Heading Off Track: The Impact of China's Mercantilist Policies on Global High-Speed Rail Innovation

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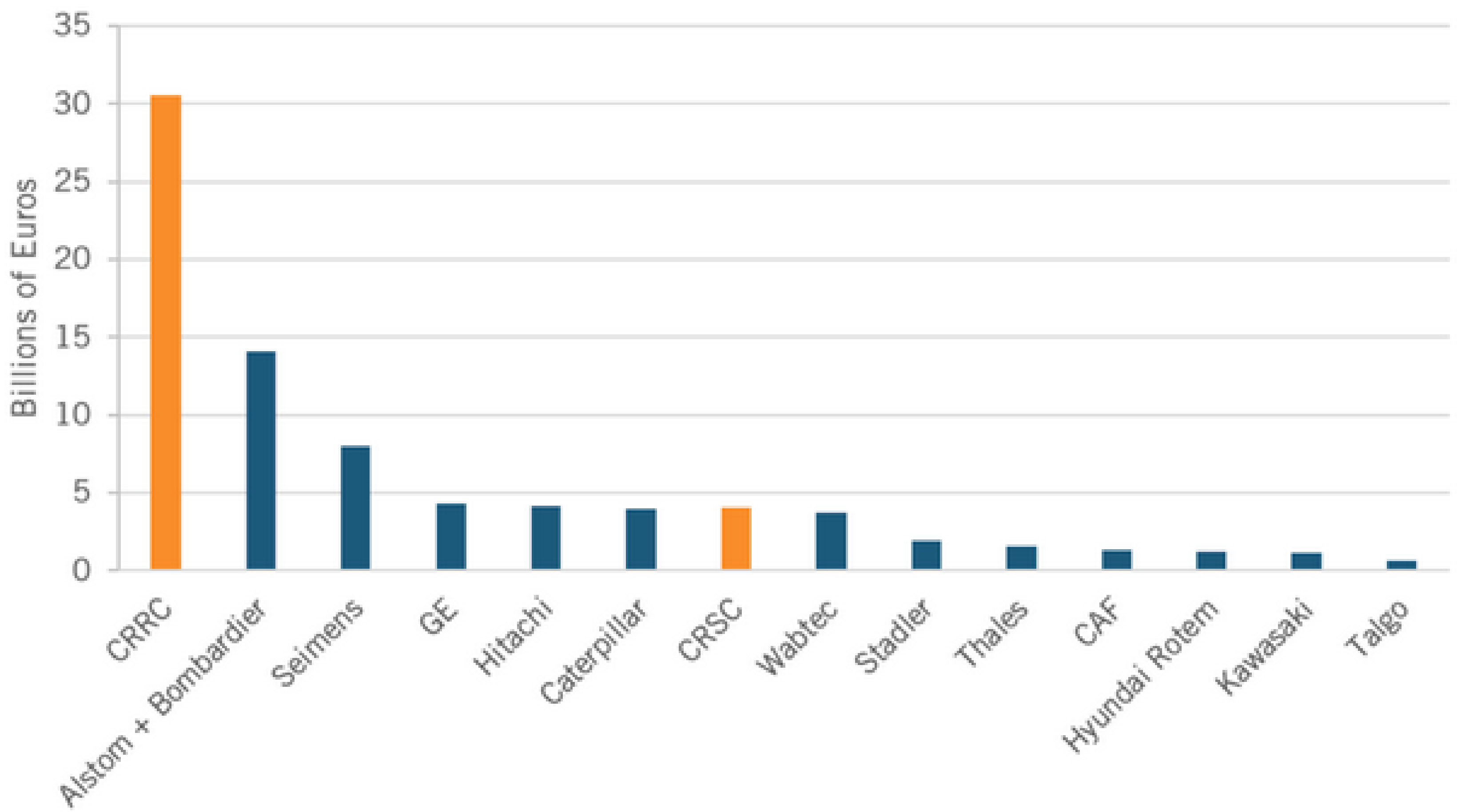
High-Speed Rail: Key Takeaways 1/2

- China's state-directed bid for leadership distorted the global HSR market.
  - Mercantilist tools: massive subsidization, mandated mergers, forced technology transfers, discriminatory procurement rules.
- China pursued zero-sum mercantilism instead of win-win trade/innovation.

High-Speed Rail: Key Takeaways 2/2

- Infrequent HSR projects means it's critical that they go to market- and innovation-driven firms, not state-driven ones.
- Revenue = R&D.
  - Each project lost to CRRC means fewer new patents.
- Necessary Reaction - two-fold:
  - Restrict Chinese rail firms and products in domestic markets.
  - Support R&D, trade, and market opportunities for innovation-driven firms.

Size Matters: CRRC Towers Over All Others



Scope Matters: Capabilities of Top Rail Firms

Manufacturer	Diesel Locomotive	Electric Locomotive	Electric Multiple Units	Diesel Multiple Units	High-Speed Rail	Passenger Coaches	Freight Wagons	Signalling/ Control Systems	Turnkey/ System Integration
CRRC	✓	✓	✓	✓	✓	✓	✓	✓	✓
Siemens Mobility	✓	✓	✓	✓	✓	✓	✗	✓	✓
Alstom + Bombardier	✓	✓	✓	✓	✓	✓	✗	✓	✓
GE + Wabtec	✓	✓	✗	✗	✗	✗	✗	✗	✓
Hitachi Rail	✗	✗	✓	✓	✓	✓	✗	✓	✓
Trinity Rail	✗	✗	✗	✗	✗	✗	✓	✗	✗
Transmashholding	✓	✓	✓	✓	✗	✓	✓	✗	✗
Greenbrier Companies	✗	✗	✗	✗	✗	✗	✓	✗	✗
Stadler Rail	✓	✗	✓	✓	✓	✓	✗	✗	✗
Kawasaki	✓	✓	✓	✓	✓	✓	✓	✗	✓
Hyundai Rotem	✓	✓	✓	✓	✓	✓	✗	✓	✓

Domestic HSR Mercantilism Goes Global

- Chinese mercantilism locked up its domestic market.
  - Over two decades, China coerced technology out of foreign firms and gradually squeezed them out of a growing range of rail sectors.
  - E.g. HSR market effectively closed since 2010.
- Foreign firms now face results of lack of early, concerted action.
  - They now face Chinese firms in most third-country markets.

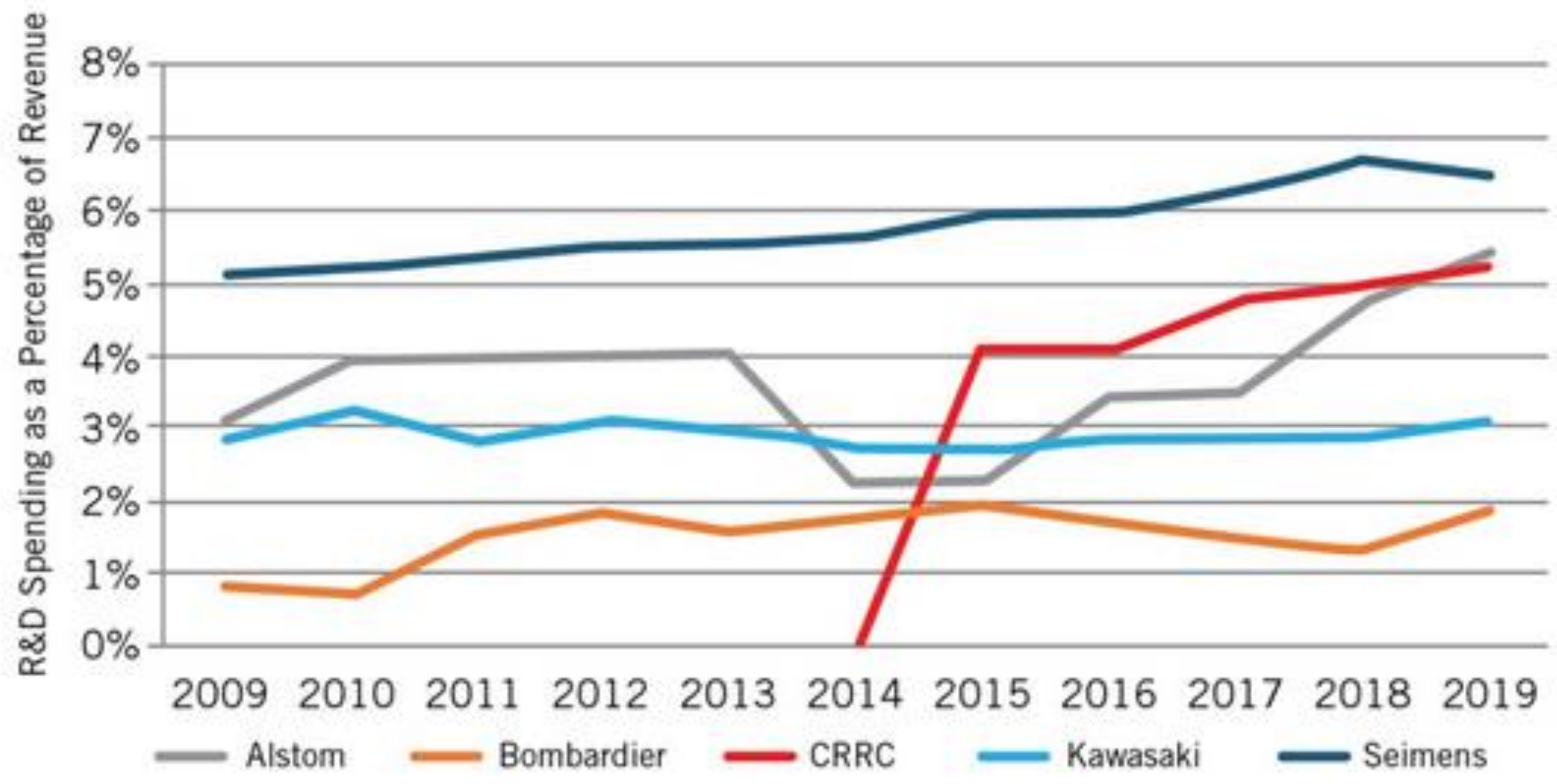
CRRC Goes Global: Some Wins, Some Losses

CRRC's Main Weapon: Cheap (State-Backed) Financing

- State-supported financing allows abnormally low bids—20-30 percent below competitors—for procurement contracts.
- E.g. CRRC's bid for a commuter rail contract in Pennsylvania.
  - $47 million less than the next competitor (Hyundai Rotem).
- Quote from Hyundai Rotem - which has a factory in Philadelphia.
  - "I cannot grasp how they are able to do it at that cost."

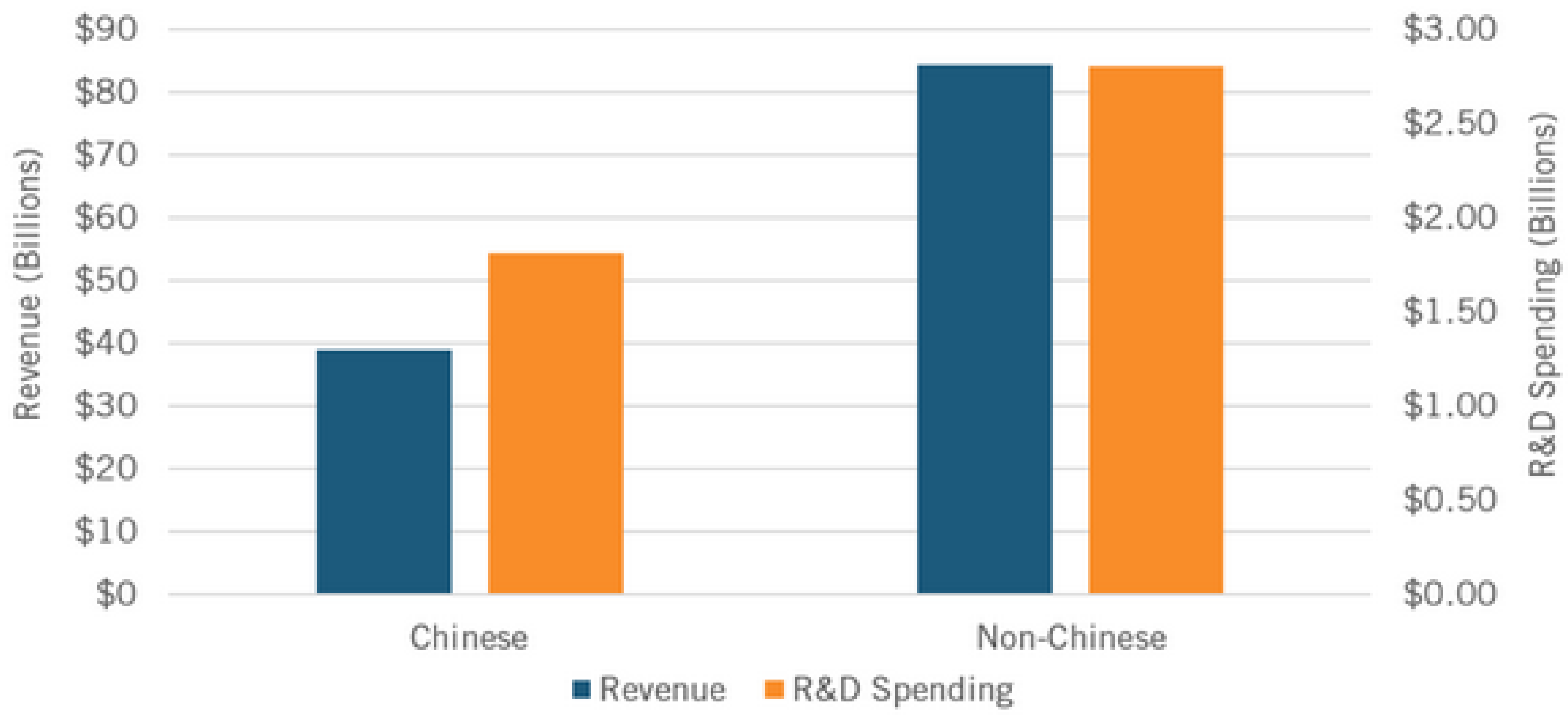
The Impact: Assessing Comparative Innovation

Figure 10: R&D spending as a percentage of total revenue for major rail companies[272]



Size Matters: Aggregate Revenue & R&D Spending

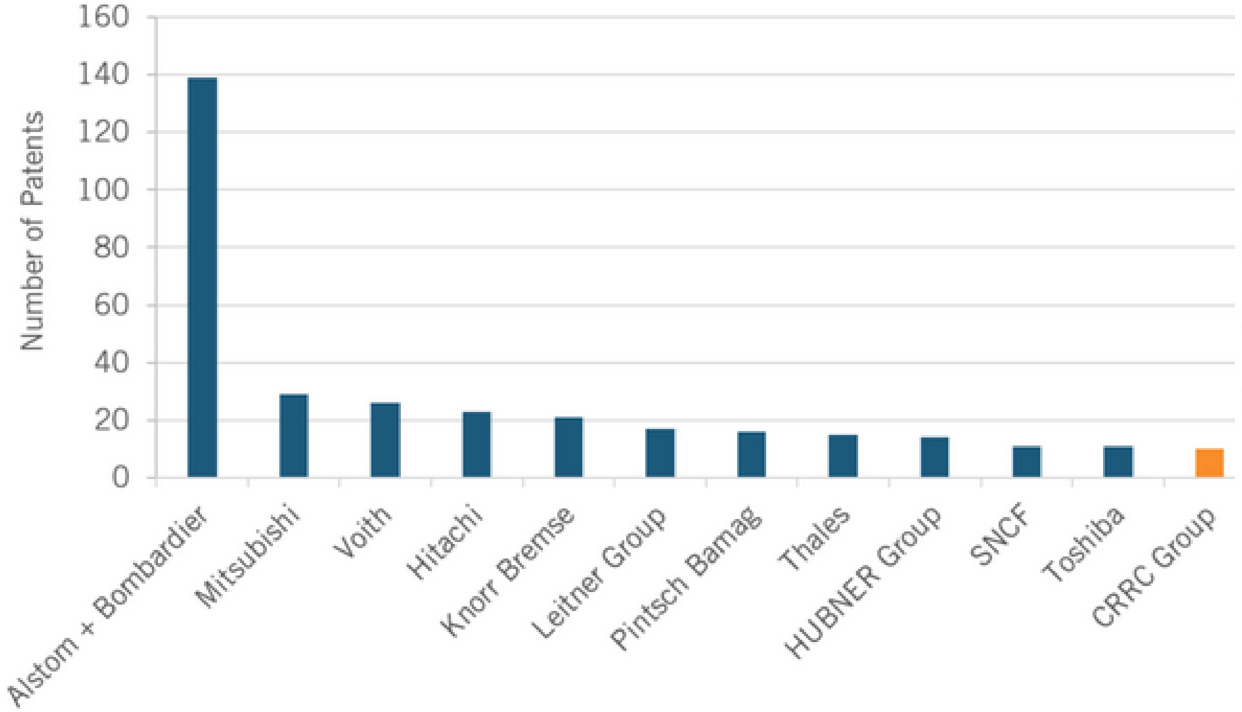
Figure 11: Total Chinese versus non-Chinese revenue and R&D spending (2019)[276]

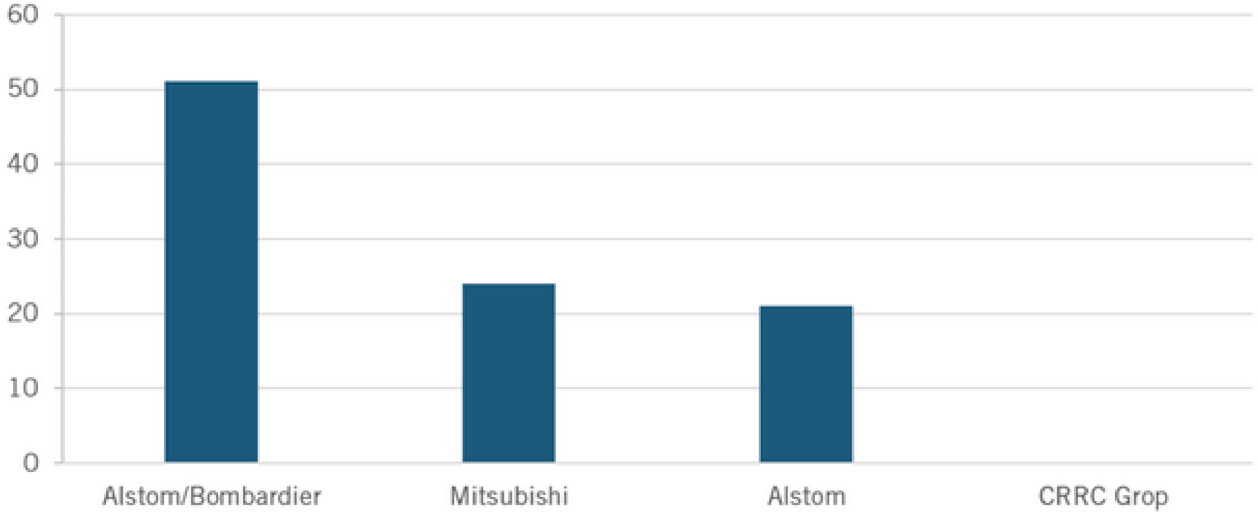


Comparative Assessment of Innovative Patents

- EPO, USPTO, and HSR tech specific analysis
  - CRRC/China have lots of Chinese patents
  - But few if any truly valuable patents in the US and Europe.
  - Consistent in patent reviews of HSR vibration, bogie, maglev, traction, and braking technologies.
- But the gap will close if counter-action isn't taken.

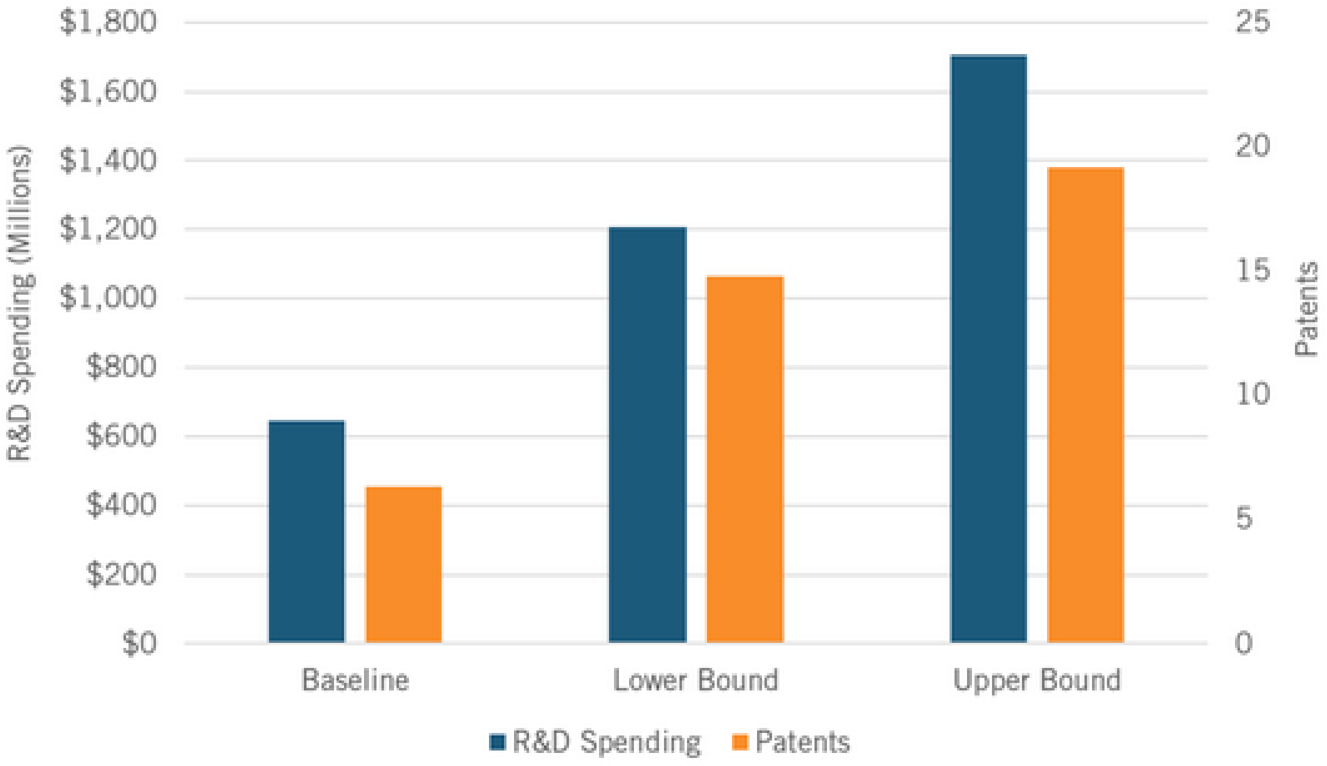
EPO (left) & USPTO (right) Rail Patents





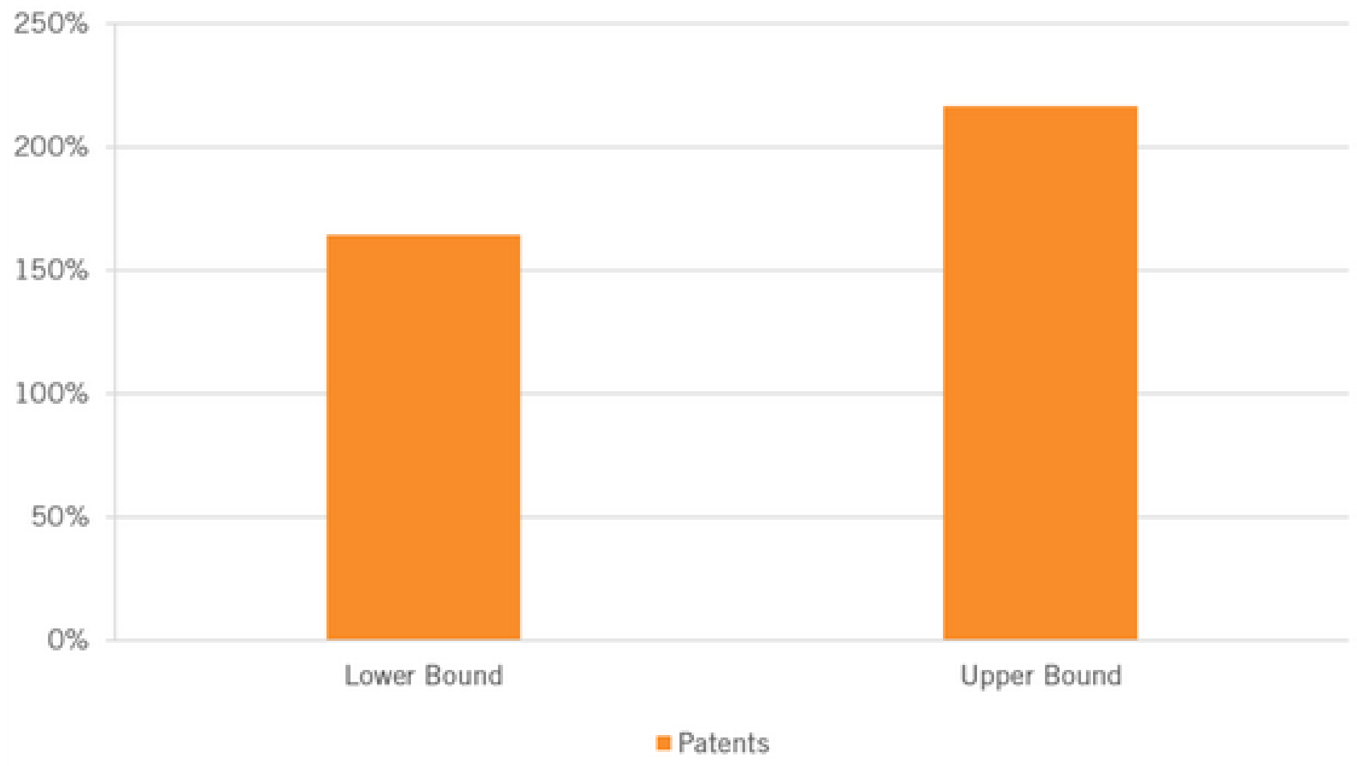
The Impact of Innovation Mercantilism: Reduced Innovation

Figure 19: Total R&D spending and patents by foreign firms as per the baseline, fair trade, and market access (upper bound), and the "somewhat fairer" fair trade and market access (lower bound) scenarios (2015–2019)[313]



The Impact of Innovation Mercantilism: Reduced Innovation

Figure 20: Change in patents by foreign firms from the fair trade and market access (upper bound) to the "somewhat fairer" fair trade and market access (lower bound) scenarios (aggregated for 2015–2019)



Recommendations to Push Back

- Block Chinese acquisitions.
- Create fairer procurement markets.
- Stop World Bank support for Chinese rail projects/companies.
- Expand export financing.
- Help international standards development.
- Increase R&D support.

Thank You!

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