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Innovation: How far ahead is China?

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Roadmap to presentation

- Why is China so interested?
- How far is China in moving up the ladder of value added products?
- Measuring innovation efforts
- Human capital as a key factor for innovation
- Which are the key sectors?
- China's indigenous innovation plans
- Results so far

Motivations for China's innovation policy through the IPhone glass

- China looks like a big exporter but its value added has been limited.
- Although the revenues from net exports may look amazingly big looking at China's trade surpluses, we should not forget that companies have generally not repatriated the profits they make in China (i.e., the value added which is not generated by China is still in Chinese territory (reinvested or in financial assets)).
- The Iphone case shows how much China seems to be stuck in low value added products

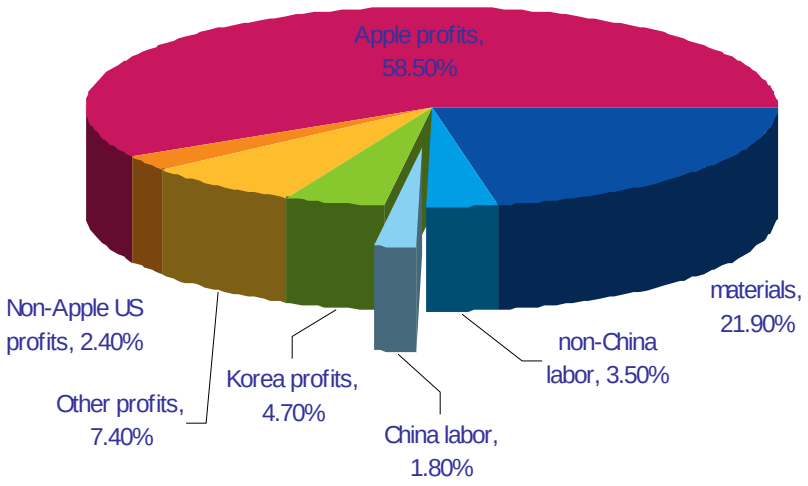
China's exports: iPhone

Source: Xing (2011) and BBVA Research

China's exports: The iPhone	
Volume (mil.)	25.7
Unit Price (USD)	179
Total Export Value (mil. USD)	**4,600**
Unit Value added by China	6.5
Total export revenue generated by China (mil. USD)	**167**
Total export revenue generated by China as % of total export value	**3.6%**

Distribution of revenue for unit of iPhone, 2010

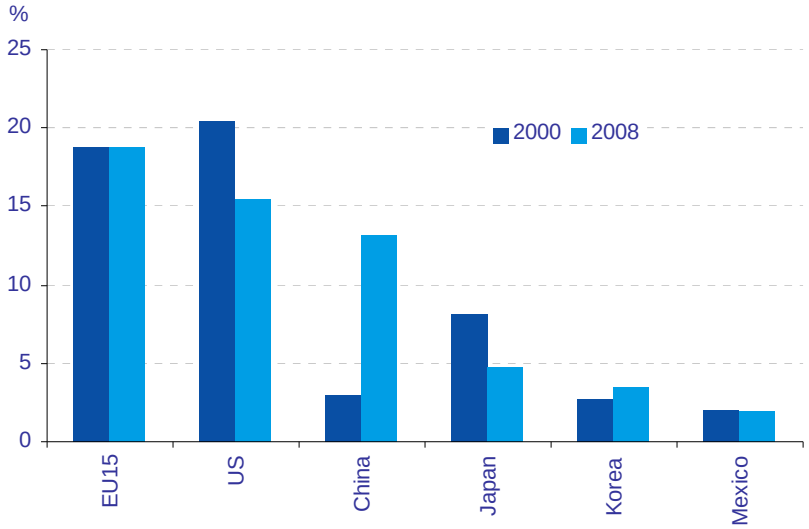
Distribution of Source: Kraemer, Linden, and Dedrick (2011) and BBVA Research



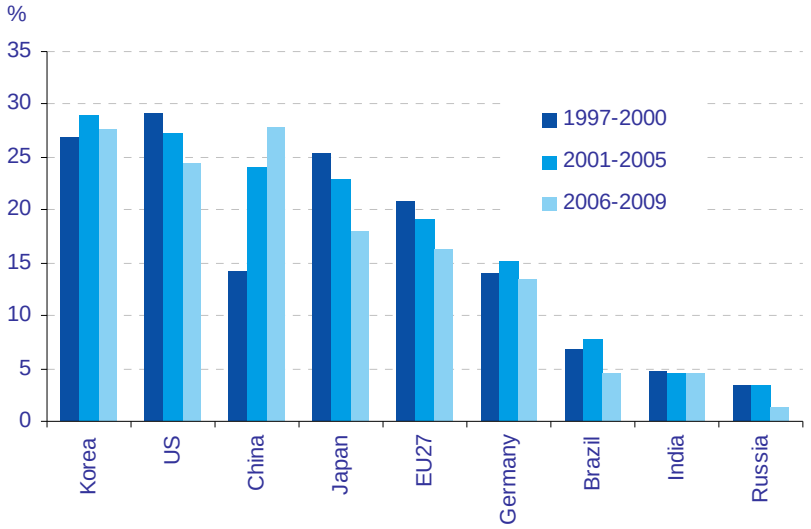
Even if value added small, exports increasingly concentrated in more advanced industries

- China's exports of R&D intensity or high-tech products increased by about 10 percentage points in the past decade (this holds true when including different sets of industries as shown in graphs below)
- However, the value added in China might not be so high: imported key parts and components account for 80% of China's high-tech exports.

Export market share of R&D intensity Industries
(aerospace, electronics, instruments, office machines and pharmaceutical)
Source: Fu et al. (2010) and BBVA Research



Export market share of high-tech industries
(aerospace, office & computing equipment, communications equipment, drugs & medicines, scientific instruments, and electrical machinery)
Source: OECD and BBVA Research

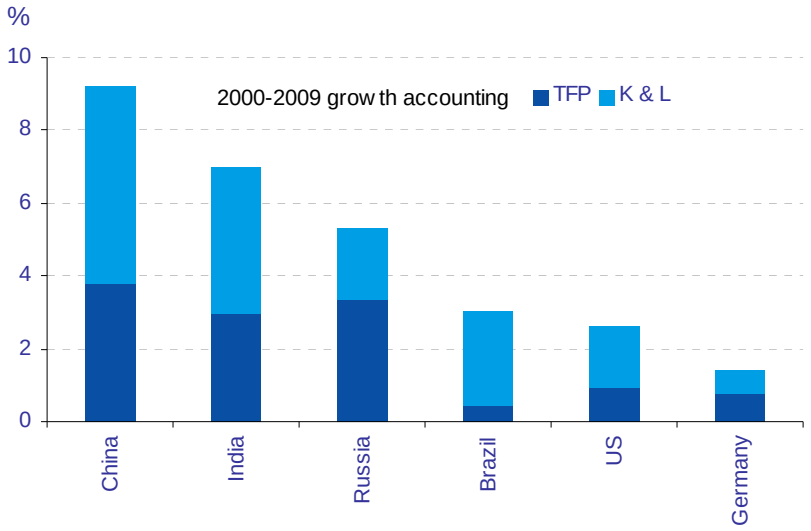


Huge total factor productivity should be a sign of China's moving forward

- Although measuring TFP is always an issue, the contribution of China's TFP to growth is larger than any other country in absolute terms.
- Beyond measurement error, TFP should be picking up human capital improvement but also technological progress

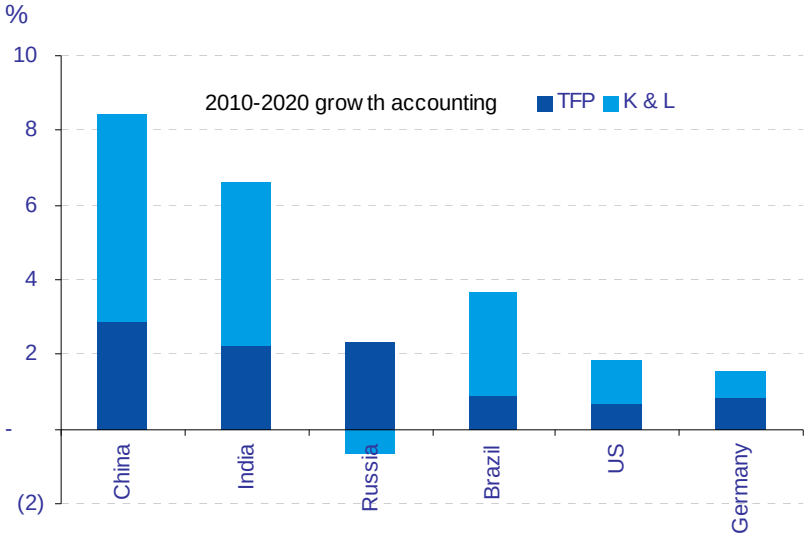
Total factor productivity (TFP) has contributed to China's rapid growth in the past decade

Source: BBVA Research



...and is expected to support China's growth in the coming decade

Source: BBVA Research

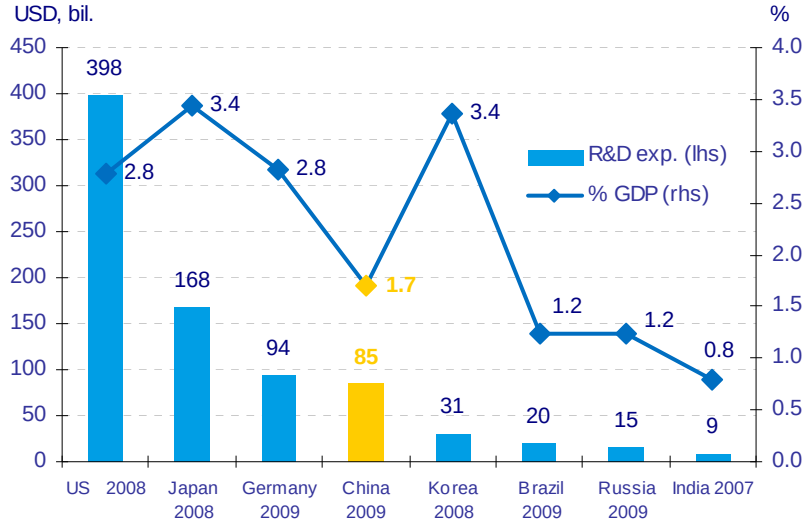


Measuring China's efforts to innovate

- When measuring efforts to innovate quantitatively (R&D expenditure) China clear stands out among BRIC countries.
- However it still lags behind major advanced economies (in terms of both absolute amount and as a % of GDP).

China's R&D expenditures

Source: OECD, CEIC and BBVA Research



China's 12th Five-Year Plan: R&D and Patents

Source: BBVA Research

period	R&D (% of GDP)	Patents (/10 thou. persons / year)
current	1.8% (2006-10 average)	1.7 (as of 2010)
by 2015	2.2%	3.3
by 2020	2.5%	n.a.

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Human capital to support innovation: ahead of the domestic front

- China's college graduates reached 5.3 million in 2009.
- China has the highest ratio of engineering and science degree holders to total new degrees.
- Given China's massive population and high percentage of graduates this means >500,000 Engineers/Year

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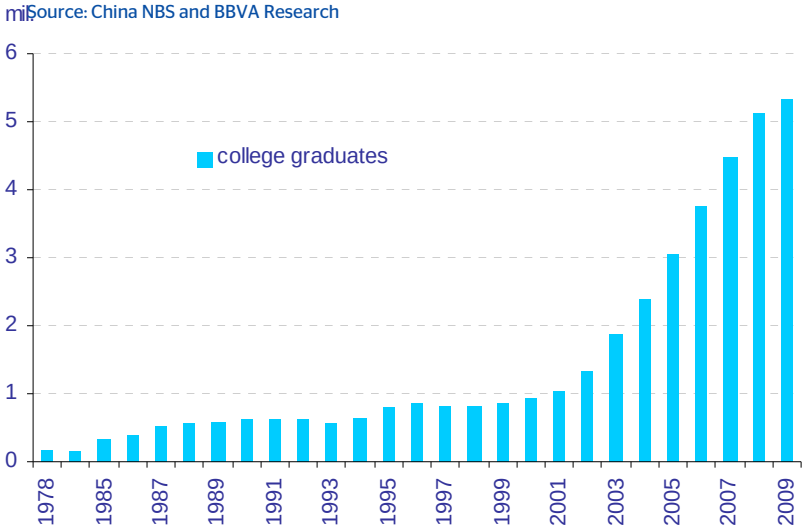

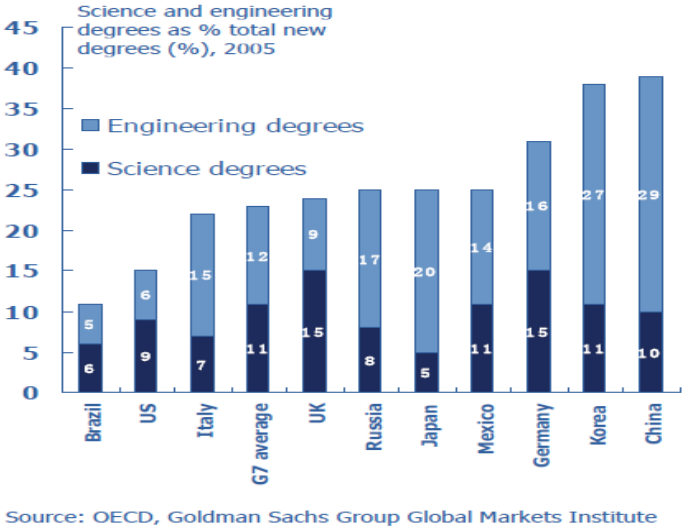

Source: OECD, Goldman Sachs Group Global Markets Institute

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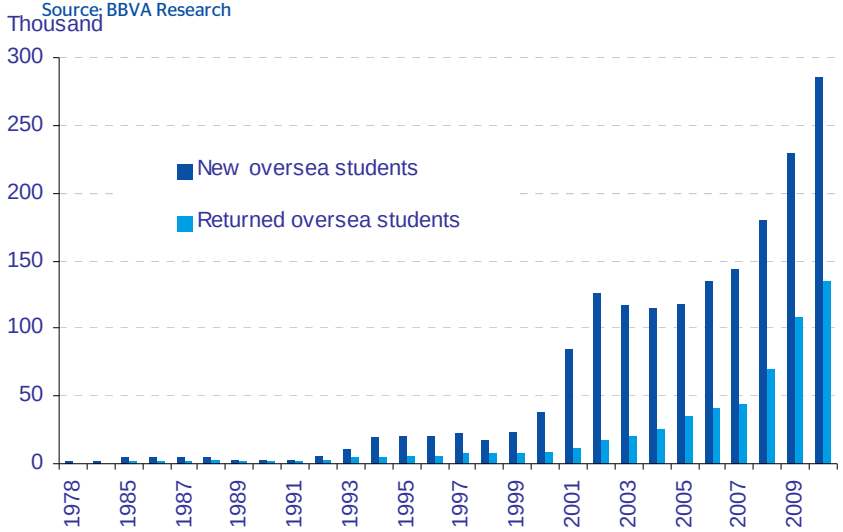
Human capital to support innovation: additional help from Chinese students overseas

- Chinese students studying overseas increased by 10% per year from 2001 to 2010 (285 thousand as of 2010).
- Overseas Chinese students returning to China increased by 30% per year in the same period (135 thousand as of 2010)
- US is the first destination (158.000, latest number of 2011) but followed closely by Europe (120.000 in 2010)! (however 40% in the UK).
- Within the US. Chinese students are by far the largest foreign community obtaining 11% of all US doctoral degrees.

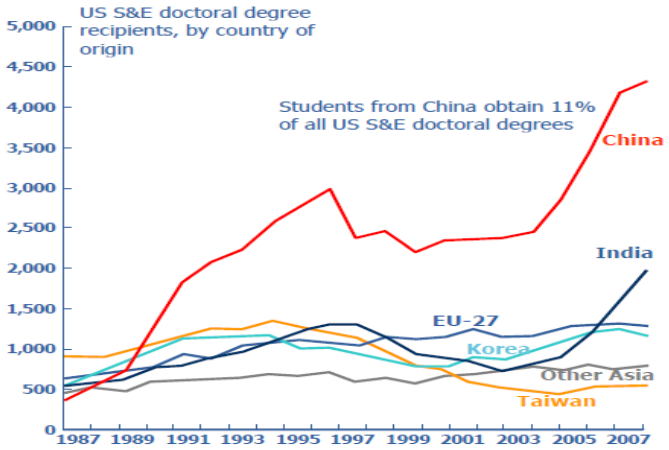
Oversea Chinese students have increased rapidly in the past decades

Source: BBVA Research



Many Chinese students pursue advanced degrees in US

Source: BBVA Research



Source: National Science Foundation

To focus innovation efforts, 7 'Strategic Emerging' Industries have been selected

- For the first time, the current 5 Year Plan selects seven strategic emerging industries because of their innovation potential
    1. Alternative energy: nuclear power, wind power, solar power and Bio-power
    2. New Materials: New function materials and advanced structure materials
    3. Biotechnology: life sciences, biomedicine and bio-agriculture
    4. New-generation IT: cloud computing, new telecommunication network
    5. High-end equipment manufacturing: equipment for space and marine exploration
    6. Environmental industries: energy saving products
    7. Alternative-fuel automobile: Hybrid and electrical cars
- From the current total size of these 7 industries (4% of 2010 GDP), the plan aims at 8% of GDP in 2015 (24% annual growth) and 15% of GDP in 2020

Incentives to support these new industries

- China aims to invest RMB 10 trillion (approximately 25% of 2010 GDP) including both private and public investments over the next 5 years on these strategic emerging industries.
- Pending the formal announcement (expected by year end), policies being discussed are:
  - Fiscal policies: zero corporate income tax for the first three years; half rate for the next three years, etc. government subsidies, preference government procurement
  - Financial polices: preferred treatment to obtain credit or capital, development of Growth Enterprise Market (yet to be unveiled)
  - Talents policies: subsidies to attract the Chinese talent abroad following the existing "one thousand talents' program (first at central level and now developing locally

What about foreign companies?

- Foreign companies, providing beneficial and important helps for China to develop the new industries, are encouraged to invest in these 7 industries. Draft guidelines exist but not official
- That said, China imposes restrictions on FDI on key sectors such as agriculture, automobiles, chemicals, energy, express delivery, insurance, securities, and telecommunications, by ownership restrictions or prohibition of access to the market.

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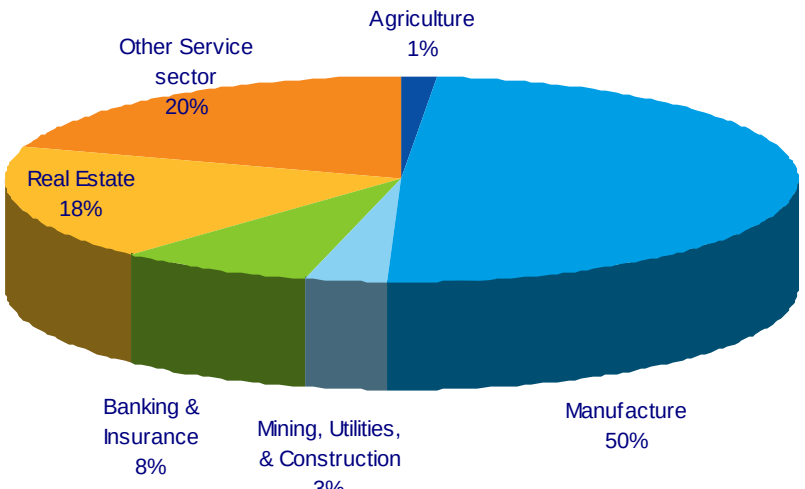
Foreign investment does help China obtain advanced technology

- Massive FDI has not only brought China the needed capital but also advanced technologies.
- Because 50% of the FDI was in the manufacturing sector, new technologies tend to have concentrated there
  - ➢ 67% of total high tech exports come for foreign companies operating in China (however this was even higher before)
- By September 2011, international corporations have set up more than 1,400 research centers in China.
- A large number of the top 500 global companies (364) have established R&D centers in China as of 2010.

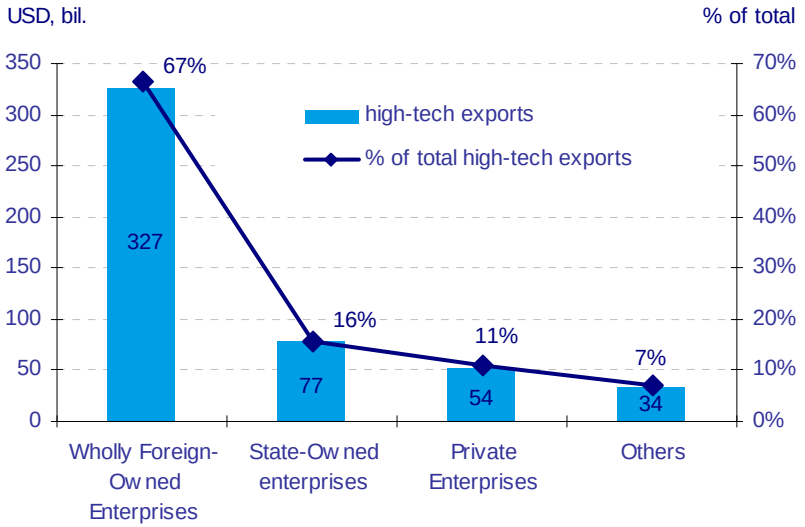
Chart: China's high-tech exports by ownership of export enterprises (2010)

Source: The Ministry of Science and Technology of China and BBVA Research and BBVA Research



China's FDI concentrates on the manufacturing sectors (2006-2010 average)

Source: CEIC and BBVA Research

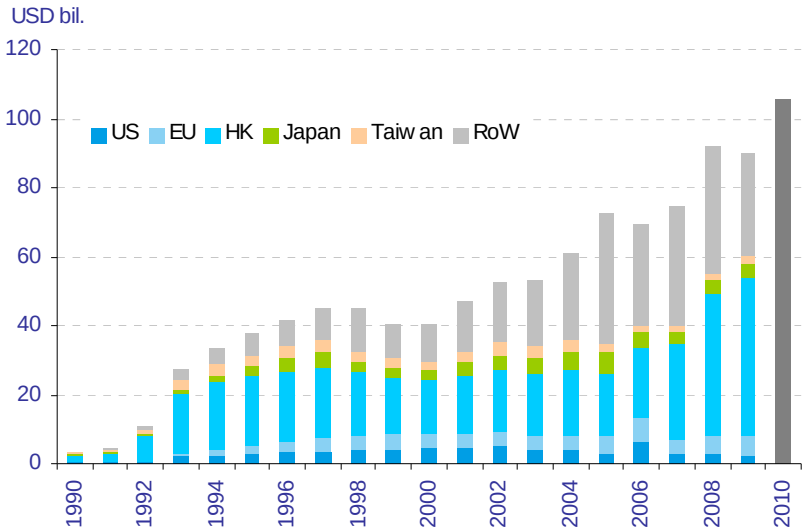


How much of tech tranfer from FDI?

- Tech transfer is very hard to measure. If we concentrate on the number of contracts behind tech transfer, there has been an increase of such contracts
- According to news, as much as 50% of total tech transfer comes from EU companies (33,558 contracts worth of 130 billion USD till May 2010)
- This is strikingly high if we consider EU only accounts for 6% of China's total FDI in 2009.

China's FDI increased by about 30 times in 1990-2010

Source: China Ministry of Commerce and BBVA Research



What is Indigenous Innovation Policy all about?

China's Indigenous innovation policy:

- Mentioned in China's 11th Five-Year Plan (2006-10) but much more prominently in 12th Five-year Plan
- Initiated In 2006 and aimed at 15 years (State Council's Medium and Long Term National Plan for Science and Technology Development: 2006-20)
- Intended to:

  (1) foster domestic creation and commercialization of proprietary ideas and technologies by Chinese companies,

  (2) move up the product value chain,

  (3) build domestic brands, and

  (4) reduce dependence on foreign technology.
- China's government has made a range of relevant policies and regulations of intellectual property, standards, taxation, and government procurement.
- Indigenous innovation catalogue includes: computers, communication, office equipment, software, new-energy equipment, and energy-efficient products.

Indigenous innovation: Issues for foreign companies (1)

Several issues remain in the implementation of indigenous innovation policy, which are of great concern particularly by foreign companies in China.

1. **Define the indigenous innovation products**.

In 2006 and subsequent years, the China government departments (of MOST, MOF, and NDRC jointly) released Trial Measures for the Administration of the Accreditation of National Indigenous Innovation Products, requiring the indigenous innovation products to meet a set of criteria. Most important criteria are :

- The applicant legally owns the exclusive domestic intellectual property rights (IPR) or the right of use of IP for the product through its own technological innovation or granted by another institution. (At some point such IPR should have been generated in China but it was changed due to controversy)
- Embody a high degree of creativity and innovation.
- Offer a high degree of reliability and quality, with certification from the China National Certification Administration or its provincial departmental branches.
- To qualify for inclusion in the production list, a product must possess technologies that have proven effective in conserving energy, reducing pollution, and/or raising energy efficiency, or must substantially improve on an original product's structure, quality, material, craftsmanship, or performance

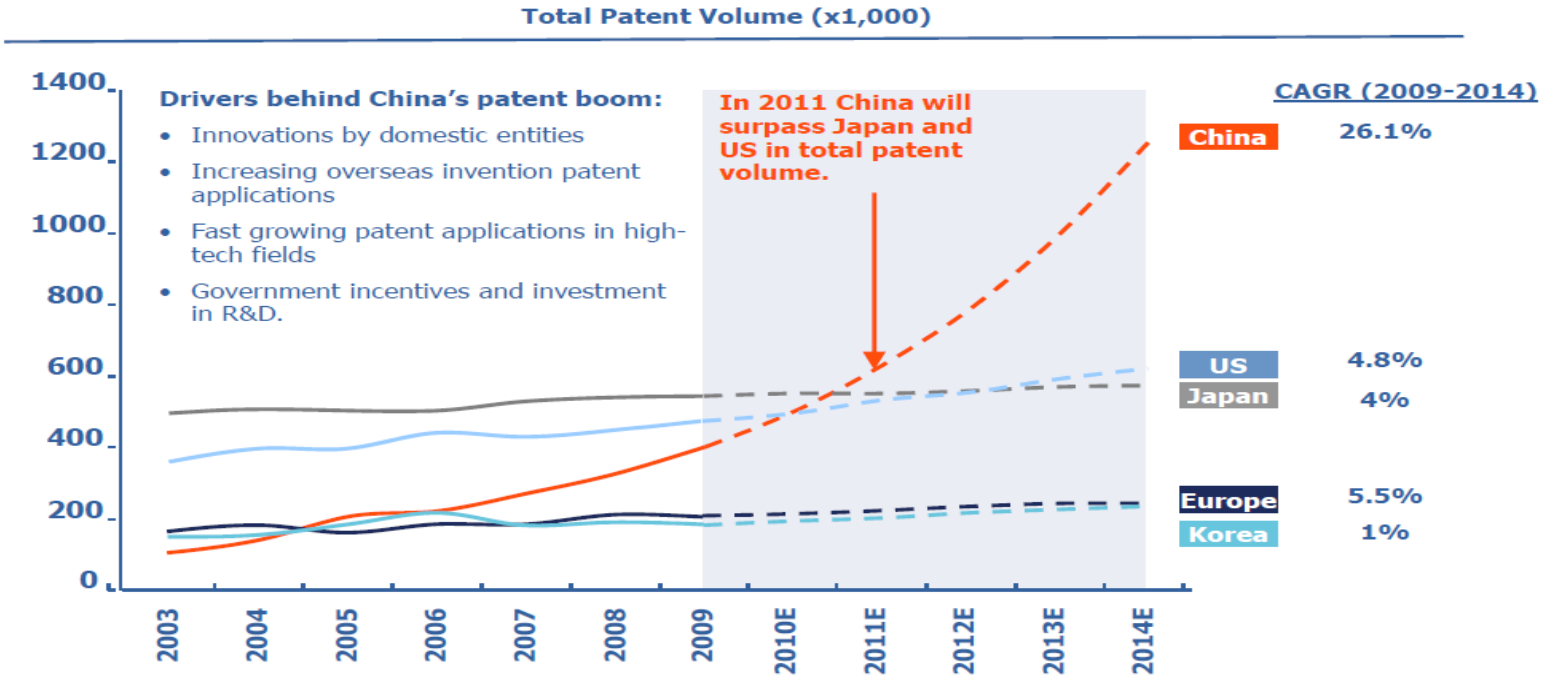
Indigenous innovation: Issues for foreign companies (2)

2. Indigenous innovation and government procurement policy.

- In late 2009 and 2010, China released various measures aimed to create an indigenous innovation products catalogue granting preferences to indigenous products during government procurement, causing broad concerns by foreign investors.
- The measures have been scraped in mid 2011, after President H Jintao's trp to the US in January 2011.
- However, the provincial government's local product catalogues of indigenous innovation products are still linked to local government's procurement.

Are China's efforts to innovate achieving the goal?

- The standard quantity measure, number of patents, gives a very positive answer to that question. In fact, China's patent volume is anticipated to exceed US and Japan in 2011
- However, the quality of China's patents are widely questioned: Over 95% of China's patents were filed domestically.



Source: Thomson Reuters - Patented in China: The Present and Future State of Innovation in China

Some final thoughts

- China seems to be far from being a full fledged high-tech economy (looking at value added) but it is moving in that direction and foreign companies seem to have been crucial in that process so far.
- As for the speed, quantity measures (R&D expenditure, qualified labor force, patents, etc) point to fast convergence. If we look at announcements and targets by the Chinese government, it seems clear this is a key objective in which all available resources will be pooled.
- Key questions remain, such as the role of foreigners in this process seems the objective is not only to move up the scale but also to become more independent