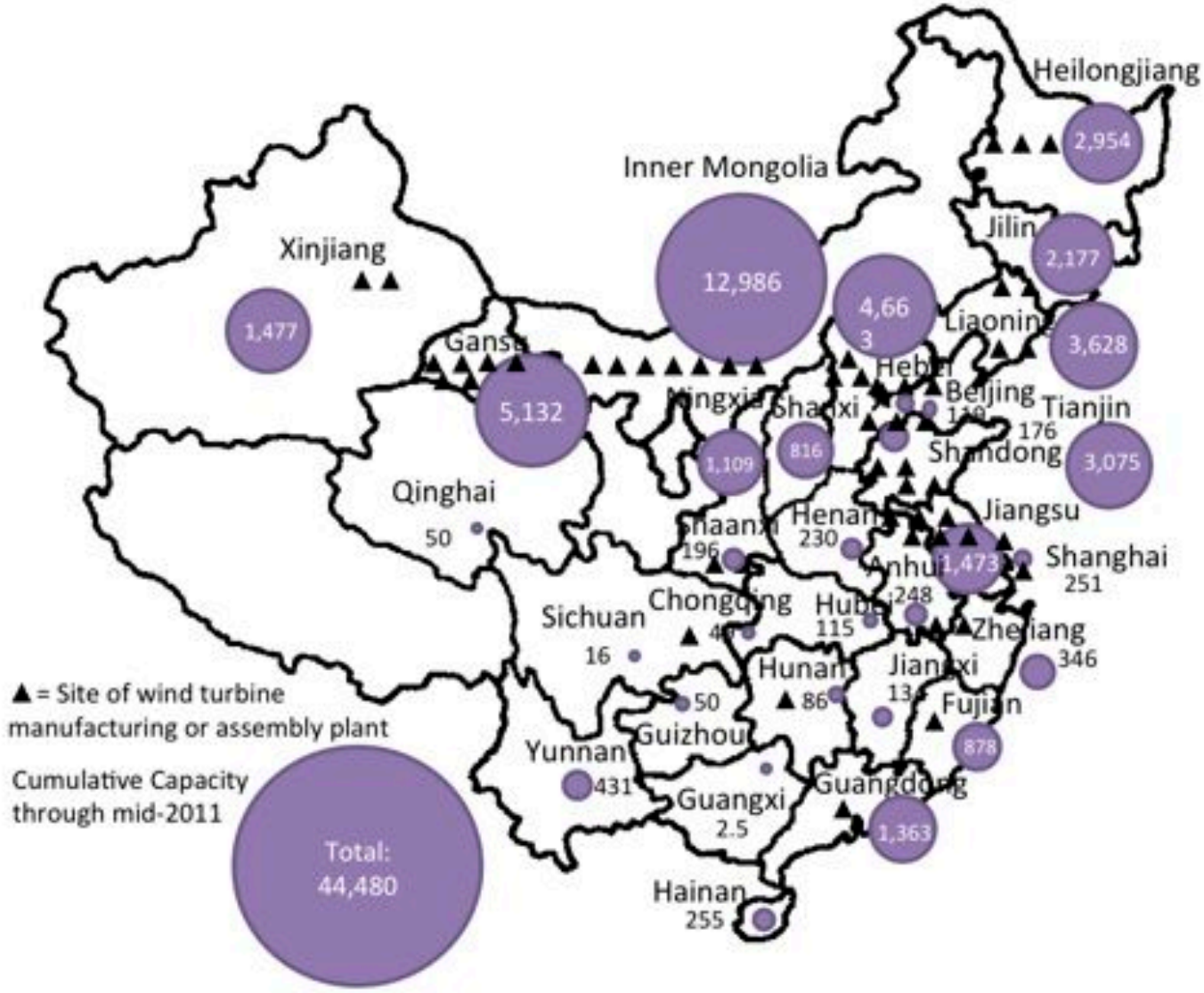
BTM, World Market Update 2010

The Chinese Success Story



Lewis, *Green Innovation in China,* Forthcoming 2012.

Provinces Becoming Hubs of Manufacturing and Deployment



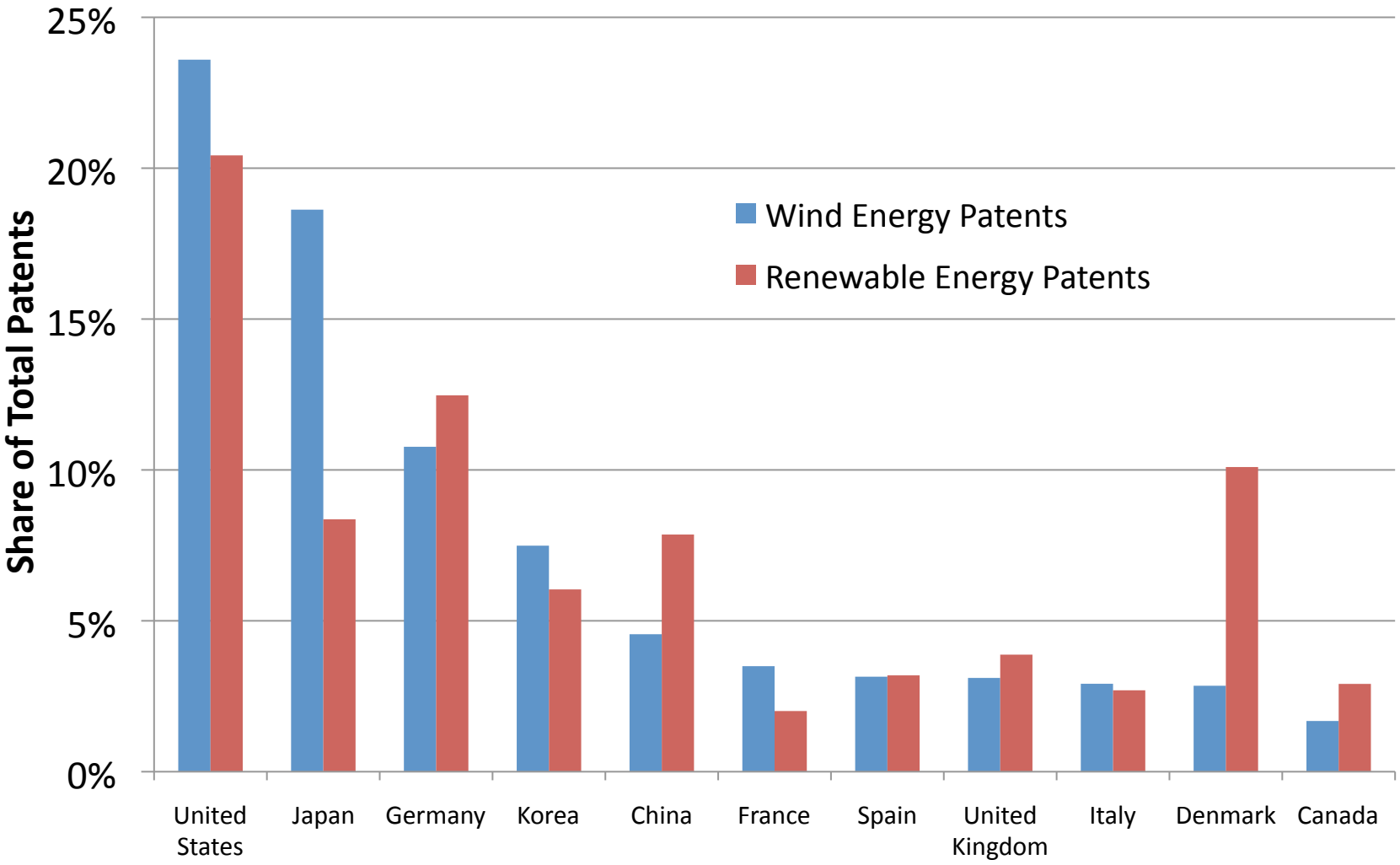
Lewis, *Green Innovation in China,* Forthcoming 2012.

Very Few Chinese Wind Turbines Have Been Exported Outside of China… Yet

- China's wind technology exports were worth just $104 million in 2010

Lewis, *Green Innovation in China,* Forthcoming 2012.

Patents Filed Under the PCT



PCT=Patent Cooperation Treaty (provides a streamlined approach for applying for a patent in multiple countries).
OECD Patent Database 2011

Cross-Country Comparisons

- China
  - Strong policy support (especially for Chinese companies)
  - Large domestic potential
  - Lots of manufacturers; limited competition
  - Rely on licensing for technology development; M&A for larger firms; joint development for more experienced firms
  - Limited global learning networks/RD&D activities
- India
  - Unstable policy support
  - Future expansion in domestic market uncertain
  - First developing country industry mover, but limited domestic competition
  - Leading manufacturer already a global player, with expansive global operations and networks
- South Korea
  - Limited domestic policy support, but evolving
  - Limited potential for domestic expansion, some opportunities offshore
  - Late-mover, but leapfrogging directly to most advanced technologies
  - Building on domestic industrial base and multinational companies; have the capacity for M&As and joint development

Domestic Policy Implications

- Technology transfers are occurring via commercial channels, but still are opportunities for technology improvement
  - Improve technical capacity in wind turbine design through independent research and testing centers
  - Knowledge transfer also important in O&M of projects
  - Can build upon international experience
  - Be careful about WTO conflicts
    - Particularly regarding local content requirements and other controversial industrial policies

Implications for Intl. Climate Regime

- Payments for licensing IPR for commercially-available tech not necessarily a barrier to technology transfer
  - Royalty payments for wind licenses are typically small proportion of total capital investment
- Government can facilitate tech transfers within the private sector (via procurements, aggregating demand)
  - Commercial technology can be acquired through private sector transfers
  - But with advanced/pre-commercial technology, leaders are not willing to give up IPR to competitors
- Are opportunities for collaborative R&D on pre-commercial technologies
  - Less competition and concerns about IPR during the pre-commercial stage, role for government support

Implications for Leapfrogging

- Substantial technical advances are possible in relatively short amounts of time
  - It took China, India and S. Korea less than 10 years to go from no experience to complete wind turbine systems
  - Existing industrial base helps; may not be applicable for LDCs
- Licensing is a relatively inexpensive way to acquire knowledge, but future potential is limited
  - Structure of license should include "know-how," but often does not
  - Beneficial also to transferring firm, particularly if not active in that market
  - Comes with market restrictions which limit expansion
  - Licenses frequently come from the same companies
- Tapping into global learning/innovation networks can be highly valuable
  - Suzlon's network of strategically positioned global subsidiaries contribute to its base of industry knowledge and technical capacity
  - Goldwind recognizes this value as well and is expanding intl. activities
  - Korea's new entrants looking globally for their technology partnerships; looking to export markets outside Korea and positioned to compete with global industry leaders

Related Publications

- Lewis, Joanna I. "Building a National Wind Turbine Industry: Experiences from China, India and South Korea." *International Journal of Technology and Globalisation* 5, no. 3/4 (2011): 281–305.

- Lewis, Joanna I. "Technology Acquisition and Innovation in the Developing World: Wind Turbine Development in China and India." *Studies in Comparative International Development* 42, no. 3–4 (October 2007): 208–232.

- Lewis, Joanna I. *Green Innovation in China: China's Wind Power Industry and the Global Transition to a Low-carbon Economy.* Columbia University Press, 2013. (available now!)