



The Rise of China's Dual-Use Technological Base and the Implications for Asia

Tai Ming Cheung
Institute on Global Conflict and Cooperation
University of California, San Diego
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Key Characteristics of the Dual-Use Technological Base

- Forging of a dual-use economy has been a **strategic priority** since the late 1990s: Recognition of convergence of civilian and military technological hardware and processes
- Switch from civil-to-military conversion to a **more balanced development** of dual-use technological base
- **Pockets of excellence**, but overall standards lags behind world levels –much of output is low-tech (cars and motorbikes); productivity and efficiency is not high

Key Characteristics of the Dual-Use Technological Base

- Dual-use technological base is a **critical component of China's strategic hi-tech economy**
- Major reforms since mid-1990s to improve **innovation capabilities**: transition from creative imitation to indigenous innovation – similarities with South Korea's take-off as a tech power in 1990s
- **Leading dual-use sectors** are aviation, space, shipbuilding, nuclear, electronics, IT
- Select defense and civilian enterprises form core of dual-use technological base

China's S&T Development Strategy: *Kejiao Xingguo*

- Key strategy in developing China's S&T is 'Revitalizing the Country through Science, Technology and Education' program (*Kejiao Xingguo* -科教兴国).
- This policy stresses raising innovation capability through technological development at the enterprise level.
- Key measures are knowledge innovation programs, basic R&D initiatives and expansion of 863 hi-tech development program.

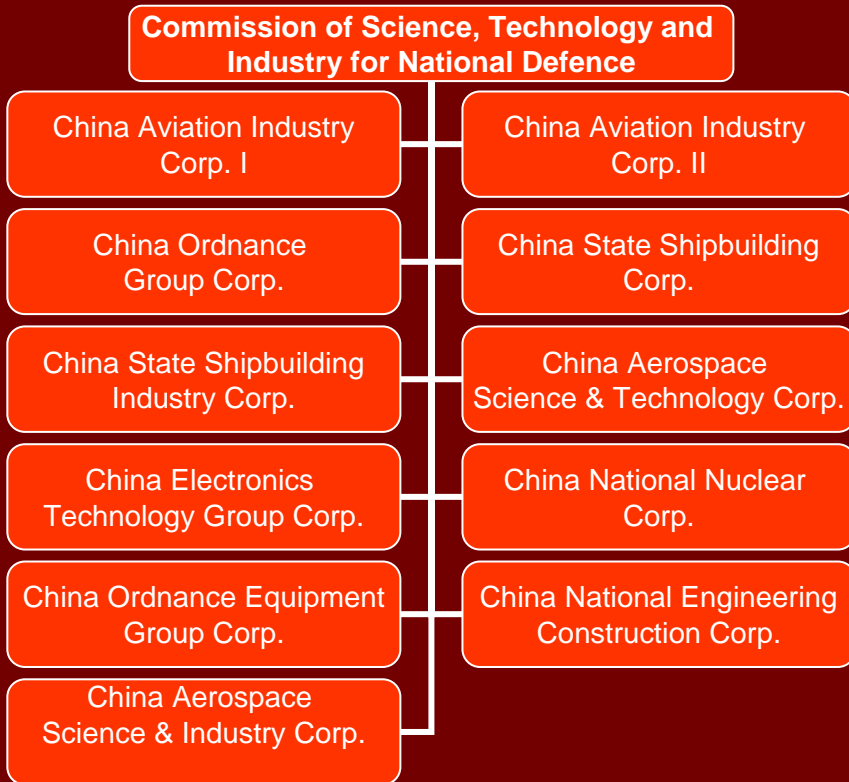
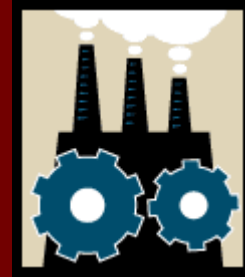
Kejiao Xingguo Strategy

- The dual-use and defense sectors have adopted many practices of the *Kejiao Xingguo* strategy:
 1. Boosting investment in educational and R&D apparatuses.
 2. Emphasizing concentration of resources on key projects.
 3. Cultivating key talent through education and improving financial incentives.
 4. Generation of patents.
 5. Monitoring and incorporation of global technological developments.

State-Based Techno-Nationalism

- China's strategic approach to its development of a dual-use technological base can be defined in techno-nationalist terms:
 1. Technological development is strategic and important for China's comprehensive national strength.
 2. State investment is critical in hi-tech because of high risks and long time cycles involved in R&D.
 3. Pursuit of import-substituting indigenization.
 4. Nurturing an indigenous innovation capacity.
 5. Diffusion through spin-off or spin-on.

The Defense Component of the Dual-Use Technological Base

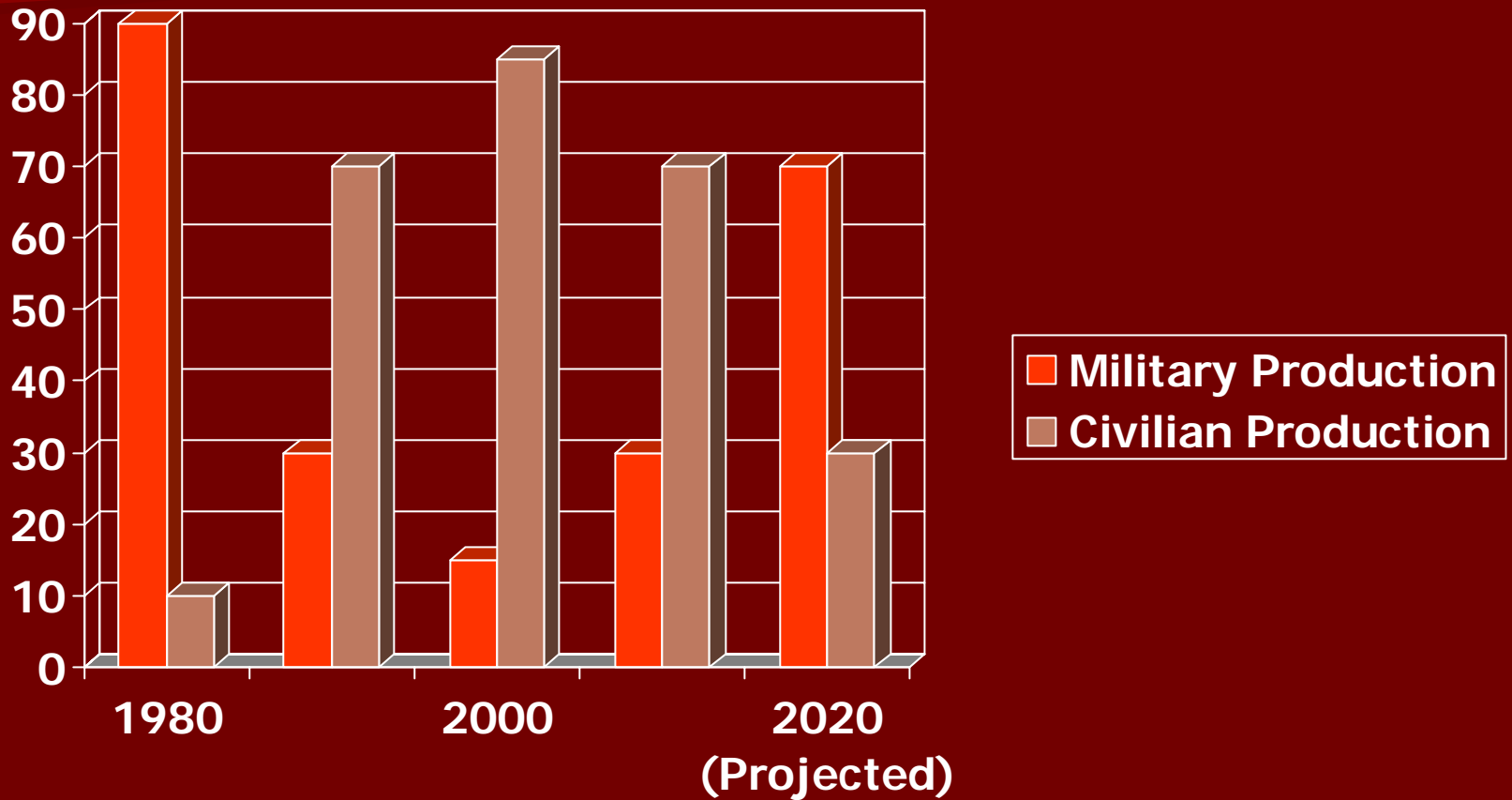


- 11 sprawling conglomerates that employ 2 million workers
- Competition is limited
- They are undergoing consolidation and downsizing
- Their military and civilian entities are being reorganized and separated
- Leaders of dual-use integration include CETG (electronics), CASTC (space), CSSC (shipbuilding)

The Civilian Component of the Dual-Use Technological Base

- Non-state and private hi-tech enterprises are emerging as important suppliers to the PLA and govt. for information, computer and telecommunications technology
- Their primary role is not military but commercial and only a small proportion of their output is sold to the military (most lack military licenses to directly sell to military customers)
- Most important of these new technology companies involved in dual-use include Huawei, Zhongxing, Datang, Julong, Legend and Founder

The Changing Ratio of Military-Civilian Production in the Chinese Defense Industry, 1980-2020



Overlapping Civilian and Military Priorities

- In 10th and 11th Five Year plans, top priorities are information & manufacturing technology, microelectronics, space and aerospace industries.
- This refers to high performance computers, super large-scale integrated circuits, applied software, space information systems & integrated manufacturing systems.
- These technologies and processes are also being urgently sought by the defense establishment

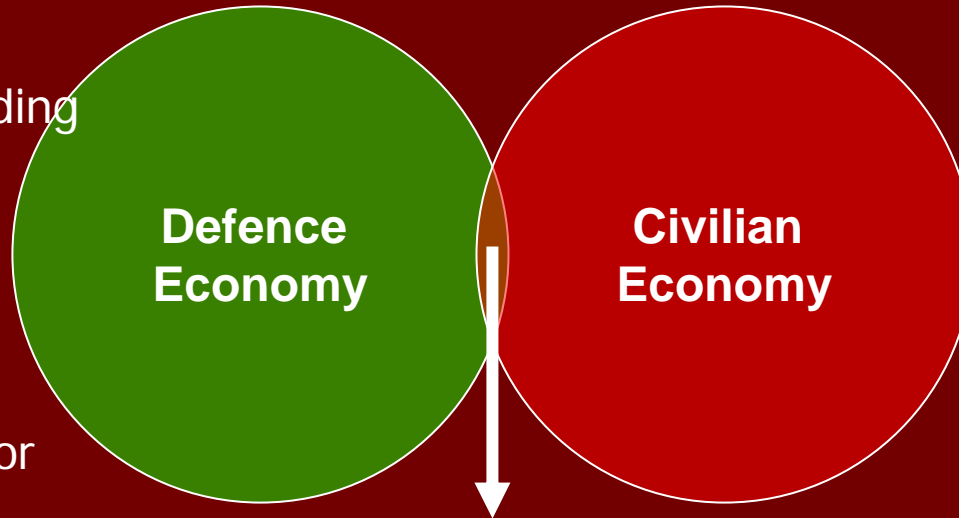
Current Requirements of the PLA's Modernisation

- Strategy of “Local Wars under High Tech & Informatised Conditions”
- Information Warfare
- Joint Operations
- Electronic Warfare
- Air and Missile Power: Precision Capabilities
- C4I: Command, Control, Communications, Computers and Intelligence
- Strategic Intelligence, Surveillance and Reconnaissance
- Wartime Support and Mobilisation

The Dual-Use Economy at the Beginning of the Reform Era

Key Features:

- High military spending
- Strong demand
- Strict separation
- More advanced technologies
- Large size
- 90% of output is for military products



Key Features:

- Less advanced than military sector
- Few ties with military sector
- Low levels of investment

Military-Civilian Overlap:

- Limited integration
- 10% of defence sector's output for civilian goods

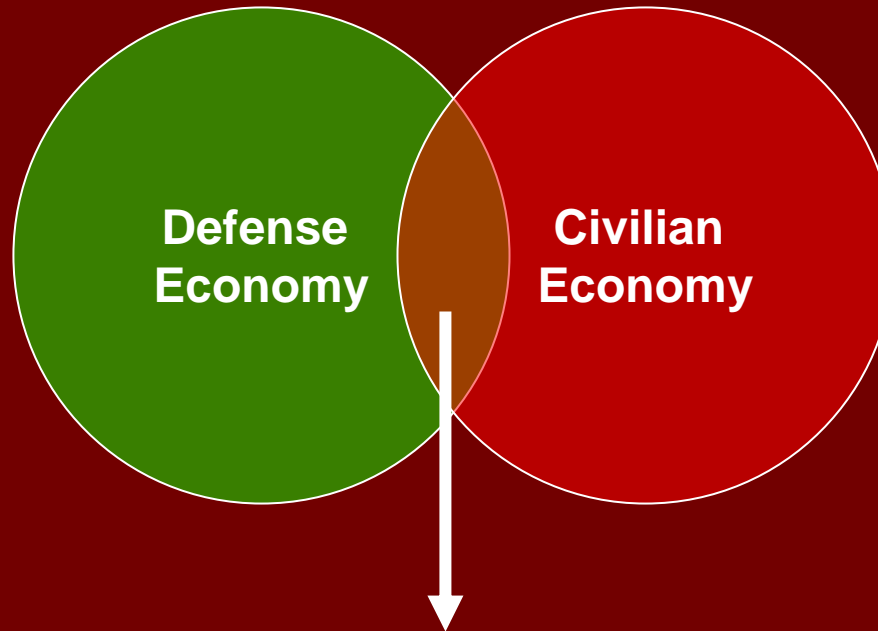
3 Phases of the Junmin Jiehe (Combining Military and Civilian) Strategy

- **1980-Late 1980s:** Spontaneous defence conversion: Entities left on their own to switch from military to civilian production.
- **Late 1980s to Late 1990s:** State guided defence conversion: Central government involved in management and funding of the defence conversion.
- **Since Late 1990s:** Focus from spin-off to spin-on or Minzhuanjun (民转军).

The Dual-Use Economy Today

Key Features:

- Limited military spending
- Limited demand
- Close integration
- Many areas of technological obsolescence
- Downsizing
- 20-30% of output for military products



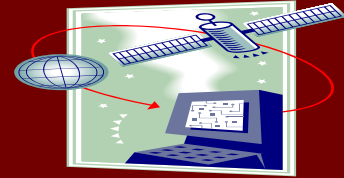
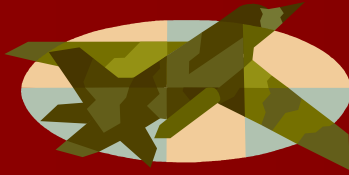
Military-Civilian Overlap:

- Extensive integration
- 70-80% of defense sector's output for civilian goods

Key Features:

- Increasingly more advanced than military sector
- Extensive ties with military sector
- High levels of investment
- Extensive foreign participation

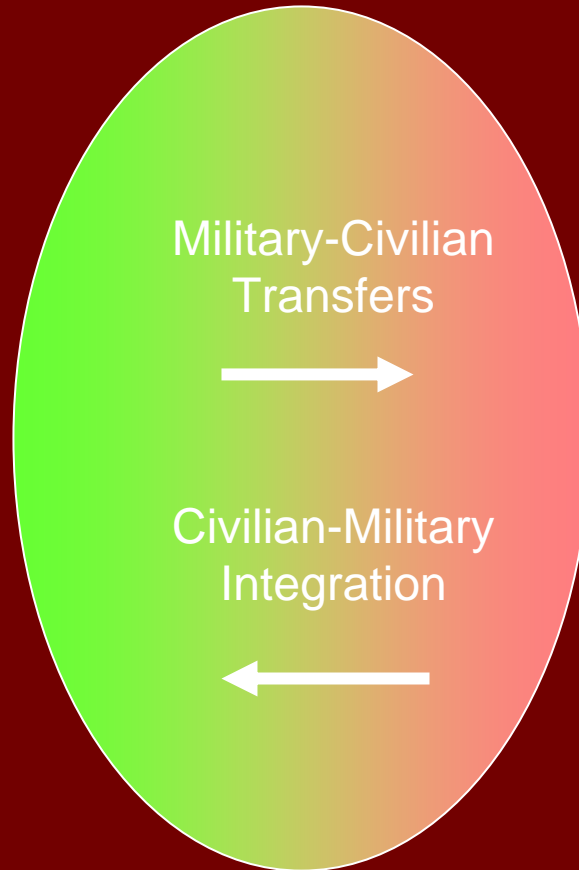
Key Features of the Dual-Use Process



Defense Conversion

军转民:

- Motor-Vehicles
- Space Programme
- High-end Computers
- Nuclear Power Plants
- Civilian Airlines
- Super Computers
- Transferring Military Infrastructure: Airports, Harbours, Railways, Communication Lines



Civil-Military Integration:

- Telecommunications –routers, optical fiber lines
- Semi-Conductors
- Computers
- Manufacturing Processes: CAD, CAM
- Composite Materials
- Wartime Mobilisation

Key Sources of Dual-Use and Military Technologies

- **Domestic:** Indigenous development is long-term priority
- **Western:** Selective acquisition of civilian and dual-use technologies. This may include purchase of companies rather than just technology –eg Lenovo.
- **Russian:** Acquisition of complete weapons systems and extensive technology transfers
- **Sino-Foreign Commercial Joint Ventures:** Manufacturing and R&D joint ventures with leading western corporations, especially in semi-conductors, computers, software

The Benefits of the Dual-Use Technological Base

- **Faster Development Processes**
- **Cheaper Products:** Savings of 20-50 percent
- **Better Output:** Commercial equipment is often equal or better than equivalent military products.
- **Smarter and More Efficient Management and Acquisition Processes:** Adoption of state-of-the-art international management and acquisition procedures.
- **Greater Self-Sufficiency:** Sourcing of critical and sensitive technologies domestically

Key Projects Dealing with Dual-Use Technologies

- **The 863, Chinese Academy of Sciences and Five Year Plans:** National hi-tech R&D projects in strategic sectors
- Lasers
- Space
- Information Technology
- Composite Materials
- Electronics, especially micro-chips
- Manufacturing Technology
- Communications

Key Dual-Use Trends over the Next Decade

- **Growing Dependence on Commercial Technology:** The military's dependence on commercial technology will steadily increase
- **Key Areas:** Dual-use will be concentrated in electronics, IT, space and avionics
- **Narrowing Technological Gap:** The PLA will gradually catch up with Western military standards, although it will still lag behind the U.S. by at least a generation overall

Implications for Asia and the US

- **Strategic Implications:** China's technological rise, especially in dual-use strategic capabilities, advances its claims to be a global power. Symbols of its emerging world-class technological prowess includes space, IT, and ship-building
- **Military Implications:** The dual-use base plays an important role in advancing the PLA's modernization, especially the acquisition of hi-tech capabilities

Implications for Asia and the US

- **Defense Industrial Implications:** A capable dual-use and defense industrial base will allow China to cultivate influence by offering hardware and tech transfers to allies and friendly states (Pakistan, Thailand, Indonesia, Philippines)
- **Technology Implications:** If China becomes a world-class innovator, this will be a watershed event in enhancing its long-term economic and military competitiveness. It will also begin to set its home-grown standards and specifications

Implications for Asia and the US

- **Economic implications:** China is presently not a technological threat to Japan or South Korea, but this is likely to change within the 1-2 decades. In ship-building, for example, China has laid claim to leadership by 2015.
- **Trade and proliferation implications:** Chinese firms are likely to be more willing to export dual-use technologies because they are not subject to the export restrictions of Western counterparts