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Production networks in the wind turbine industry, which place for developing countries in East Asia?

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Production networks arise from the cross-border dispersion of component production/assembly within vertically integrated production processes. In industries where a production network pattern is in place, each country specializes in a particular stage of the production sequence. Figure 1 and Box 1 below illustrate the relevance for our industry:

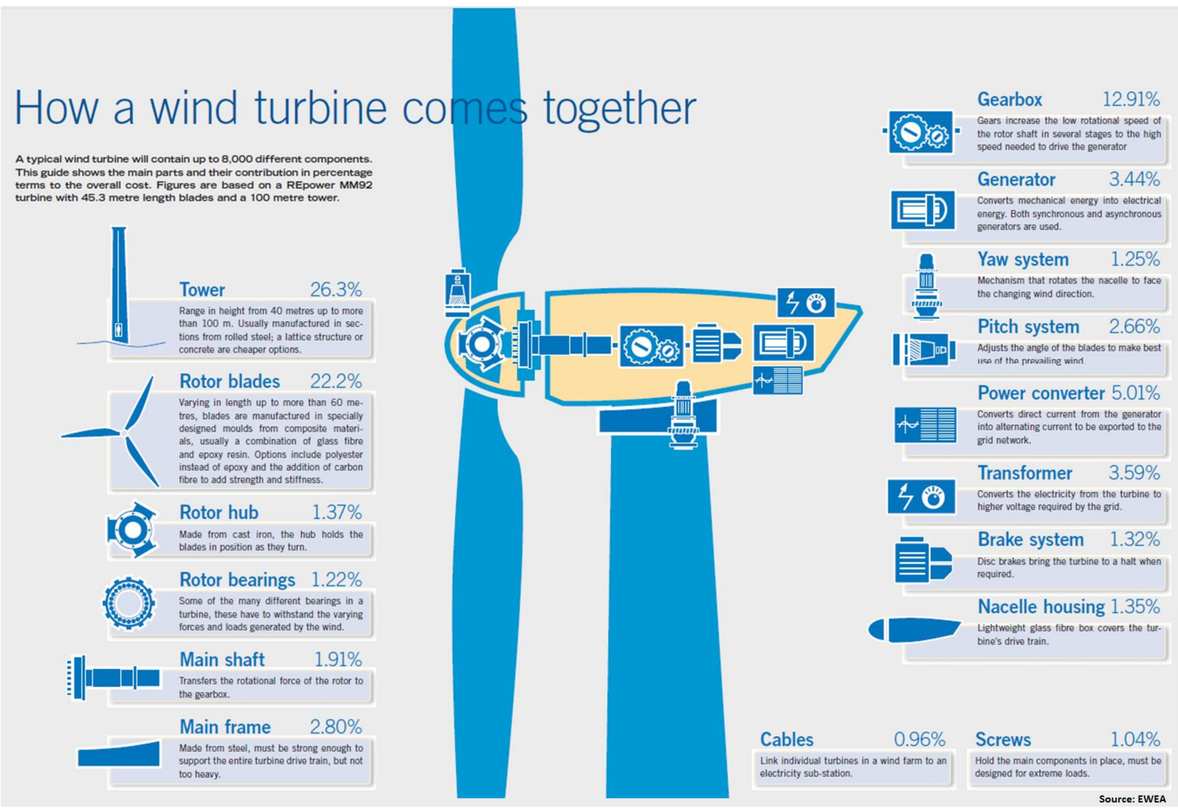


Figure 1. How a wind turbine comes together. Source: Aubrey, C. (2007) 'Supply chain: The race to meet demand', *Wind Directions*.

Box 1 – How Gamesa produces wind turbines

The Spain corporation Gamesa is the top 10 wind turbine manufacturers. In 2014, it accounts for 4.7% of total market 51, 026MW.

The Corp.'s wind turbines were made by a production network of 8,862 suppliers in over the world. In total, the company made purchases valued at €2.2 billion, concentrated mainly in Spain, China, India, the US, Mexico and Brazil.

The percentage of local purchases reached 88% in China, 61% in India and 29% in Brazil in 2014.

High percentages of the parts used by Gamesa are sourced outside the firm, specifically 86% of its blades, 49% of its gearboxes, 12% of its generators and 24% of its power electronics.

Source. Gamesa report 2014.

Theoretical framework

Determinants for location choices of a multinational enterprise

- Neo-classical trade theory: Helpman, E. (2011) *Understanding global trade.* Harvard University Press
- Industrial organization theory : Yamashita, N. (2010) *International fragmentation of production: The impact of outsourcing on the Japanese economy.* Edward Elgar Publishing.
- Global value chain theory: Gereffi, G., Humphrey, J. and Sturgeon, T. (2005) 'The governance of global value chains', *Review of international political economy,* 12(1), pp. 78-104.

The wind turbine production network is intra-regional rather than inter-regional.

Europe is the largest trade cluster, followed by Asia

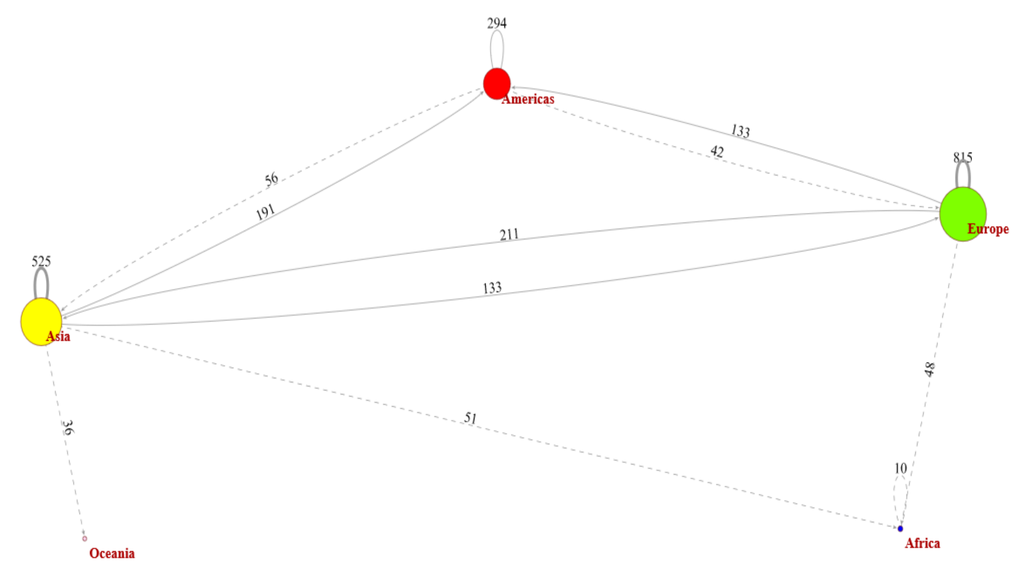
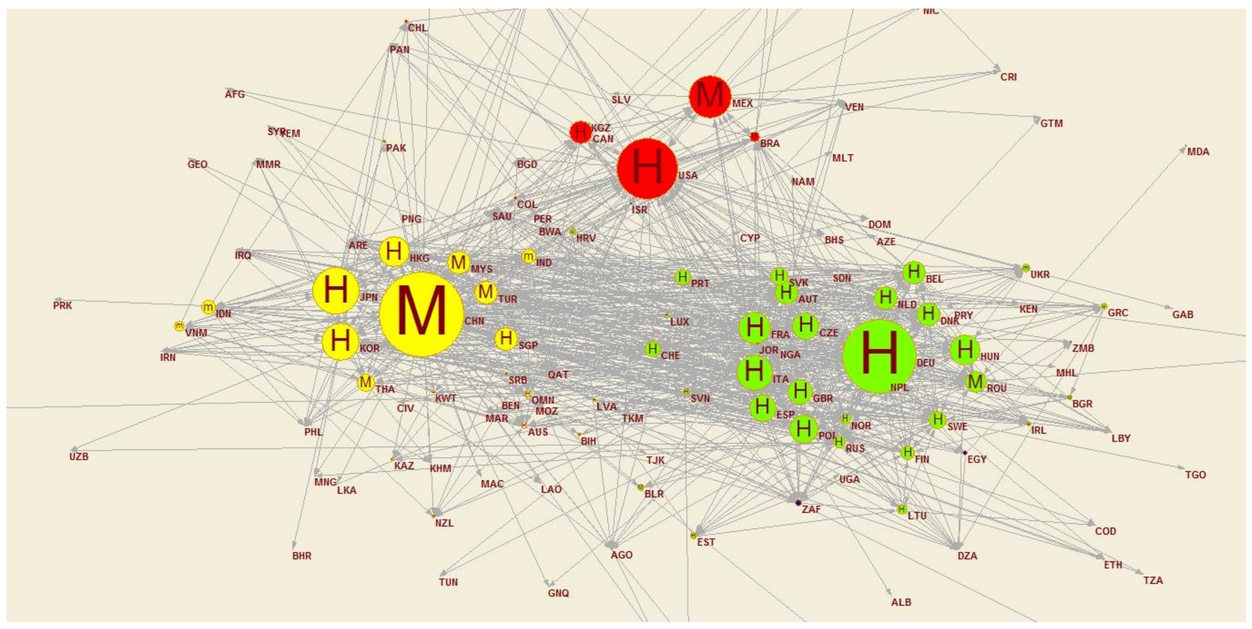


Figure 2. Exports of Wind turbines' parts and components across regions in 2014. Unit: 10^9USD. Source: Author compiled from UNComtrade data.

Low and lower middle income countries only account for a minor share of the network.



H - High income; M - Upper middle; m - Lower middle; L - Low income
Size of vertices: the percentage of the countries in total world exports

Figure 3. Exports of Wind turbines' parts and components across countries in 2014. Source: Author compiled from UNComtrade data

Next steps

- Quantitative approach with econometric models will be employed to examines the impacts of (i) countries' profiles, (ii) industry features and (iii) firms' profiles on the participation of East Asia developing countries in the network
- Qualitative sector surveys will be used to explain how (iv) the type of networks determines the network entrance ability of firms in East Asia developing countries

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