Key issues

- Why China started to develop innovation systems?
- What are the unique characteristics of innovation systems in China?
- What are the roles of universities in Chinese innovation systems and the challenges?
Developing innovation systems as a response to resolve current economic problems?
Challenges in Chinese economy

- Three drives of economic growth:
  - Domestic consumption
  - Investment
  - Export
- All need qualitative changes
Domestic consumption

* Consumption is dominated by real estate industry, while the other consumption is great in short

* Consumption account for almost 30% GDP dropping from 50% in the 1990s
Investment

* Foreign direct investment (FDI)
  * One attractiveness for foreign invest: low labour cost (but salaries largely increased in the past years)
  * Global decrease of FDI since economic recession

* Governmental investment
  * 400 Billion Euros in 2009
  * Negative consequences appear
Export

* Export is based on expansion of low-wage manufacturing which relies on imported equipment and technology.
* Affected by the economic recession and recent appreciation of RMB (Chinese Yuan)
Three drives’ contribution to GDP gross in 2007 and 2009

2007 GDP gross: 11.4%
* Domestic consumption: 4.4 (38.60%)
* Investment: 4.3 (37.72%)
* Export: 2.7 (23.68%)

2009 GDP gross: 8.7%
* Domestic consumption: 4.6 (52.5%)
* Investment: 8.0 (92.3%)
* Export: -3.9 (44.8%)

Source: National Statistics Bureau
Other problems

- Wide gap between rich and poor
- High unemployment rate (Official statistics: 4%)
- Aging population
- Environmental degradation
- Low-tech dominated trade
Figure 1.6 China remains specialised in low-tech
Contributions of industries to trade balance
as % of manufacturing trade by technological intensity, 2005

Source: F. Sachwald (2006) based on data from SYSPROD-IFRI.

(OECD, 2007, p.10)
New policy strategies

* Overall objective: to ensure further progress, which is economically, socially & environmentally sustainable.
  * Not only keep the development sustained but sustainable.
* Solution: to seek new economic growth point through technology progress.
  * Main economic activities shifting from labour-intensive production to capital-intensive and technology intensive production.
* 2006: the National Medium- and Long-term Program for Science and Technology Development
  * China sets up the goal of becoming an innovative country by 2020
Key elements in an innovation system

- Key actors: universities, research institutes, companies, central and local government
- Institutions: formal and informal rules
- Interplay between actors and interplay between actors and institutions
Characteristics of Chinese innovation systems
## Contexts of Chinese NIS compared to developed countries

<table>
<thead>
<tr>
<th>Developed countries</th>
<th>China</th>
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<tbody>
<tr>
<td>1. Compete through creation of new and better products</td>
<td>1. Compete through low product process and low price</td>
</tr>
<tr>
<td>2. Abundant highly skilled labour</td>
<td>2. Lack of skilled labour</td>
</tr>
<tr>
<td>3. Outsource manufactures</td>
<td>3. Manufacturing cheap product for export</td>
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<tr>
<td>4. Employing skilled workers and investing in new technology for high return</td>
<td>4. Focusing on simple manufacturing tasks using little technology and a lot of manpower</td>
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<tr>
<td>5. High demand for new knowledge</td>
<td>5. Low overall demand for new knowledge</td>
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<tr>
<td>6. The concept that universities are important source of new and potential product-related technology is becoming institutionalised</td>
<td>6. The concept of university-industry relations are not interested by companies</td>
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Adapted from (Kroll and Liefner, 2008)
Regional innovation systems as foundations of NIS

* Province-level (or municipal-level) regions as the basic units for developing innovation systems
* These regions are administratively and economically independent geographical regions
* The operation of innovation system happen more often from within, rather than between province-level regions.

* (Chen & Guan, 2011)
Some Chinese characteristics, resulting from both the legacy of the centrally planned system and Chinese-style socialism, become barriers for China to change towards a national innovation system. Nevertheless, the enhanced importance of science and technology to economic development has been recognised by Chinese government and there is a strong policy motive to commercialise knowledge through strengthening university-industry relations since the 1990s.
Changing roles of universities in innovation systems and challenges
The impact of university on regional economy

(Armstrong and Taylor, 2000, p. 19)
Second academic revolution

- Adding the “third” mission: An economic and social development mission (Etzkowitz, 2008, p.30)
  - Emerging academic entrepreneurship
    - Capitalisation of knowledge
    - Scientific firms/spin off firms
  - University integrate with economy
    - Industry funded university R&D activities
    - Industrial sponsors’ influence on academic agenda
- The role of university in innovation systems is often understood from the perspective of triple helix framework
Two starting points of triple helix

- Statist model
- Laissez-fair model
Tendency towards an overlapping model
Various academic arguments and Chinese policies all emphasise the close cooperation and active interaction between university and industry.
Challenges in university and industry cooperation

- Weak cooperation between university and industry
  - Environmental perspective
  - Universities’ perspective
  - Companies’ perspective
* Enterprises cannot absorb the universities’ research achievement effectively (Wang and Zhou, 2009, p.103; Eun et al. 2006)
* Incomplete legal system and practice in protecting intellectual property (Kroll and Liefner, 2008)
* Deficient contract law (Kroll and Liefner, 2008, p. 302)
* Cooperation between Chinese universities and enterprises mainly focuses on the short-term contract mode to solve some practical technology problem in production (Wang and Zhou, 2009, p.103)
Universities’ capacities

- Traditionally teaching-oriented
- A small number of research universities
Universities’ motivation

- Weak propensity to directly engage in economic activities
- Faculty members’ mindset: critical of devoting too much time and energy to establishing and managing business related activities
- “Third mission” considered not a main task of the university
Companies’ capacities

- State-owned enterprises: limited investment in knowledge generation
- Private companies: little access to investment capital
- Foreign-funded companies: seldom interact with Chinese universities to acquire knowledge

(Kroll and Liefner, 2008, p.301-302)
Companies do not have a strong demand for the “third mission” of universities, and most of them undertake only short-term cooperation with universities to solve some practical technology problems in production.

(Wang and Zhou, 2009, p.103)

- Most companies conduct R&D by themselves
- Cooperation with universities in R&D only account for a small portion
- Motivation varies between companies

(Wang, 2011)
Universities have basically three options for the process of commercialising knowledge:

1. Patenting and licensing of technology innovations
2. Direct cooperation with enterprises (e.g., contract research)
3. Set up of spin-off enterprises & University Run Enterprises

(Kroll and Liefner, 2008)
While establishing spin-off formation is an interplay of academic entrepreneurs, parent organisations, and venture investors in western countries, university run enterprises try to perform all three roles at once in China:

- Integrate several stages of the research, development and commercialisation process into one organisational entity. (Kroll and Liefner, 2008)
Following the President Hu Jintao’s speech at the 100 anniversary of Tsinghua University in 2011,


It aims to achieve innovation by collaborative efforts among universities, research institutes, industries and governments.

This policy will change from previous institution-based investment to program-based and institution-concerted investment.
Development tendencies?

Eun et al. 2006
Final reflections

* Developing innovation system is not only about knowledge production and technology upgrading, but also a matter of institutional change.
* The success is heavily dependent on Chinese legal and cultural contexts too.
* To develop appropriate legal consciousness and culture fostering innovation at both organisational and individual levels, education is the key.
* Also universities bear the responsibilities to cultivate “scientific spirit”.
* Lacking scientific spirit as considered by Qian Xuesen as a real problem in Chinese higher education, when he raised the question to the Premier Wen Jiabao “Why our higher education institutions can hardly cultivate first class talents” in 2005.
It is no surprise that our schools always fail to nurture outstanding talents.

With so many universities competing to build luxury school buildings, who is to create an open and free academic atmosphere?

With so many experts and scholars spouting for extra income, who is to engage in scientific research?

If people issue their papers just for completion of task, who will be immersed in further exploration of issues?

When so many professors are striving to become leading members, who will regard science as the basis of all issues?
So, when the executive power is always above the academic power in schools,
when the executive order is much higher than academic freedom,
when quick success is much better than forethought,
our schools will impossibly nurture outstanding talents,
but just regretfully become the source place of outstanding talents for the United States and other countries.
Thank you!

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