China in Asia Seminar Series
Seminar 3: Will Technology Be a Source of Chinese Influence in Asia?
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SUMMARY
Dr. Ernest Preeg (Manufacturer's Alliance)
"The Emerging Chinese Advanced Technology Superstate"
The Chinese advanced technology superstate is a slightly modified version of the Japanese model, but deserves to be taken more seriously since China's rapid technological advancement has only been underway since 1995, when the Chinese leadership made technology and military modernization their top priorities.

There are four basic components of a technology superstate: Research and Development; Scientists and Engineers; Foreign Direct Investment (FDI); and Advanced Technology Trade. Chinese R&D expenditures now surpass Japanese R&D. China has tripled the number of university graduates, with an emphasis on mathematics, science, and engineering. Doctoral degrees in engineering grew 16 percent per year. Comparisons with the U.S. and Europe must consider that a significant number of engineering degrees in those countries go to Chinese students who return home.

In 1993 and 1994, FDI in China began to take off. There was a slight decrease in 1999 and 2000 due to hesitation about joint ventures, but now foreign companies can have wholly-owned investments. Last year FDI reached a record $62 billion. High-tech manufactured exports are the bottom line of international competitiveness and China has been rapidly growing in this area as well. In 1992, China was far below Japan, the U.S. and the EU. By 2001, the PRC had moved up to half the Japanese level and is expected to surpass Japan soon (as China did in total exports last year). High-tech exports are growing as a percentage of Chinese total exports, with a clear trend away from labor intensive goods.

There are three dimensions to watch:

1. **China as an export platform**. Taiwanese, South Korean, and Japanese firms manufacture a large percentage of Chinese exports. Until 2002, the U.S. was number two, but has since dropped to number four, leaving a very East Asia-oriented value-added regime. Chinese companies are contributing a rising share of value-added as they develop supply relationships and move up the technology ladder. Three years ago there were 200-300 R&D centers with foreign participation in China; now there are over 700 such centers, an astonishing increase.
2. **Development of Chinese firms**. Chinese firms seek to increase brand recognition, build a reputation for quality, and develop leading edge R&D programs. Some prominent Chinese successes are: Lenovo (computers), Huawei (telecommunications), and the Harbin Pharmaceutical Group.

3. **Technology innovation**. Can China take over U.S. leadership in innovation? This is a major national security and economic issue.

China's emerging technology prowess has potential geopolitical and geostrategic implications. China will be the economic hegemon in East Asia with corresponding policy leverage. China can also use the China-ASEAN FTA to bypass Southeast Asia's high tariffs. Strategically, the pace of Chinese military modernization has increased rapidly since increasing military and commercial linkages. Five years ago, the Department of Defense assessed the Chinese military as at least 20 years behind the U.S. In 2004, the revised assessment was that China would have uneven success in catching up in the next 5-10 years. This is an extraordinary change. China will become the number one naval power in East Asia in the next few years.

How should the U.S. maintain technological leadership? Chinese currency manipulation is a significant factor. The U.S. should not oppose the ASEAN-China FTA, but establish FTAs of its own with Asian countries. U.S. domestic economic policy is critical. We need higher savings rates so we do not have to borrow so much. A large proportion of our trade deficit is in the technology and manufacturing sectors. We have major disadvantages in our education performance, stagnant R&D in science and technology, relatively high corporate taxes, and high health care costs, all of which need to be addressed.

What is most lacking is a sense of national purpose. When the Russians launched Sputnik, the U.S. responded with thousands of Ph.Ds and a man on the moon within 10 years. We need a national purpose and a vision. The debate is not focusing on the Chinese challenge.

Tai Ming Cheung (UCSD)
"The Rise of China's Dual-Use Technological Base and the Implications for Asia"
China's dual-use technological base has several key characteristics. The Chinese leadership has made integrated civilian and military technology development a priority since the late 1990s. In the 1980s and 1990s the focus was on defense conversion and spin-offs from military to civilian; now the goal is balanced development of a dual-use technology base. Despite pockets of excellence, much output remains low-tech and relatively inefficient.

China is focused on improving innovation capabilities. There are three stages to innovation: imitation, creative imitation, and indigenous innovation. China has been in the second stage since the 1990s; the critical question is whether the Chinese can make the leap to the third stage. China's leading dual-use sectors are aviation, space, shipbuilding, nuclear, electronics, and information technology.

China's S&T development strategy "Kejiao Xingguo" [Revitalizing the Country through Science, Technology, and Education] focuses on raising innovation capability, especially at the enterprise level. Entrepreneurship is an important driver of this strategy. The dual-use and defense sectors have adopted some "Kejiao Xingguo" practices, such as boosting investment in education and R&D (although much investment has been spread thinly and thereby been wasted) and cultivating key talent (as scientists and engineers from the 1960s and 1970s retire). Despite greater emphasis on the market, China still practices state-based techno-nationalism, focusing primarily at the basic R&D level.

China's dual-use technology base has both a defense side and a civilian side. Eleven key defense agencies employ about 2 million workers, a total that has declined by about half over the last decade. The civilian component includes non-state and private enterprises; most see military applications as an afterthought. The Chinese government is seeking to increase the participation of private companies in the defense sector by removing barriers.

Defense conversion reduced the ratio of military-civilian production in the Chinese defense industry from 90 percent in 1980 to about 15 percent today. However this process has begun to change back, with military production projected to make up 70 percent of the output of the defense industry by 2020.

PLA technology requirements in many ways mirror developments in the civilian side. In the 1980s the overlap was very small, but by the late 1990s about 90 percent of PLA technology needs were met from outside of the defense sector. Since the late 1990s, the focus is on both spin-off and spin-on. Today overlapping priorities include high performance computers, super large-scale integrated circuits, applied software, space information systems, and integrated manufacturing systems.

China has four key sources of dual-use and military technologies. Indigenous development is the long-term goal. Russia is the major source for military technologies. China selectively acquires Western dual-use technology, including by purchasing companies. Commercial joint ventures (especially in semiconductors, computers, and software) are another way to acquire and develop technology. Over the next decade, China will continue to develop technology at an accelerated pace, with the goal of catching up with the world's advanced powers by 2020.

China's technology strategy emphasizes prestige; China's role as the first Asian country to put a man in space is a source of great national pride. The dual-use technology base plays an important role in advancing the PLA's modernization, especially in information operations. China is currently an importer of defense components, but its dual-use technology base will make China an increasingly important exporter of hardware and technological transfers to other countries, most especially to its Asian neighbors.

As the civilian and military sectors of China's economy become more integrated, it will become more difficult to prevent China from getting hold of certain dual-use technologies; as a result, export restrictions against China will come under increasing pressure.

Will Martin (World Bank)

Dr. Preeg documents the dramatic changes occurring in China's economy – pointing out that if a country wishes to produce high-tech products, it needs a high-tech labor force. His forthcoming book is an important contribution to understanding China's transition.

I only want to raise a few issues. China wants to produce high-tech goods, but it will need a high-tech labor force and capital base. China has opened its market and taken advantage of globalization, following the examples of Thailand, Indonesia, and the Philippines in using FDI to build its capacity to produce medium-technology products. It has adopted the right trade regime

to encourage exports and export processing. Despite pockets of excellence, China still lags behind much of the rest of the world. Even though China has lots of engineers and investment, it is still not a capital intensive economy. It will take time for the stock of skilled people in China to catch up with the stock in the United States. China is advancing in absolute number, but is still low in relative terms.

I have concerns about some of the policy recommendations. You emphasize the U.S. imbalance on the current account deficit and argue that China is engaging in currency manipulation. With a fixed exchange rate, the central bank has to buy foreign currency. Ordinarily we would expect a short-term accumulation in reserves and a corresponding rise in domestic inflation. But we are not seeing that. Instead we have a funny situation of high Chinese savings and investment rates. China's current account surplus is being driven by the high savings rate, largely due to the lack of a social security safety net. An appreciation of the *yuan* would produce only a small change in the trade balance (absent fundamental changes in the savings-investment balance). To really have a big change in the current account, there would have to be a change in expenditure relative to income. This would have little effect on the imbalance between the U.S. and China. The low U.S. savings rate is a principal cause of the U.S. current account deficit. However if China did turn around and run a large current account deficit, this would greatly impact world markets and increase global interest rates.

I also found some of the points about currency dispute resolution procedures a little cavalier, since the Bretton-Woods system was based on other countries pegging to the U.S. dollar. I do not really understand the concern over bilateral trade balances. There is no reason to expect U.S.-China bilateral trade to balance even if one's own house is in order. We would expect to see lots of triangular trade.

Q&A

One question highlighted recent research suggesting that China and India lacked domestic institutions such as property rights, a fair legal system, and developed equity markets that were necessary for sustained innovation. Some experts questioned this argument given Chinese growth. Tai Ming Cheung noted that the Chinese leadership recognizes current weaknesses such as the excessive role of the state and weak IPR enforcement and is working to address them, paying particular attention to innovation in other countries. There is much effort underway about addressing institutional processes. The pace of development and innovation is only going to increase as they deal with their weaknesses.

Another audience member noted Chinese complaints that the United States would not export high-tech products to China and questioned the utility of U.S. export controls given the growing importance of dual-use technology. Tai Ming Cheung indicated that the U.S. Commerce and Defense departments are paying attention to these issues. However restrictions on technology exports appear to be tightening rather than opening up. Another expert noted that as commercial uses increase, it becomes harder to control technology. A split might eventually occur between dual-use technologies with commercial uses (such as electronics and space) and those with pure military uses (such as stealth technology). Dr. Preeg agreed that export controls are indeed becoming more complicated. He noted that there is now a Chinese supercomputer which is the third fastest in the world – built by Chinese in China with Chinese technology.