

COMPLETION REPORT

The impact of innovative mercantilism on Japan's High-speed rail development

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In 2004, Japan's Kawasaki Heavy Industries (Kawasaki) and other leading high-speed rail (HSR) manufacturing companies began exporting HSR technologies to China. Eyeing China's lucrative market, foreign HSR companies assumed their Chinese competitor would only become a threat after many decades. In 2007, China stopped importing HSR technologies and started assimilating foreign technologies according to the domestic situation and exporting HSR abroad. Many HSR experts speculated that: 1) China had unlawfully pirated foreign technologies; and 2) China's "innovation mercantilism" have reduce the global market share of foreign innovators, lower their research and development (R&D) spendings, and harm the global HSR technology. Yet, an alternative liberal conceptualization of geoeconomics frames China's "market for technology" policy as a pure economic strategy, seeking non-zero-sum cooperative gains to advance domestic industry rather than pushing for geopolitical domination.

Against such an HSR technological developmental debate, this research provides a nuanced understanding of the HSR technology development before and after China's entry into the HSR market in 2007. Through a systematic review of the HSR-related patents granted by the World Intellectual Property Office (WIPO), the Japan Patent Office (JPO) and the China National Intellectual Property Administration (CNIPA) between 1997 and 2021, this report sheds light on three significant findings.

First, China's HSR-related technology dominates the industrial sector by domestic and international standards. Between 1997-2006, 71 HSR-related patents were granted at CNIPA. The number has increased exponentially to 11,763 between 2007 and 2021. Internationally, China has acquired two HSR-related patents in the pre-2007 period and 197 in the post-2007 period, equivalent to almost 80% of 248 world-combined internationally recognized HSR patents. Interestingly, out of 100 HSR patents registered in JPO since 1996, six of them were granted to Chinese applicants.

Second, such technological advancement in China has not displaced its competitors' R&D efforts in developing HSR technology. According to the WIPO database, there were only 13 HSR-related patents granted internationally between 1997 and 2006 (1.3 patents per year); the number has grown to 248 between 2007 and 2021 (16.5 patents per year). Interviews with Japanese HSR experts reveal that they began to file patent applications only after realizing the threat from a late-comer and the need to protect the indigenous intellectual properties. The filing of patented technology does not only serve to protect the innovator, it also serve to share the R&D outcome under an internationally consented timeframe. The resulting global HSR technology is likely to be a non-zero-sum advancement.

Lastly, unpacking the HSR patents into the constituent technologies according to the WIPO classification allows for a more nuanced explanation of the countries' variation in HSR technology development. While Japan has endeavoured to secure internationally recognized HSR-related patents in advancing technology development or material production related to upgrading the electrical moving units (EMUs) and the communication system, China has researched beyond the core technologies for EMUs (Lee 2012) covering areas including civil and track works, traction and power supply, operation and maintenance system, as well as other minor technical areas, such as furniture or suction cleaners, door and window design, as well as elevators or escalators or moving walkways. Japan is obviously specializing its sophisticated HSR technology which requires longer research timeframe. China, on the other hand, is becoming an all-rounder and its HSR technology may sometimes have to adjust downwards for pragmatic and economic concerns especially in developing countries.

Publication of the Results of Research Project:

Verbal Presentation (Date, Venue, Name of Conference, Title of Presentation, Presenter, etc.)

Thesis (Name of Journal and its Date, Title and Author of Thesis, etc.)

An article entitled "Japan's High-speed-rail innovation spillovers from China's market for technology strategy" is under preparation.

Book (Publisher and Date of the Book, Title and Author of the Book, etc.)