China’s Emerging Innovation Trajectory: Critical Role of Foreign R&D Activities

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1. The New Face of Global Competition in the 21st Century

- IPR Wars
- Technology Wars
- Patent Wars
- Standards Wars
- Innovation Wars
- Talent Wars

Global Competition
Globalization has changed the nature of innovation

• Key success element: harnessing and managing transborder innovation—new core competency (Bartlett and Ghoshal)

• Competitive firms are those that perform well across three dimensions
  – Ability to link and leverage knowledge, information, and expertise across borders
  – Ability to shift to integrated systems of operation and management...software is critical as the “glue”
  – Ability to be a technology leader: establishing the rules and standards of the game

• Moreover, successful companies must operate with a high degree of “simultaneity”-- process and product + service differentiation count in the end as much as (if not more than) costs management—*[necessary but not sufficient]*
2. Three Periods of China Investment Fever

Phase 1, 1979-6/4/89
- Jump in Quickly: Market of 1 Billion
- Tiananmen Incident

Phase 2, 1991-2001
- Normalization Of Business
- Asian Biz Crisis I & II

Phase 3, 2001-Present
- Globalization
- China Joins WTO

R&D
Channels of Access: China has built an extensive network for acquiring technology

- Bilateral S&T Agreements
- Overseas Students & Scholars
- Overseas Chinese Links
- Membership in Int'l S&T Bodies
- Foreign Technical Experts
- Foreign Direct Investment and R&D
- Defense Cooperation + Exchanges
- Technology Transfer Agreements
- Illicit Acquisitions
- Reverse Engineering
- International S&T Conferences

Taiwan
Changing Drivers of PRC Growth

- Low Cost Labor Drives Growth (1985)
- Low Cost IP Drives Growth (2005+)

Source: DeWoskin and Stevenson, April 2005.
3. The Supply-Side of the Talent Pool: A Talent Shortage??

New enrollment at regular institutions of higher education (1,000 persons)

Year

Average annual growth: 13.0%

Average annual growth: 28.9%

New enrollment in graduate education (1,000 persons)

Year

Average annual growth: 12.4%

Average annual growth: 24.0%
From Official Data to Reality: “Real” Size of China’s Eng Grad Pool

1.09 million
UG Engineering Graduates (2005)

Minus non 4 yr Grads
478,000
Minus Grad School-PRC
435,000
Minus For. School
326,000
Minus Low Quality
245,000
Minus Misc Mismatch

196,000
Minus Those Choosing Other Options

REAL #
196,000 +/-

Source: D. Simon and C. Cao, Talent—China’s Emerging Competitive Edge (Cambridge U Press, 2008)
Specific Reasons for S&E Shortage in China

• Not enough students trained with relevant skills and knowledge for the current and future job market: McKinsey only 10%

• Skills mismatch: labor shortage may be actually larger – companies have a specific demand for experience-based skills that universities can’t meet
  – More aggressive wage programs could reduce shortages

• Legacy of Cultural Revolution

• Particular areas of deficiency:
  – Lack of creativity
  – Uneasiness about taking initiative
  – Absence of an aptitude for risk-taking
  – Low tolerance for failure to support technological entrepreneurship and innovation
  – Absence of “soft skills”—management, communications, etc.
  – Limited international exposure and cross-cultural awareness
Reversing the Brain Drain…
….Catalyst or Internal Brain Drain?

![Graph showing the number of overseas students studying and returning over years from 1978 to 2004.](image)
3. The growth of MNC R&D centers is being driven by a confluence of global and local competitive factors

- **Pull Factors**: Capabilities + Policies (positive) + Economics
  - Gain access to under- and unemployed scientists & engineers, (including those from former third-line industries) as well as growing number of returnees
  - Size of China market and use of market “weighting” to set or enhance new global standards
  - Commitment of PRC govt to science and technology
  - Education policy—improve and expand training of S&Es
  - Commitment to the open door
  - Cost factors + global supply chain

- **Push Factors**: Demographics + Competition + Policies (negative)
  - Dynamics of global competition: innovation speed + capacity building
  - Market saturation
  - Tax policies
  - Visa policies
  - Salaries and benefit packages
  - Availability of technically trained people
4. Impact of Foreign R&D in China

• Foreign R&D in China as part of NIS is still a very new phenomenon—too early to measure full impact
• Policymakers need to strategize around “capture” options
• Clear tie between domestic R&D growth and foreign investment, e.g. focus on process innovation
• Contributions may be more intangible than tangible
  – Training—technical, methodology (design), teaming
  – Technology transfer—codified + uncodified know-how
  – Standards—best practices, industry standards, quality
  – Management—project mgt, business mgt, work environment
  – Networks and Access to Resources—knowledge networks
  – Spinoffs—new business ventures
  – Spillovers—assistance to vendors & suppliers…plus labor circulation/turnover—may be key vehicle for local benefit
  – Contribution to forming an environment supporting creativity
5. Whither Foreign R&D in China

- The largest unknowns regarding foreign R&D in China’s innovation system remain on the “software” side not the hardware or technology side of the equation
  - Skills and comfort levels re: managing in a fluid, fast changing environment
  - Skills and comfort levels re: managing technology across borders and cultures…in a fluid, fast changing environment
  - Comfort levels with respect to working outside of guanxi networks as well as ethnic networks
  - Ability to stimulate creativity in an environment where petty jealousies and ad hoc interventions often occur
  - Ability to absorb returnees and allow them to become “catalysts”
  - Ability to develop/educate managers who are flexible, adaptive, problem-solvers with a capacity for critical analysis and thinking across disciplines: where in the system does this happen?
  - Ability to grow a leadership contingency with the global outlook needed to compete effectively in China’s increasingly open economy

- MNCs need to pursue collaborative as well as pre-emptive strategies to harness emerging Chinese capabilities as part of new competitive paradigm—Intel’s Dalian project!!
Can China Achieve All Three Goals?

- Innovative Nation
- Harmonious Society
- Collaborative Economy
- Creativity
- Stability
- Openness