National System of Innovation: A View from India

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National System of Innovation (NSI):

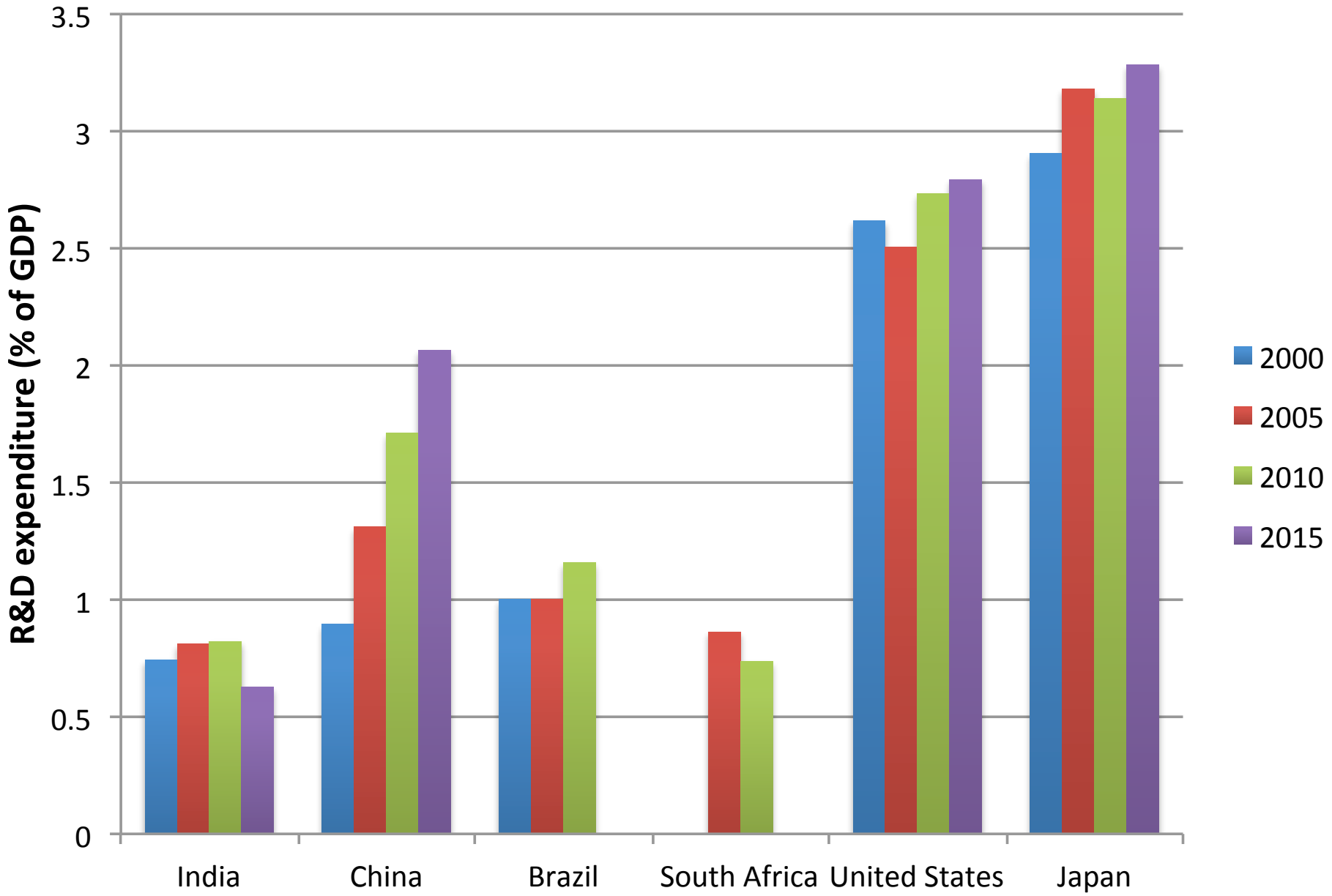
NSI: The 'system' that underlies the processes that influence the development, diffusion, and use of innovation (where an innovation is the commercial introduction of a 'technology' that is new to the world or new to the region/application)

An NSI consist of interacting constituents that are organizations (formal structures, e.g., government agencies, academic and research organizations, firms, financiers, incubators) and institutions ('rules of the game', e.g., norms, culture, policies, laws, practices)

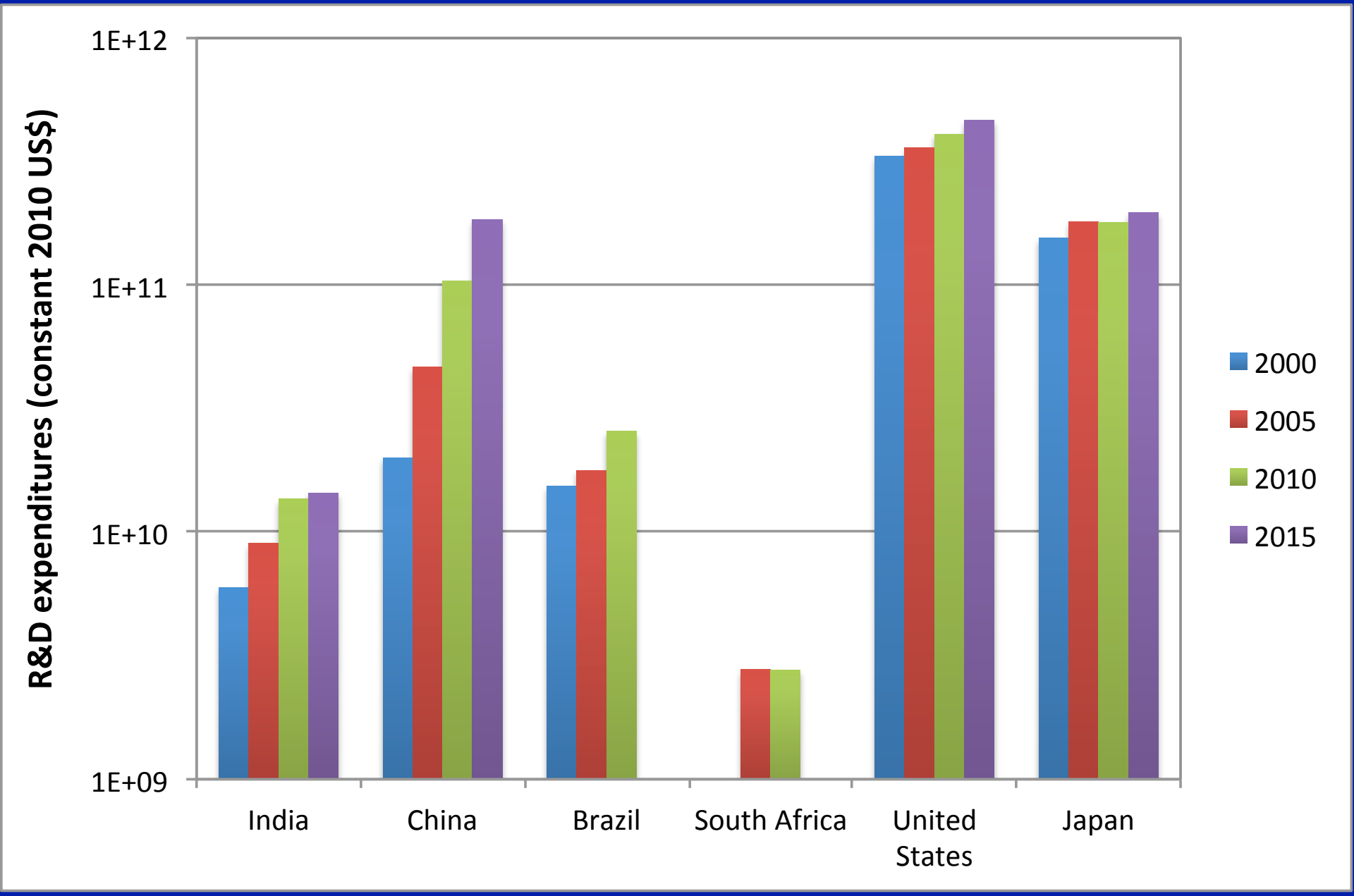
NSI: A view from India

- ✓ The Indian NSI is dominated by government agencies – both funding (45.1% by central government,7.4% by state governments, and 5.5% by PSEs; private sector 38.1%) and performing (DRDO, DAE, DOS)
- ✓ Overall investments in R&D ~0.7% of GDP (global average 2.2%)
- ✓ Private sector R&D spending has risen rapidly (about 19% CAGR since 2001)
- ✓ Expenditure on education ~4% of GDP

(Data from DST R&D Statistics 2017-18)



Source: World Development Indicators



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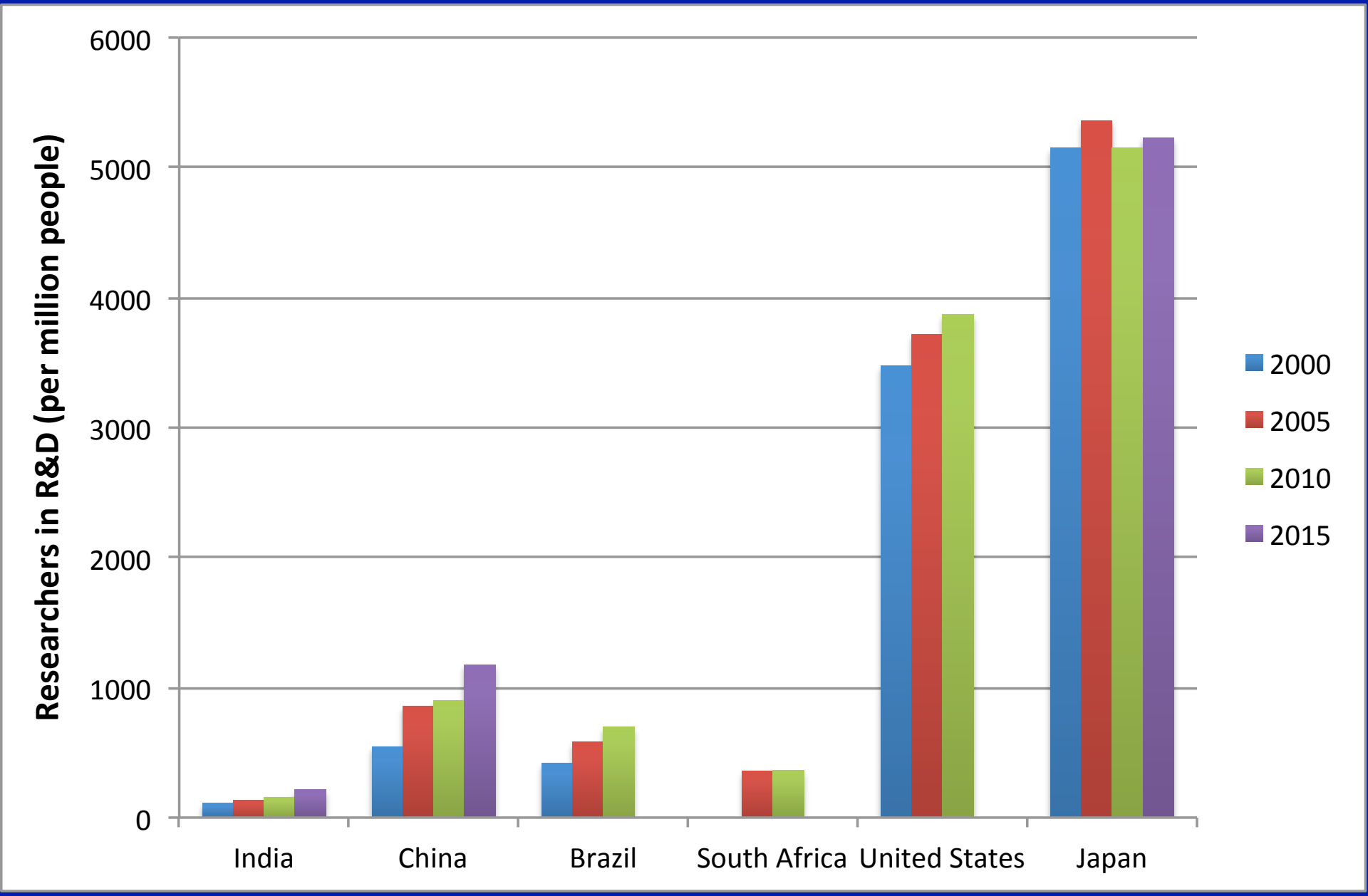

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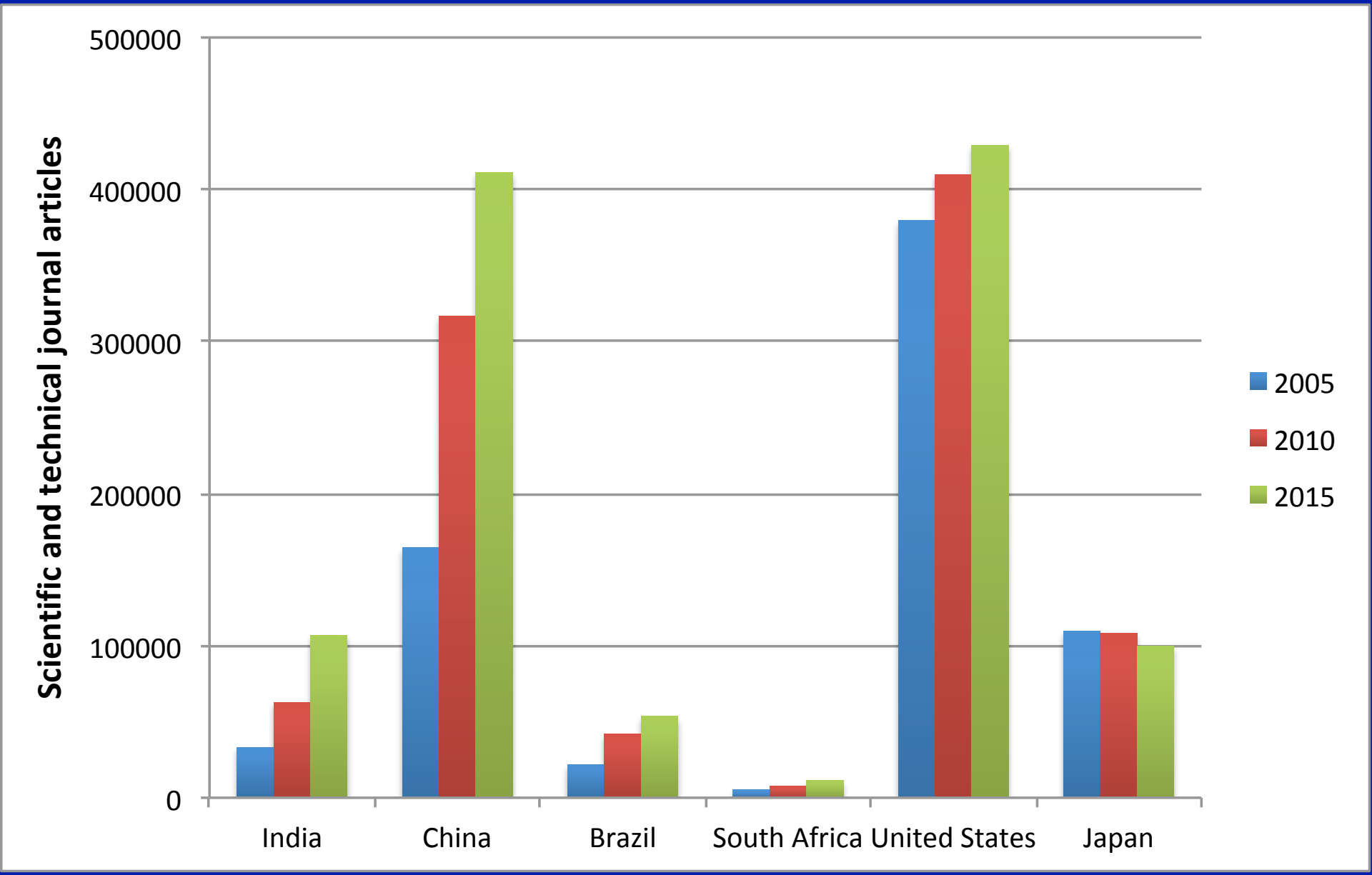

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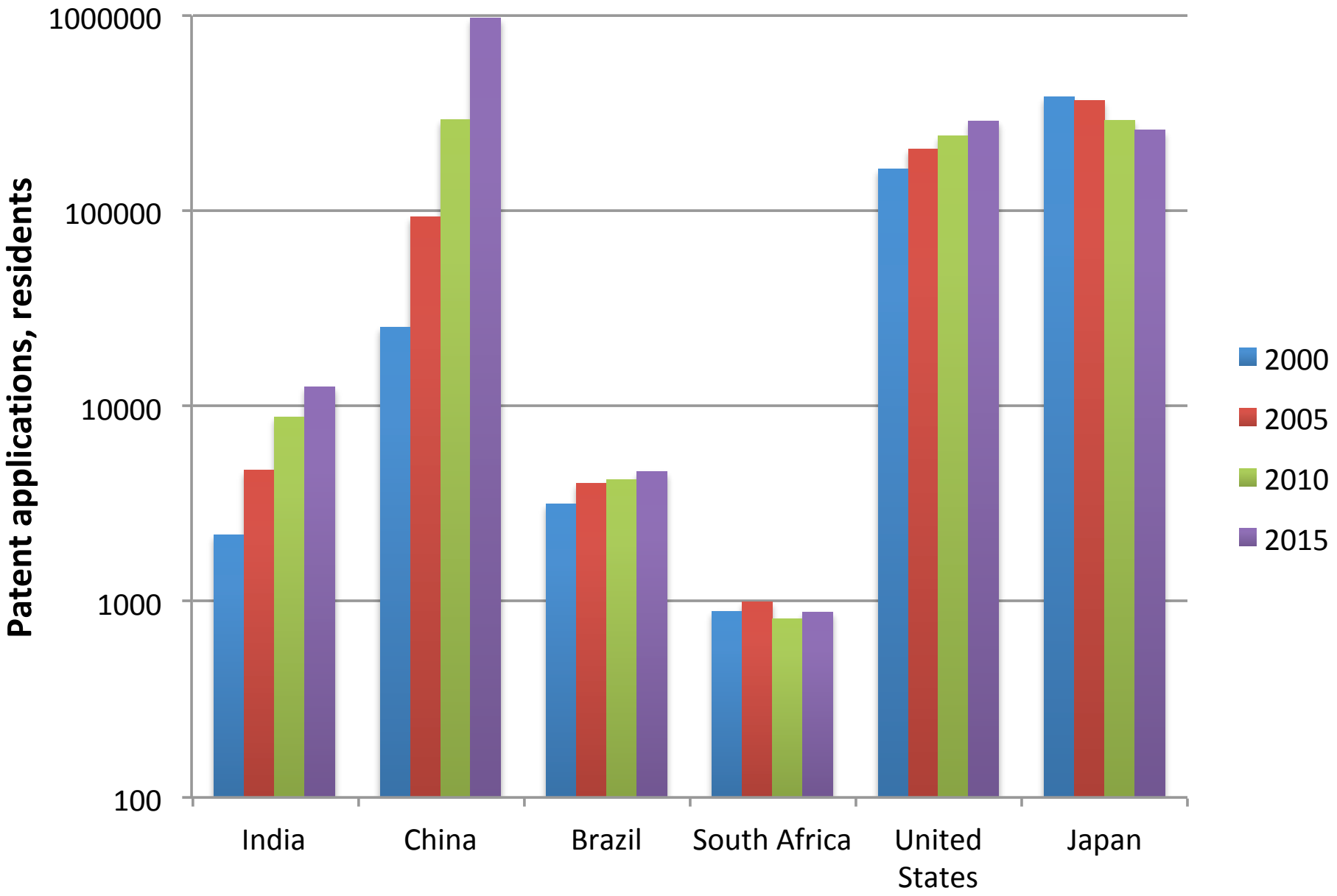

Source: World Development Indicators

NSI: A view from India (3)

Indian NSI characterized by wide distribution and extremes

- ✓ Government agencies: Some but not all are effective in leveraging S&T (e.g., DBT, BEE, Space)
- ✓ Education: Renowned higher education institutions but majority of education institutions of low quality
- ✓ Firms: World-quality products in many areas (pharma, IT, space, automobiles, steel, cement, power) but also many poorly performing firms and large number of SMEs
- ✓ Agriculture: Enormous diversity in productivity; high vulnerability

Almost a bifurcated NSI – parts that are world-class (with diverse linkages) and parts very poorly performing with limited linkages

What shapes the performance of the Indian NSI?

Limited investments in S&T (R&D and education)

Weak or ineffective institutions and organizations, especially regarding translation of aspiration to action. Limited focus on systematic or strategic policy development and implementation. Some success, especially in mission-oriented efforts.

Limited interactions between actors (academia and industry; academia and government; MNC R&D centers and Indian academia/firms)

Limited integration across issues/sectors (energy and health, agriculture, climate and health, urban planning and environment…)

Numerous 'experiments'/efforts but often no scaling

Little or no learning from experience and connect to policy design

Lessons for CTCN's NSI efforts

1. Focus on strategic interventions that leverages existing capacity, i.e., builds on existing elements of NSI, to achieve climate goals

   - ✓ Improve policy-making in relevant govt agencies by helping build policy-analytical capabilities and connection to policy-making. Pay particular attention to upstream activities (strategic planning) and implementation design, taking into account national/local context.
   - ✓ Help enhance interactions between relevant actors (e.g., academic institutions and SMEs on energy issues)
   - ✓ Share effective practices from other countries, especially developing countries, both on organizational strengthening and policy design/ implementation.

2. Address key relevant organizational/institutional gaps

3. Focus on programmatic efforts rather than projects. Demo, early adoption, and scaling may be particularly salient areas.