Written Statement to the US-China Economic and Security Review Commission Hearing on China's Industrial Policy And Its Impact on US Companies, Workers and the American Economy, March 24, 2009

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The subject of today's hearing is an important one for a variety of reasons. It is important for the US as it seeks to define appropriate policies for relations with a rapidly changing China. It is important for China, as well, as it seeks to refine the policy environment for its developmental trajectory in the face of new domestic and international contingencies. It is also important for the larger international community which must both accommodate China's emergence as a major economy, and force in science and technology, while also struggling with the reconciliation of national self-interests, international processes of technological innovation, and the building of international regimes for the governance of a global knowledge economy. The issues before us are not simply those of a complex bilateral US-China relationship. They are rather symptomatic of the challenges facing many countries as they attempt to prepare domestic industries for interactions with global production and innovation networks.

Our topic is also one that is not easily understood. China's industrial policy, and it's approaches to the building of pillar or strategic industries, continue to evolve as the economy becomes more complex in terms of ownership, levels of technology, and relations with players in the international economy. And, increasingly, industrial policy engenders dissensus within China, thus making the domestic politics of industrial policy also more complex. A central question for any national industrial policy, and one which China struggles with now, is the proper role of the state in guiding industrial development. Once taken for granted, the answer to this question in China today is increasingly contested as China attempts to conform with its WTO obligations, as Chinese companies discover that their interests are no longer automatically aligned with those of the state, and as increasingly cosmopolitan government officials come to understand that national industrial policies which do not recognize and accommodate global trends in research and innovation invite costly failures. Let me illustrate some of these points with reference to our recent work on ICT standards as a tool of industrial policy.[1]

There is no doubt that the Chinese state regards the telecommunications and information technology industries (hereafter, ICT) as central to national security and economic well-being. In this, China is no different from the national governments of a number of other countries, including our own, which have used industrial and technology policies to promote these industries. In China, the recent government reorganization to create the Ministry of Industry and Information Technology (MIIT), which has as part of its Chinese name (*Gongye Xinxihu Bu*) the concept of "infomatization" (*xinxihua*), implies that advanced information technologies are

[1] Scott Kennedy, Richard P. Suttmeier, and Jun Su. *Standards, Stakeholders, and Innovation: China's Evolving Role in the Global Knowledge Economy*. Seattle. National Bureau of Asian Research. NBR Special Report Number 15. September, 2008.

intended to be diffused throughout society, including to the industrial economy and the national defense system. Not surprisingly, therefore, ICT research has been included in major state-supported national R&D projects, such as the 863 program, and in the new 15 year Medium to Long-Term Science and Technology Plan. Included in the latter, for instance, is a large project on "Next-Generation Broadband Wireless Mobile Communications Network," focused on the development of fourth generation (4G) telecommunications technology, which is expected to receive more than 70 billion *yuan* over the course of the project.[2] The national R&D system has taken technical standards development as a key task, special R&D programs for standards have been initiated, and tax and procurement policies are being used to incentivize Chinese enterprises to become centers of intellectual property development and standards initiatives. In addition, direct R&D support is being offered to enterprises. In the ICT sector, for instance, Huawei and Datang reportedly have been awarded new "national laboratories," an institutional designation that leads to preferential funding that had previously been reserved for research institutes and universities.[3]

Large R&D projects of this sort, however, have not always enjoyed the success which might be expected from the heavy investment of resources they have received. This is well illustrated by past work on 3G technology and, in particular, the development of the Chinese TD-SCDMA 3G standard. Although TD-SCDMA was recognized by ISO as international standard in 1999, China's ability to incorporate the standard into commercially viable innovative telecommunication systems has been a long and drawn out affair, with Chinese telecommunications companies only reluctantly accepting it.

Chinese efforts to support a distinctive Chinese 3G standard illustrates a number of problems with the development and implementation of Chinese industrial policy more generally. First, in spite of the technical contributions made by Chinese researchers, the standard also relied heavily on foreign technology.[4] Thus, in spite of suggestions that China seeks greater technological self-reliance in its industrial policy, maintaining an openness to international technology flows will continue to be an important part of technological development going forward. As with other standards, such as the WAPI (WLAN Authentication and Privacy Infrastructure) security standard for local wireless networks, TD-SCDMA was aggressively pushed by its developers and bureaucratic allies to the point of securing government support without necessarily considering the interests of other Chinese stakeholders; in this case, important

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[2] http://english.caijing.com.cn/2008-02-25/100049443.html. *Accessed March 20, 2009.*

[3] See Caijing Annual English Edition, December 2007, http://www.caijing.com.cn/English/Cover/2008-02-20/48880.shtml and http://www.caijing.com.cn/English/Editorial/2008-02-20/48880.shtml.

[4] Chinese share of the patents in the standard, reportedly, was only about 7%. Yan Hui, "The 3G Standard Setting Strategy and Indigenous Innovation Policy in China: Is TD-SCDMA a Flagship," Danish Research Institute for Industrial Dynamics, DRUID Working Papers, no. 07-01, 2007.

telecommunications companies who had a vested interests in commercially viable 2G legacy technologies more compatible with the other two international 3G standards (WCDMA and CDMA 2000). Thus, in keeping with classical critiques of industrial policy, predictable rent seeking behavior by special interests seeking bureaucratic sanction emerged and came into conflict with the market-based technological judgments of the Chinese service providers. The development of operational TD-SCDMA systems has been further complicated by efforts to reorganize the telecommunications industry. The now reorganized industry involves competition among three service providers each having a license for a different 3G technology. Thus, the TD-SCDMA standard is licensed to China Mobile, the world's largest mobile operator (which absorbed China Tietong), while China Telecom has a license for a CDMA 2000 system, and China Unicom (which merged with China Netcom) is licensed to develop W-CDMA technology.

The reorganization itself raises some interesting questions about industrial policy. By licensing three separate and competing technologies, the Chinese government appears to be adopting a position of technology neutrality *vis-à-vis* Chinese and international standards, seemingly in support of the principle of market competition. On the other hand, the delays in licensing which have occurred over the past several years have been interpreted as a form of state intervention to allow time for further development of the less mature TD-SCDMA technology. In addition, the assignment of the TD-SCDMA license to China Mobile, which has a much larger mobile subscriber base (over 400 million, in contrast to Telecom's 43 million and Unicom's 125 million) could be interpreted as tilting the competition towards the stronger player as the chosen champion of the Chinese standard. On the other hand, Chinese industrial policy has often sought to promote competition. Thus, the less mature technology was licensed to the stronger company in order that competition be maintained. Should Telecom, and especially Unicom (which has the second-largest subscriber base), provide better quality service, based on more mature technologies, Mobile's advantage could erode. Further complicating the picture are the problems of making mergers work, as companies that have developed under competitive market conditions face the challenges of dealing with the corporate cultures of new partners whose traditions are in a planned economy.

The 3G story in China illustrates both possibilities for effective industrial policy, but also its pitfalls. Through government policy efforts China has been able to establish an international standard for next-generation mobile telephony and seems ready, finally, to establish the standard in a large commercial system. Many observers both inside and outside of China, however, would be loath to regard the 3-G story as a success, however, given the costs it has imposed on service providers, and the cost to consumers in terms of delayed rollouts of 3G service and the likelihood that the service may not employ the best available technology. A far stronger case for the TD-SCDMA program can be made if it is regarded as an expensive learning technology which will put China in a much stronger position to compete in 4G technology. For instance, for 4G, there will be more companies involved as stakeholders in the development of the technology, and more of the R&D will be performed in corporate labs, rather than in government research institutes and universities.

Chinese industrial policy will be measured, in part, by the success of its key companies abroad, and Chinese telecommunications companies are certainly beginning to make their presence

known internationally. Among service providers, for instance, China Mobile in 2007 acquired Pakistan's Paktel and established CMPak, now a wholly owned subsidiary of the parent company. China's telecom equipment manufacturers, especially Huawei and ZTE, have been considerably more active in terms of international expansion. Both have become important international suppliers of telecom equipment in second and third tier markets, and are beginning to make their presence felt in first tier markets as well. For instance, Huawei reportedly has secured a contract from TeliaSonera to deploy the world's first 4G commercial network in Oslo, which should begin operations in 2010.[5]

An interesting question about this expansion is the extent to which it leads to the diffusion of Chinese technical standards abroad. The evidence is not clear. Successful companies, like Huawei and ZTE, are now investing heavily in their own R&D at home and abroad and are incorporating innovative Chinese technology in the products they sell internationally. However, market-based companies are driven primarily by solutions that work and thus are drawn to the use of established international standards where these offer the greatest functionality. Thus in the Oslo project, Huawei appears to be offering innovative fourth-generation telecommunications base stations that can handle 4G standards derived from WCDMA (WCDMA/LTE) and CDMA (CDMA/LTE), and not from TD-SCDMA. It is interesting to note, though, that in May, 2008, China sponsored a 20 day seminar on Chinese approaches to standardization for officials from African standardization bodies. In this, China seems to be proselytizing Africa in ways which are reminiscent of recent US and the EU sponsored standards workshops and seminars intended to proselytize China!

As we observe the evolution of Chinese industrial policy, especially as it relates to technical standards, we can see that it is responding to the complexities of global innovation networks and the new technologies they generate, in a way which points to active policy learning. The crude attempt in 2004 to mandate the WAPI standard for wireless devices has now given way to a far more sophisticated appreciation of the need for industrial policy to conform to market forces and the norms and processes of international institutions, including standard-setting institutions. Efforts to impose strict uniform national limitations on the participation of foreign companies in Chinese technical committees for standard-setting reportedly have given way to a somewhat more relaxed approach in which technical committees can set their own rules for foreign participants that are wholly-owned or joint venture firms that are legally registered in China.[6] These rules, no doubt, will still be under the influence of state bureaucratic parents, but the overall policy is one that subjects techno-nationalist objectives to some of the realities of techno-globalism.

Chinese industrial policy shares with the industrial policy experiences of other East Asian countries in having both successes and failures. The successes, often achieved at great - and in

[5] http://www.chinatechnews.com/2009/01/20/8544-huawei-deploys-first-4g-commercial-network-in-norway/. Accessed March 18, 2009.

[6] Personal communication. Beijing, March, 2009.

some cases, arguably, unnecessary - costs have come as a part of the national "catch up" strategies that have transformed poor agricultural countries in the region into the ranks of technologically capable, middle-or wealthy country status. The ability to mobilize resources and direct them towards state selected priority sectors has been key to this catch-up strategy. But, as with its East Asian neighbors, there comes a time when the challenges of moving beyond catch-up make old policy modalities a liability. Parts of China still have a very long way to go before the catch-up phase is over, but clearly some sectors are approaching - or are at - the stage when catch-up industrial policies must give way to new approaches. China's leaders appear to recognize this fact and have called for the creation of a China by 2020 which is an "innovative society," and an industrial leader in new science-based industries, including ICT. Opinion is divided, both in China and abroad, as to whether these goals are achievable and as to the instruments being used to pursue them. In many ways, the trajectory of Chinese high technology development is very impressive, but we should also recognize the many problems China faces to maintain that trajectory.[7] Nevertheless, as frequent visitors to China can attest to, there is an increasingly sophisticated and cosmopolitan vibrancy to the place which would lead one to place one's bets on significant industrial and technological achievements over the coming decade.

Given this likelihood, the US must prepare itself for a far more competitive China in areas of high technology and science-based industry where we once enjoyed comfortable leads. While it will want to continue to monitor Chinese industrial policy to assess China's compliance with its WTO commitments, and engage China on a variety of bilateral trade and investment issues, the US must confront the need for its own revitalization and realize that revitalization is inseparable from our growing interdependence with China. This requires some serious rethinking of our interests *vis-à-vis* China, and a far more proactive approach to securing long-term benefits for the US from the successes of China's industrial and technological development. Chinese industrial policy need not lead us into a zero sum game, especially if we recognize that the challenges from China has less to do with Chinese industrial policy than with our failures to solve chronic problems keeping our nation from reaching its potential. A number of interrelated issues have to be faced by the US political system, the resolution of which requires far more effective bipartisan congressional leadership, and executive-legislative cooperation, than we have recently seen. These include:

1. Global Competition for Talent. Due to the relative underdevelopment of research and education conditions in China, and the superiority of those conditions in the United States, the US has long been a magnet for science and engineering talent from China. But, as a result of pro-research and education policies being pursued by the Chinese government, the advantage once possessed by the US is fading. As Chinese students seek advanced degrees in their own country, as generous research support from the Chinese government makes the salaries, equipment and facilities in China competitive with those in the US, and as economic conditions lure Chinese

[7] See, Richard P. Suttmeier. "The Discourse on China as Science and Technology Superpower: Assessing the Arguments." Presented at the "International Symposium on China As a Science and Technology Superpower" Organized by the China Research Center Japan Science and Technology Agency Tokyo, December 9-10, 2008. Submitted for the record of this hearing.

technical entrepreneurs to invest their energies in home markets with remarkable growth opportunities, the trans-Pacific competition for talent will intensify. One should note that this competition is not solely limited to Chinese scientists and engineers. China seeks to attract talent from around the world much as the US has long done.

2. Immigration. This competition for talent moves immigration policy to the center of the economic revitalization agenda, as illustrated, for instance, by the concerns of US high-technology companies in their efforts to recruit highly skilled Asian immigrants. Although some progress has been made in reconciling US traditions of free movement of people with the security concerns expressed in tightened post-9/11 visa policies, problems remain. Chinese scientists often have been unable to get visas in time for important professional meetings (including meetings of technical committees for international standards development), for instance, and this has not only produced considerable antipathy towards the US in the Chinese technical community, but has also led US companies and professional societies to convene their activities outside of the United States. Less than welcoming immigration policy has not helped in the competition for talent. Since the success of Chinese industrial policy, especially in next-generation science-based industries, ultimately depends on the quantity and quality of technical personnel available, US visa policy should be seen as a factor affecting the success of Chinese industrial policy.

3. Export controls. There is a need to reassess whether controls over high technology exports hit the right balance between the promotion of trade in industries where the US enjoys comparative advantage and the protection of strategic technologies in the face of Chinese security challenges. Special attention should be given to "deemed exports," or the movement of technology acquired by foreign researchers who participate in the work of American companies, universities, or government laboratories. The analysis and recommendations of "Beyond Fortress America," the recently released report on export controls and visa policies by the National Academy of Sciences, warrant priority attention. Chinese colleagues take great pleasure in pointing out that US export controls, while limiting technological capabilities in the short run, have often forced China into either seeking technology from other suppliers (at US expense) or, forcing a recommitment through Chinese industrial policy to develop the technology itself.

4. Foreign Investment. The growing wealth and technological sophistication of Chinese companies are likely to lead to an increased interest in acquiring stakes in American high-technology firms. Interest in such investment is again symptomatic of the interrelated nature of competitiveness and China policy. The hostility toward prospective Chinese investments in American firms during the past eight years was often of questionable economic rationality and security value, and created negative feelings towards a US which has long preached to others of the virtues of free and open foreign investment policies. A China that is emerging as one of the world's largest economies and an important player in global research and innovation is certain to seek further foreign investment opportunities in the United States, and the US needs to have a policy environment that will increase the likelihood that these investment initiatives lead to win-win outcomes, rather than lose-lose.

5. Standards and Intellectual Property. US leadership in setting technical standards and creating

intellectual property continues, but there is little doubt that China seeks to challenge that leadership for economic, national security, and prestige reasons. With enhanced national science and technology capabilities, distinctive market conditions, and government policies in support of standard-setting and intellectual property development, competition over standards and IP is sure to increase. The US cannot allow its leadership in standard-setting for cutting-edge technologies to dissipate.

A "new geography of knowledge"[8] represented by China's emergence as an important player in science and technology, a "new geography of finance,"[9] represented by China's national wealth and foreign currency reserves, along with a "new geography of pollution and resource consumption" have created a very different international reality from that which most Americans are familiar with. This new international reality requires a major recalibration of US security, economic, and environmental interests *vis-à-vis* China. Successful engagement with the consequences of Chinese industrial policy, including its growing technological capabilities, requires that the health of the eco-system for research and innovation in the US be ensured. It is necessary that the nation's science and engineering be given high level attention and priority access to resources. Science in the White House can no longer be relegated to an ancillary position. The President's Science Advisor needs to be given real stature and the Office of Science and Technology Policy should be strengthened, including the addition of personnel who are familiar with Chinese science and technology trends. Since the stakeholders in US science and technology relations with China extend well beyond those in the government, there is also a need for a high-level government-private sector council on US-China science and technology relations that would include representatives from industry, universities, NGOs, as well as government, to share information and coordinate activities. At present, US participation in science and technology relations with China are woefully uncoordinated, and government offices responsible for this relationship are woefully understaffed.

The US must recommit itself to the ideas of maintaining scientific and technological excellence throughout its public and private institutions and ensure that it remains a magnet for technical talent from throughout the world. This cannot be done without the revival of science as a US cultural value and the rebuilding of an effective system of science and engineering education. There is no greater long-term threat to the US ability to engage Chinese industrial policy than having a scientifically illiterate American population interact with a scientifically and mathematically sophisticated Chinese population on matters of science and technology.

[8] Dieter Ernst. "A New Geography of Knowledge? Asia's Role in Global Innovation Networks." East-West Center Policy Studies. 2009.

[9] I'm indebted to Dieter Ernst for suggesting this term.

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