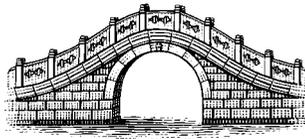


The Political Economy of Standards Coalitions: Explaining China's Involvement in High-Tech Standards Wars

—
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EXECUTIVE SUMMARY

This essay seeks to explain China's inability to successfully adopt and commercialize new technology standards by contrasting two standards development cases: wireless local area networks and home networking.

MAIN ARGUMENT

Technology standards are often the result of conflict between competing industry coalitions, which derive their strength from both political and economic sources. Several of the coalitions supporting unique Chinese standards, most notably for wireless local area networks (LAN), have been narrow and weak relative to the coalitions formed by their foreign competitors. Other less publicized efforts, such as those in home networking, have attracted a broader base of support and as a result show genuine commercial promise.

POLICY IMPLICATIONS

- As long as the industry coalitions supporting Chinese efforts to set unique technical standards in information technology are narrow, the opposition both of important segments of Chinese industry and of foreign companies and their governments will cause such efforts to fail.
- Despite high visibility, China's bid to promote WAPI over Wi-Fi as the international wireless local area network standard is not representative of all Chinese standards efforts. Much of Chinese industry and government increasingly recognize the need to be more transparent and receptive to foreign input during the standards process. In addition, Chinese firms want to contribute constructively to international initiatives as well.
- In order to foster Chinese integration into the global standards community, Western industries and governments should avoid highly politicized conflicts over standards and instead promote transnational business partnerships as well as technical and legal training. This approach would avoid unnecessary trans-Pacific tensions and increase business opportunities for Western businesses.

Chinese efforts to set unique technical standards in information technology as a competitive tool of industrial policy have led Western industries and governments to sound alarm bells. This concern stems not only from the perception that such efforts potentially violate the WTO's Agreement on Technical Barriers to Trade but also from the perception that these efforts challenge the West in an area where Western countries previously thought themselves highly competitive and most easily able to withstand China's rise as a manufacturing powerhouse. The concerns of Western nations peaked in late 2003 and early 2004, when China attempted to mandate a new wireless LAN standard, WAPI (wireless LAN Authentication and Privacy Infrastructure) over the widely used Wi-Fi (wireless fidelity). In response, foreign industry and governments mobilized both to challenge WAPI and to redirect China's overall strategy. Countering, or at least channeling, China's standards development efforts has become a prominent feature of U.S. and European Union (EU) trade policy.¹

What is generally lost in the discussion among Western observers is China's record to date. The Chinese government has already drafted two dozen industry and national standards in information technology, at least two of which (Chaoji VCD and TD-SCDMA) have been approved as international standards. Yet gains from these achievements have benefited China very little: Chinese industry has not collected any royalties from these standards, cross licensing of standards between Chinese and foreign companies has yet to occur, foreign firms have not turned over their intellectual property as a result of these standards, and products based upon these standards have met with only limited commercial success. Foreign companies and their products, however, have so far remained generally unscathed.

This essay attempts both to explain China's overwhelming record of failure in standards development to date and to identify signs indicating possible future success. The focus is not on how either China's problematic political environment may stifle innovation or how the country's economic situation may make innovation a less than ideal business strategy for Chinese firms. Instead, this essay demonstrates how the relative strength of competing business coalitions has shaped the trajectory and outcome

¹ This concern was most recently enunciated by the U.S. Trade Representative Office in its "U.S.-China Trade Relations: Entering a New Phase of Greater Accountability and Enforcement: Top-to-Bottom Review," February 2006. In August 2005 the United States posted a dedicated standards attaché to the U.S. embassy in Beijing, one of only four embassies with such an official (the others are Mexico, Brazil, and the EU). American standards organizations, such as the American National Standards Institute, have stepped up both their interaction with Chinese standards bodies and their consultations with the U.S. Congress and executive branch. The EU has also stepped up its efforts to provide training and advice to improve China's standards development process.

of standards fights in China. This position is defended by comparing two ongoing standards development efforts: one regarding the infamous WAPI case, the other involving less visible efforts to set home networking standards that facilitate communication between computers, consumer electronics, and communications technologies (collectively known as “3C convergence”). Wireless LAN and home networking standards efforts in China have differed in their origins, in processes of standards drafting and implementation, and in efforts at commercialization. For wireless LAN, there has been a small, narrow Chinese coalition of firms arrayed against a huge alliance of multinationals supported by their Chinese corporate partners. As a result, WAPI has had virtually no chance to succeed. By contrast, in the case of home networking, two Chinese efforts—IGRS and ITopHome—are composed of relatively broad coalitions of Chinese firms and even of some foreign partners. Although these groups are confronting an even broader coalition of multinationals, the Chinese may prove capable of commercializing a Chinese standard in products that find a willing market.

The data for this paper has been drawn from three sources. Most important are the more than 30 in-depth interviews—carried out in the fall of 2003 and August and October of 2005—with Chinese and foreign government officials, company executives, industry association representatives, and independent industry analysts. Another source includes the websites of the Chinese government, Chinese and foreign standards organizations, and various industry alliances. The final source used is the Western and Chinese media.²

This essay is divided into five sections:

- ≈ pp. 45–48 overviews different approaches to understanding China’s standards development and introduces the idea of competing coalitions
- ≈ pp. 48–56 presents a case study of China’s wireless LAN and the small, narrow Chinese coalition of firms supporting it
- ≈ pp. 56–59 presents a case study of China’s Home Networking standard and the broadening coalition base involved in standards creation
- ≈ pp. 59–61 presents conclusions
- ≈ p. 62 provides an **Appendix** of all the acronyms used in this essay

² In order to protect my sources, I must maintain their anonymity, and thus refer to them in citations as “author interviews.”

STANDARDS DEVELOPMENT AS WAR

China's entry into the World Trade Organization (WTO) in December 2001 was a watershed event. As part of membership, China agreed to eliminate or reduce thousands of tariff and non-tariff barriers.³ Though reforms have resulted in unprecedented levels of access to the Chinese market, WTO entry has not signaled the complete elimination of trade barriers. China has gradually begun to employ practices usually associated with advanced industrialized countries. In the area of fair trade, China is now the third most active initiator of anti-dumping investigations against foreigners (behind India and the United States) and has initiated its own safeguard actions.⁴ Equally novel, Chinese firms have joined with the Chinese government to develop technical standards, not simply as a way to promote harmonization, facilitate efficiency, or ensure health and safety, but also as a strategic tool to benefit the particular interests of Chinese industry and the Chinese state.⁵

Chinese efforts to employ standards as a competitive tool have been focused on information technology. In light of the fact that standards wars around the globe have been a regular feature of information technology—in particular networked technologies—during the past 30 years, this focus is understandable.⁶ Chinese businesses, government officials, and experts have repeatedly enunciated a strategy that views standards as trade weapons.⁷ This view is partly borne out of an impression that Western industry has used technology standards to solidify Western dominance of markets and force developing countries such as China to remain in an inferior position. An executive at Lenovo, a Chinese computer company, recently stated that, “Chinese companies must develop high technology and we must make our own technical standards if we hope to change from ‘made in China’ to ‘made

³ Nicholas R. Lardy, *Integrating China Into the World Economy* (Washington, D.C.: Brookings Institution Press, 2002).

⁴ Scott Kennedy, “China's Porous Protectionism: The Changing Political Economy of Trade Policy,” *Political Science Quarterly* 120, no. 3 (Fall 2005): 407–32.

⁵ The most complete review to date of this strategy is Richard P. Suttmeier, Xiangkui Yao, and Alex Zixang Tan, “Standards of Power? Technology, Institutions, and Politics in the Development of China's National Standards Strategy,” *NBR Special Report*, no. 10 (June 2006).

⁶ H. Landis Gabel, *Competitive Strategies for Product Standards: The Strategic Use of Compatibility Standards for Competitive Advantage* (London: McGraw-Hill, 1991); and Stanley M. Besen and Joseph Farrell, “Choosing How to Compete: Strategies and Tactics in Standardization,” *Journal of Economic Perspectives* 8, no. 2 (Spring 1994): 117–31.

⁷ For example, see An Baisheng, *WTO yu guojia biao zhun hua zhan lue* [The WTO and National Standardization Strategy] (Beijing: Chinese Commerce and Trade Press, 2005); and Zhang Ping and Ma Xiao, *Biao zhun hua yu zhi shi chan quan zhan lue di 2 ban* [Standardization and Intellectual Property Rights Strategy, Second Edition] (Beijing: Intellectual Property Rights Press, 2005).

by China.”⁸ Advocates of native Chinese standards believe that China’s large market gives the country the necessary leverage to succeed in such a strategy. Hence Fang Xingdong, a business consultant and Tsinghua University doctoral student, wrote last year that China’s huge market “is ours, but we’ve been passive, not proactive. To negotiate with the other side, we need our own cards to play. Standards are China’s cards.”⁹

So far, though, China has not played its standards cards well. Perhaps the most enticing perspective for explaining China’s problematic involvement in this contest thus far would be to focus on China’s political environment. Observers have noted how China’s mammoth and interventionist bureaucracy stifles innovation both by not adequately protecting property rights (particularly intellectual property rights, or IPR) and by pushing industry to take on projects that make bureaucratic, not market, sense. China’s firms spend a great deal of effort developing vertical ties to the state instead of horizontal links with researchers and other companies. The result is limited technological innovation.¹⁰ The natural corollary is the existence of few standards that make commercial sense.¹¹

An alternative explanation would focus instead on China’s economic circumstances. Internally, China’s low per capita income pushes firms to make low value-added products (based on existing standards) precisely because that is what the market will bear. China’s global economic position is likewise inhospitable to the development of new and unique high-tech standards. China’s comparative advantage lies in assembly and manufacturing. China is also a follower market for all high-technology products. Hence, Western companies have first mover advantages in setting standards, a position critical in the area of technologies with network effects.¹² The best circumstantial evidence for this economic perspective is that no developing country, regardless of political environment, has ever been successful in setting unique international standards in information technology when such standards primarily benefit that country’s own industry.

⁸ “China Strives for More Say in Technical Standards,” *People’s Daily Online*, May 14, 2005.

⁹ Zhao Huaxin, “Technical Standards Updated to Suit WTO,” *China Daily*, April 2, 2004.

¹⁰ George J. Gilboy, “The Myth Behind China’s Miracle,” *Foreign Affairs* 83, no. 4 (July-August 2004): 33–48; Anne Stevenson-Yang and Ken DeWoskin, “China Destroys the IP Paradigm,” *Far Eastern Economic Review* 168, no. 3 (March 2005): 9–18; and *Redefining Intellectual Property Value: The Case of China* (PriceWaterhouseCoopers, 2005).

¹¹ This link was made explicit by several interview sources.

¹² “Follower markets” are composed of products originally designed and manufactured for more mature markets with wealthier consumers. “First movers” include companies who are the original leaders in a product category, a situation that gives them advantages against newcomers when compatibility between products (such as a video player and discs) is important.

Though each perspective contains important elements of truth, neither is sufficient on its own. Not all Chinese companies behave as the political explanation envisions.¹³ Even if one were to accept that many companies do behave in such a manner, this view is useful only in explaining why few Chinese standards exist. The question of why Chinese initiatives do not succeed commercially (either within China or overseas) once a standard has been created is left unaddressed. Conversely, an economic explanation ignores the obvious political factors that shape everyday business behavior in China. This essay suggests that the most productive approach is to view these perspectives as complementary and see standards development efforts as contests between competing coalitions whose composition and power are derived from both domestic and international political and economic sources. This paper conceives of coalitions as alliances of firms based upon shared business interests. It is important to recognize that coalitions draw their strength not only from their members' capabilities and market prominence but also from those governments and international organizations that support and endorse coalition efforts.

An explanation that is based on coalitions is appropriate for several reasons. China's move to the market has been accompanied by the growing political activism of companies. These companies routinely lobby the national government on economic policy both directly and via industry associations. In addition, the policy preferences of firms are now heavily affected by business interests as opposed to ownership form or nationality. Thus we now see a variety of coalitions that cross policy issues and sectors. As China's economy has opened up, foreign firms and industry associations have also become politically active within China. Although sometimes united against Chinese industry, the two sides have regularly found common policy ground.¹⁴ More broadly, as suggested above, industry has become more directly involved in setting standards across the globe, and standards wars between competing coalitions of firms have become common. Chinese standards efforts can be examined through the same coalition-centered framework.

¹³ Donald N. Sull with Yong Wang, *Made in China: What Western Managers Can Learn from Trailblazing Chinese Entrepreneurs* (Boston: Harvard Business School Press, 2005); and Ted C. Fishman, *China, Inc.: How the Rise of the Next Superpower Challenges America and the World* (New York: Scribner, 2005).

¹⁴ See Scott Kennedy, *The Business of Lobbying in China* (Cambridge: Harvard University Press, 2005). For the discussion of lobby's effect on standards wars in China, see pp. 119–25. I also discuss this issue in Scott Kennedy, "Holey Protectionism!" *China Economic Quarterly* 8, no. 3 (Fall 2004): 24–28.

WIRELESS LAN: CHINA'S NARROW COALITION

Origins

The fight over wireless LAN standards exhibits strong political overtones and in many ways is consistent with viewing Chinese standards efforts through a strictly political (rather than economic) lens. Though perhaps explaining why WAPI emerged, such an analysis will not explain why WAPI failed. For WAPI to fail, an opposing coalition had to exist. This section will demonstrate how the composition and influence of the opposing coalitions were shaped by both political and economic factors.

The central rationale for China's effort to establish the WAPI standard was the apparent weakness of the encryption component in the widely used Wi-Fi standard. Ever since the Institute of Electrical and Electronics Engineers (IEEE) approved Wi-Fi in 1999, independent analysts have noted the security deficiencies of Wi-Fi's encryption component, which is known as wired equivalent privacy (WEP). A year after Wi-Fi's initial release, the IEEE's Local and Metropolitan Area Network Standards Committee (802.11) began looking for an improved encryption method. In early 2003 the committee issued the temporal key integrity protocol (TKIP), also known as Wi-Fi protected access (WPA), as an interim solution to replace WEP.¹⁵

In light of Wi-Fi's original technical weaknesses, China's concern over security paralleled that of others.¹⁶ The reason why China's involvement in wireless encryption standards goes beyond mere academic curiosity or a commercial venture is largely due to the chief actors interesting in establishing a new wireless standard in China. The primary researchers and industry origins come from Xidian University's National Key Lab for ISDN Theory and Key Technology. In 2000 the lab created a corporate face, IWNCOMM (*jietong*). Several interview sources suspect that IWNCOMM, which had over 70 employees as of 2005, has strong ties to the Chinese military and state security apparatus. Of note is the fact that the company's registration records list several individuals as having invested RMB 1 million in IWNCOMM. The age and public work background of these individuals, however, suggest that

¹⁵ Jesse Walker, "IEEE 802.11i Standard Improves Wireless LAN Security," *Technology@Intel Magazine*, May 2005 ~ <http://www.intel.com/technology/magazine/standards/80211i-0505.html>.

¹⁶ William A. Arbaugh et al., "Your 802.11 Wireless Network Has No Clothes" (working paper, University of Maryland, March 30, 2001); and Jesse Walker, "A History of 802.11 Security" (keynote speech, WINLAB, Fall 2005) ~ <http://www.winlab.rutgers.edu/pub/docs/JesseWalker.pdf>.

they would either not have such resources themselves or would be unable to obtain such resources from commercial banks.¹⁷

The other key participant in China's effort to establish the WAPI standard is the State Encryption Management Commission (SEMC). Foreign industry first became aware of SEMC in 1999, when the State Council issued a regulation requiring all software makers—Chinese and foreign—to turn over their encryption codes to the SEMC.¹⁸ Given that such a move would potentially open the financial and management networks of the software industry to Chinese government eavesdropping, foreign industry balked at the rule.¹⁹ By early 2000 the SEMC had relented, at first by limiting the scope of the regulation's applicability and then by temporarily suspending the regulation. The weaknesses of Wi-Fi offered SEMC a second bite at the apple.

China's promotion of the WAPI standard may stem from several potential motives. As with other standards, WAPI could provide Chinese industry with significant income from royalties if companies end up using the standard in their own products. China could also obtain foreign technology in exchange for access to WAPI. In addition, WAPI clearly touches a nationalist chord since its commercial success could burnish China's reputation. One final possibility is that China's military and security agencies want to obtain foreign technology for use in Chinese equipment or, more conspiratorially, to implant coding in WAPI that would allow for backdoor access to the confidential information of foreign companies and governments.²⁰

Drafting

In August 2001 China formed the Broadband Wireless IP Standards Group (*Zhongguo kuandai wuxian IP biao zhun gongzuo zu*, or BWIPS) to draft a standard more secure than IEEE 802.11 (Wi-Fi). BWIPS work culminated in May 2003 when the Standardization Administration of China (SAC) issued the WAPI standard (*guojia wuxian juyuwang guojia biao zhun*). WAPI apparently differs from Wi-Fi primarily in authentication and encryption

¹⁷ Author's interviews. An interview source from Chinese industry challenges these assertions, saying that even if a firm interacts or has contracts with the military, it is not the military itself. The same would not be said of American companies that make dual-use or military equipment for the U.S. military.

¹⁸ See the text of the "Commercial Encryption Management Regulation," State Council Document 273, signed October 7, 1999 ~ <http://www.SunTzuReport.com>.

¹⁹ Author's interview.

²⁰ "Deconstructing China's WAPI," *Electronic Engineering Times*, January 12, 2004; and author's interview. Many Chinese believe Microsoft's Windows operating system has a backdoor that can be exploited by the U.S. National Security Agency, hence, one rationale for promoting Linux.

methods. Citing the 1999 commercial encryption regulations, however, which stipulate that such information cannot be shared with foreigners, the SAC and SEMC have not released WAPI's encryption algorithm. Due to national security concerns, the SAC took the liberty of making WAPI mandatory, what the WTO refers to as a technical regulation. The standard was originally expected to take effect December 1, 2003, but a six-month grace period was granted, setting a firm deadline of June 1, 2004. From that point forward, no other wireless LAN encryption protocols were allowed to be sold in China. Moreover, since WAPI's encryption algorithm could not be shared with foreign entities, the SEMC declared that foreign companies that wanted to sell encryption-enabled equipment in China would have to cooperate with licensed Chinese vendors.²¹

This declaration was an extremely bold, even brazen attempt to force a standard onto the market. Also apparent is that the behavior and composition of the WAPI coalition varied drastically from the behavior and composition of those who drafted and promoted Wi-Fi. BWIPS has been composed of a relatively narrow group of companies, research institutes, and other agencies. BWIPS was also quite secretive during the drafting process and apparently had far more connections with the security side of the Chinese government than with either Chinese industry at large or with the usual information technology regulators, such as the Ministry of Information Industry (MII). After the standard was issued, foreign industry had difficulty both interacting with BWIPS and learning any information regarding WAPI's encryption algorithm.²² Generally speaking, statements by BWIPS leaders carry the tone of government cadres making official pronouncements—something inappropriate for a supposedly non-state group composed of companies and researchers.²³

The contrast with those organizations drafting the Wi-Fi standard could not be more stark. The IEEE, a non-profit and independent group of engineers from all over the world (including a large contingent of Chinese experts), created the IEEE 802.11 committee in 1990 in order to begin drafting a wireless LAN encryption standard, which was issued in 1999. U.S.

²¹ For a very good summary of the WAPI/Wi-Fi conflict, see Ping Gao, "Elements Influencing Standardization in Developing Countries: A Case of Wireless Security Standards Disputes," in *Proceedings of the 4th International Conference on Standardization and Innovation in Information Technology, September 21–23, 2005*, ed. T.M. Egyedi and M.H. Sherif, International Telecommunications Union, Geneva, Switzerland.

²² Author's interview.

²³ For more regarding the history and composition of BWIPS, see the official BWIPS website ~ <http://www.chinabwips.org>.

government involvement in the committee has been virtually non-existent. Instead, the committee is dominated by experts from a wide number of major corporations and research institutes. Soon after the initial standard was released, five telecom companies—Cisco, Conextant, Agere, Nokia, and Symbol—formed the Wireless Ethernet Compatibility Alliance (WECA) in August 1999 in order to promote commercialization of the standard. In October 2002 WECA changed its name to the Wi-Fi Alliance. The Wi-Fi Alliance has grown to include more than 220 companies. In addition, the alliance has created its own system for testing and certifying products as Wi-Fi compliant; the list of certified products sold throughout the world has now grown to 2,200.²⁴

WAPI supporters regularly contend that Wi-Fi is not an international standard, noting that the IEEE, though claiming a global membership, has its secretariat in the offices of the American National Standards Institute (ANSI) and is heavily influenced by ANSI's largest corporate members (particularly Intel). Moreover, the IEEE is not a state-based membership organization.²⁵ The Chinese stress this point because the WTO's Agreement on Technical Barriers to Trade discourages countries from developing a standard when an international one already exists. Thus, although the Chinese are technically correct in claiming that Wi-Fi has not been made an official international standard, Wi-Fi's global commercial spread has been more important in shaping the contest's outcome.

Resolution

Following the formal adoption of the WAPI standard in December 2003, several months passed during which firms and governments attempted to learn more about how to comply with WAPI. The initial conflict concluded on April 21, 2004. Following negotiations with U.S. Secretary of Commerce Donald Evans and U.S. Trade Representative Robert Zoellick, Chinese Vice Premier Wu Yi announced that China would “indefinitely postpone” the mandatory

²⁴ Additional background information is available on Wi-Fi Alliance's website  <http://www.wi-fi.org>.

²⁵ “China Wants Own Security Protocol International,” *China Daily Business Weekly*, December 16, 2003; and author's interviews. This is technically important because the WTO's TBT Agreement states that when an international standard exists, countries should adopt that standard. Efforts to do otherwise can be seen as protectionist. The WTO does not officially recognize the IEEE as an “international” standards organization. See the TBT Annex 1, available on the WTO's website  <http://www.wto.org>. From a tactical point of view, WAPI supporters should have granted that Wi-Fi was an international standard but stressed that Wi-Fi was problematic and undergoing revision, something that should not only be permitted of the standard's original authors.

implementation of WAPI. Wu also promised that China would work to revise WAPI and cooperate with international standards organizations.²⁶

The composition and behavior of the two opposing coalitions were largely responsible for the conflict's outcome. WAPI was supported by a narrow coalition; at its core was the SEMC and the BWIPS drafting group, led by IWNCOMM. Also included were the two dozen Chinese companies licensed to receive the WAPI algorithm; these companies could either produce their own WAPI-based products or cooperate with foreign technology companies. Though the list of these Chinese vendors does include some impressive companies—Lenovo, Founder, Qinghua Tongfang, Huawei, and TCL—only a few had much enthusiasm for WAPI. A few foreign companies did begin the process of trying to comply with the standard and enter into dialogue with potential Chinese partners, including BenQ, D-Link, CyberTAN, Atheros, Netgear, Linksys, and Texas Instruments.²⁷ None went so far, however, as to develop a WAPI-compliant product.

In the other camp stood a large and firmly unified group of multinationals from the United States, Western Europe, and elsewhere. The two most important companies involved were semiconductor companies Intel and Broadcom, which both announced that they could not meet the WAPI regulation guidelines and thus would stop shipping relevant products (such as Intel's Centrino chips) to China as of June 2004.²⁸ Intel's actions were particularly important since the company is one of the largest foreign investors in China, with three factories in Shanghai and research facilities elsewhere. Several industry associations were also quite active in organizing foreign business, including the U.S. Information Technology Office, the European Information and Communications Technology Industry Association, and the Japanese Chamber of Industry and Commerce. These various players lobbied the legislative and executive branches of their respective governments, which in turn put pressure on the Chinese to abandon WAPI.

Although unified foreign opposition was the critical factor in WAPI's demise, a large swath of Chinese industry was also opposed to WAPI. Lenovo was officially a licensed vendor, but was not likely enthusiastic about being so. Lenovo has a long partnership with Intel and was in the early stages of

²⁶ Ping Gao, "Elements Influencing Standardization." For the official announcement, see U.S. Trade Representative Office, "U.S.-China JCCT: Outcomes on Major U.S. Trade Concerns," April 21, 2004 ~ <http://www.ustr.gov>.

²⁷ "Intel Tells China: No More Chips," *Wi-Fiplanet.com*, March 11, 2004; "Intel Asks China to Drop Local WLAN Spec," *The Register*, April 5, 2004; and Ping Gao, "Elements Influencing Standardization."

²⁸ "Intel Tells China: No More Chips," *Wi-Fiplanet.com*.

negotiations to buy IBM's personal PC unit. Along with other Chinese companies, Lenovo also had to worry about the costs of developing a China-specific product that could derail pursuit of a greater interest: exporting to the West.²⁹ As a result, interview sources believe that several of the most successful Chinese IT companies expressed concern to Chinese bureaucrats and political elites regarding WAPI and the negative effect WAPI could have on their business.³⁰ These industry giants were more economically and politically important than the band of small companies and institutes that pushed for WAPI. Hence, when Wu Yi succumbed to foreign pressure, she was also abiding by the preferences of China's business elite.

As persuasive as a coalition explanation may be as to why China gave up WAPI, one industry source offers an alternative explanation that emphasizes bureaucratic conflict. WAPI was supported by the SEMC, which is part of the Chinese security bureaucracy. WAPI was not a product of MII, the Ministry of Science and Technology (MOST), or the Ministry of Commerce (Mofcom), all three of which are part of the economic and financial bureaucracy. Throughout the conflict, not a single official from the economic bureaucracy spoke up publicly on behalf of WAPI. From this perspective, when Vice Premier Wu Yi—herself a member of the economic side of the system—sacrificed WAPI, she was only giving up something that her part of the bureaucracy never had much vested interest in the first place. Though seemingly a reasonable explanation and one that is consistent with a long record of turf battles that often grip China's bureaucracy, this view neglects to consider whether the views of officials in MII, MOST, Mofcom, or of Wu Yi herself were at all shaped by the views of foreign and, more importantly, Chinese industry leaders. Because the available evidence suggests that such outside influence was present, a standard bureaucratic politics explanation does not adequately capture the dynamics of the situation (or in much of Chinese economic policymaking more broadly). If a wide spectrum of China's corporate elite had embraced WAPI, Wu Yi probably would not have given up on the standard so quickly, particularly before the deadline had passed.

²⁹ "WAPI biao zhun tuichi shixing qianjiu meiguo?" [Does Delaying Implementation of WAPI Standard Accommodate America?], *Renminwang*, June 12, 2004.

³⁰ Author's interviews. One foreign analyst said that Chinese industry essentially told the government, "WAPI is going to screw us."

Aftermath

Following the April 2004 concessions, China did revise WAPI and attempted to make it an international standard. In November of that year, China submitted a draft standard to the relevant official international organization for standards, the International Organization for Standardization/International Electrotechnical Commission Joint Technical Committee Subcommittee 6 (ISO/IEC JTC1 S6).³¹ At the same meeting, the IEEE also submitted Wi-Fi, complete with a fully revised version of its security protocol WPA2 (which the IEEE itself ratified in July 2004).³² The IEEE/Wi-Fi Alliance apparently took this step in response to China's actions; the alliance did not want to allow for the possibility that WAPI might be the only "official" international wireless LAN standard.

As the coalition explanation would expect, the Chinese side faced significant opposition at the international level and was ultimately defeated by the IEEE/Wi-Fi coalition. At the November 2004 meeting in Orlando, Florida, four of the six Chinese participants were unable to obtain visas. The Chinese contend that the U.S. government withheld these visas in an attempt to help Intel and the Wi-Fi Alliance. Others say that the Chinese participants simply failed to provide the necessary forms and were denied entry for security reasons.³³ During the next JTC1 S6 meeting in Frankfurt, Germany in February 2005, the organizers surprised the Chinese delegation by deciding not to place the WAPI proposal on the meeting's agenda, arguing that the proposal was improperly prepared. The IEEE proposal was instead discussed and plans went forward for it be voted on. The Chinese, feeling that they had been sidelined, walked out of the meetings after two days, causing a firestorm of nationalistic media attention in China. The meeting organizers accused the Chinese of engaging in stunts.³⁴ If meant to foster delay, then these tactics did not work. During a May 2005 meeting in Geneva, the various sides mended fences and agreed that both standards should be considered. In August 2005 the parties met in Beijing to see if the two standards could be integrated into one. No agreement was reached. Thus the two competing alternatives were

³¹ The JTC is a joint committee composed of both the ISO and IEC. JTC's subcommittee six is responsible for standards related to "telecommunications and information exchange between systems."

³² "ISO Finally Acknowledges WAPI," *SinoCast*, December 13, 2004.

³³ Author's interviews; and "ISO Meeting Fails to Back WAPI Standard," *China Daily*, February 25, 2005. One independent observer has also expressed such suspicions.

³⁴ Chris Buckley, "China's Homegrown Technology vs. the Establishment," *International Herald Tribune*, March 14, 2005.

placed on the ballot before the JTC1 S6, and the voting period lasted from early October 2005 to early March 2006.³⁵

When the results were announced, Wi-Fi emerged the clear winner, obtaining 19 of 22 votes from the committee's "participatory" members and thus easily surpassing the necessary two-thirds minimum. Only 5 of 22 members voted for WAPI.³⁶ Chinese officials charged that the IEEE engaged in an underhanded "conspiracy" to thwart WAPI by lobbying voting bodies and spreading disinformation—behavior that violates the expected consensual norms of the process.³⁷ Due to the distributional benefits standard adoption or blockage brings, the IEEE's aggressiveness and ability to sway voting members underscores the hotly contested nature of standards. In addition, several of those who voted against WAPI explained that their decision was partly affected by the fact that WAPI's development process was relatively closed and that China would not divulge WAPI's encryption algorithm.

WAPI's defeat in the international standards forum likely seals its commercial fate. In the two years between Wu Yi's concessions and the ISO JTC1 S6 vote, there has been little progress toward developing any genuinely commercially viable products based upon the WAPI standard. In March 2005 AMD, Intel's global rival, expressed support for WAPI, but has not yet taken any concrete steps to do so.³⁸ In January 2006 the Chinese government issued a circular encouraging government agencies to buy domestic products that use the WAPI standard.³⁹ One month later, just as the ISO's decision was about to be revealed, twenty Chinese companies announced the formation of the WAPI Industrial Alliance, with the goal of meeting this new mandated need.⁴⁰ At best a face-saving effort, the formation of this alliance increasingly looks like

³⁵ "ISO/IEC wuxian juyuwang anquan tiebie gongzuo huiyi zai Beijing zhaokai" [ISO/IEC Wireless LAN Security Special Working Meeting Opens in Beijing], BWIPS website, August 8, 2005 ~ <http://www.chinabwips.org>; and "WAPI chansheng pianyu guojia zhudaohua zhongmei duilei biao zhun zhanlue" [WAPI Produces a State-led Standards Strategy Prone to U.S.-China Confrontation], *Caijing shibao*, December 31, 2005.

³⁶ The five votes came from China, the Czech Republic, Iran, Kenya, and Spain. China also received positive votes from three observer members: Cuba, Luxembourg, and Russia. Note that some members voted for both. Information taken from ISO JTC1 S6 website, March 2006. See Mike Clendenin, "ISO Rejects China's WLAN Standard," *EE Times*, March 12, 2006.

³⁷ After voting began, the IEEE circulated a statement strongly critical of the WAPI proposal. The Standardization Administration of China (SAC) responded with statements defending WAPI and charging the IEEE with, among other things, "cultural chauvinism." See Mike Clendenin, "Patents for SALE Spec's Defeat Riles China," *EE Times*, March 20, 2006; Standardization Administration of China, "Urgent Alert on IEEE's Recent Unethical Activities," February 2006; and SAC, "Preliminary Response to IEEE Comments on 1N7904," February 2006.

³⁸ "AMD Shows Support to China's WAPI," *SinoCast China IT Watch*, March 9, 2005.

³⁹ Liu Baijia, "Network Products Receive Lift," *China Daily*, January 7, 2006, 5.

⁴⁰ Li Weitao, "Nation Pushes Forward Own Encryption Standard," *China Daily*, March 8, 2006.

a face-losing effort since it is questionable whether the alliance can generate enough enthusiasm among Chinese chipmakers, computer manufacturers, and network providers to bring WAPI to fruition. Though WAPI may eventually be adopted by Chinese government and military agencies, the coalitional dynamics are such that WAPI will never be commercialized, no matter how strongly elements of the Chinese government support it.

HOME NETWORKING: BROADENING INVOLVEMENT

The prominence of the WAPI case is responsible for the impression among some Western companies and governments that all Chinese standards efforts are politically motivated and aimed at unfairly locking foreign industry out of China's market. WAPI is not, however, indicative of Chinese high-tech standards efforts writ large. In clear contrast is the case of home networking standards. Two coalitions of Chinese companies have drafted and are now attempting to commercialize their respective standards. The competition both between these two coalitions and between the coalitions and multinationals demonstrates even more clearly the importance of economic factors in determining the trajectory of standards development.

International Efforts

The first global efforts to create home networking standards are more recent than those related to wireless local area networks. The Digital Home Working Group (DHWG) was formed in June 2003 by seventeen companies from the computer, consumer electronics, and communications industries, including Sony, Philips, Hewlett-Packard, Matsushita, Microsoft, Intel, and Nokia. In June 2004 the group changed its name to the Digital Living Network Alliance (DLNA) in order to signify the group's promotion of the convergence of information technologies both within and outside the home. At around the same time, the group issued the DLNA Home Networked Device Interoperability Guidelines v1.0.⁴¹ The document is called a guideline rather than a standard because it aims to promote connectivity between products that are already standardized. Much like the Wi-Fi Alliance, DLNA has attracted a large number of companies both from across the industrial spectrum and from around the world. In September 2005 DLNA announced procedures to

⁴¹ See the Digital Living Network Alliance website ~ <http://www.dlna.org>.

begin certifying products as DLNA compliant.⁴² As of May 2006 the group had 261 members from around the world and from all levels of the product supply chain.

Chinese Efforts

Whereas the WAPI effort was primarily initiated by the security side of the Chinese government, there has been much more industry initiative for home networking standards. In this respect the government's role has been relegated more to that of a facilitator than a leader.⁴³ In 1999 the former State Economic and Trade Commission issued an approval for twelve Chinese companies to begin drafting a home networking standard within the Home Informationization Network System Structure and Product Development Platform Working Group. The twelve companies were Changhong, Haier, ZTE, Wuxi Little Swan, Chunlan, the MII TV Sound Institute, TCL, E-World, Shanghai Guandong, Qinghua Tongfang, Xiaxin, and Beijing Changxinjia. Because the group made little progress during the first two years when it was chaired by Changhong, Haier was allowed to take over the reins. At the end of 2001, the Ministry of Information Industry set up its own working group, the Digital TV Receiver Equipment and Home Network Platform Interface Standards Working Group. In fact, MII's group was really just an extension of the SETC group. Eleven more companies joined the process, including Lenovo, Hisense, and Shanghai Bell.

The large and diverse group worked well together until the time came to decide on a standard. Of the four proposals put forward, only two were accepted—one by Beijing Changxinjia, the other by Qinghua Tongfang. These two proposals were submitted jointly to MII in October 2003. Dissatisfied with the group's direction, Lenovo persuaded MII to allow Lenovo to withdraw from the group and engage in a separate effort. In July 2003, Lenovo, TCL, Konka, Hisense, and Great Wall formed their own independent industry alliance, the Intelligent Group and Resource Sharing (IGRS, commonly known in Chinese as *shanlian*) Working Group.⁴⁴ MII's only stipulation was that, due to the first group's focus on home networking, IGRS should focus on the office and business environment. In March 2004 the new group, run

⁴² A list of these products is maintained on the group's website <http://www.dlna.org>.

⁴³ The Chinese government was not a mere regulator in this case, but acted as a "midwife" to the sector. See Peter Evans, *Embedded Autonomy: States and Industrial Transformation* (Princeton: Princeton University Press, 1995), 77–81.

⁴⁴ The group's formal Chinese name is *Xinxi shebei ziyuan gongxiang xietong fuwu biao zhun gongzuozu* [Information Equipment Resource Sharing System Service Standards Working Group].

by Lenovo, submitted IGRS 1.0 to MII for approval.⁴⁵ Not to be outdone, in July 2004 the original group, led by Haier, created the ITopHome Alliance (*e-jiajia*).⁴⁶

The behavior of both Chinese groups is more open and independent than that shown in the effort for WAPI. For example, the IGRS Working Group's constitution is relatively progressive about membership and operating rules. So long as non-Chinese companies are interested in China's market, membership is open to foreign companies. Proposals require two-thirds support to be accepted. And, as is typical internationally, IGRS requests that members who contribute technology to the standard disclose their relevant patents, grant other members access to their technology on a "reasonable and non-discriminatory" basis, and accept that the working group will create a patent pool for licensing the standard to non-member companies. As of April 2005 the group had incorporated 179 patents into its draft standard.⁴⁷ Although the constitution gives MII's Science and Technology Division significant oversight powers, in reality government officials rarely attend IGRS Working Group meetings.⁴⁸

The IGRS and ITopHome consortia both have also spent a great deal of effort to expand their respective alliances. The IGRS Alliance has almost 60 members, including companies from South Korea, Japan, and Taiwan. IGRS has also signed memoranda of understanding to promote cooperation with home networking groups in Japan and South Korea.⁴⁹ Haier's ITopHome consortium has 244 members, but has had less success in attracting foreign participants.⁵⁰ In late June 2005 the standards proposals of both groups were approved by MII.⁵¹ Since then both groups have focused on commercializing their standards. With cooperation from the MII Institute Certification Center,

⁴⁵ "Ejiajia VS shanlian: shuzi jiating zhongguo biaozhunde yuliangzhizheng" [ITopHome vs IGRS: War of Masters for Digital Home Chinese Standard], *Huliangwang zhoukan* [Internet Weekly], September 3, 2004.

⁴⁶ "Ejiajia VS shanlian: shuzi jiating biaozhun qi neizheng" [ITopHome vs IGRS: Digital Home Standard Starts Civil War], *Cbinews*, August 2, 2004.

⁴⁷ Sun Yuning, "Shanlian biaozhun gongzuo jinzhan jieshao" [Introduction to the Development of Shanlian Standards Work] (presented at the Beijing Information Technology Standard International Forum, Beijing, April 2005).

⁴⁸ Author's interview. For more information on IGRS, see the group's website ~ <http://www.igrs.org.cn>.

⁴⁹ "China, Japan, South Korea to Form Digital Home Network Committee," *SinoCast China IT Watch*, April 3, 2006.

⁵⁰ "Will Intel and Microsoft Dominate China's Digital Home Market?" *Interfax China IT & Telecom Report*, December 2, 2005; and ITopHome website ~ <http://www.itophome.org.cn>.

⁵¹ "Shanlian ejiajia jun huopi cheng guobiao, shuangfang wei dacheng hezuo gongshi" [IGRS and ITopHome Both Approved As National Standards, Two Sides Yet To Reach Cooperation Consensus], *Diyi Caijing Shibao*, July 1, 2005.

IGRS has developed a process for testing and certifying products as IGRS-compliant.⁵² The IGRS Group has set up over two dozen sites demonstrating home networking technology, and the group claims that it sold over 1 million IGRS-compatible products in 2005. Most recently, Konka and TCL have launched IGRS-enabled television sets. Most product development, however, has been done by Lenovo.⁵³

Although these efforts may soon pay major dividends, Chinese groups are feeling pressure from DLNA, which has begun to market its products in China. Intel has also begun to look for partners to help market its “Viiv” home entertainment platform in China. In mid-December 2005, perhaps as a result of Intel’s efforts, eight of the IGRS Alliance members formed an IGRS company to better facilitate their business activities.⁵⁴ Perhaps the most interesting aspect of these developments is that Lenovo itself is a member of both the IGRS and DLNA groups, having joined DLNA as a founding member in June 2003. TCL joined DLNA in December 2004 and Huawei joined in July 2005. Cross-membership thus not only raises the chances for potential cooperation between the groups but also allows several Chinese companies to benefit commercially even when unable to compromise. The contrast with WAPI could not be more stark.

CONCLUSION

This review of recent standards efforts suggests the benefits of looking at standards conflicts through the lens of coalitions, especially given that the composition, behavior, and influence of coalitions are the product of both political and economic factors. Coalitions in China have not conformed to a single pattern. On the one side is WAPI, which is representative of narrow, politically motivated coalitions. On the other side is IGRS and ITopHome, both of which are comprised of a broad spectrum of firms. Despite having higher visibility, WAPI is the only high-tech standards effort in China to date to carry direct security implications and hence the only one to be embodied in a mandatory standard. The home networking case is more typical—the government is often involved but plays a more subsidiary role, the drafting process is more transparent, and the contests are not strictly between China

⁵² “News,” IGRS, August 31, 2005 ~ <http://www.igrs.org>.

⁵³ “Digital Home Network Committee,” *SinoCast China IT Watch*; and “China’s Digital Home Market?” *Interfax China IT & Telecom Report*.

⁵⁴ “Eight Titans to Push IGRS,” *SinoCast China IT Watch*, December 23, 2005; and “SMG to Provide Content for Intel’s Viiv PC Platform,” *Interfax China IT & Telecom Report*, January 6, 2006.

and foreign industry. Examples include the standards process for developing video disc players (Chaoji VCD and EVD) and, most recently, audio-visual standard (AVS). Although the initial standards-setting process for China's third-generation cellular technology (TD-SCDMA) was relatively closed, the efforts to commercialize this technology have involved extensive cooperation with global industry.

What is driving Chinese standards efforts to be inclusive? China's low level of independent technological capabilities is partly responsible by making the Chinese dependent upon foreign help. As Chinese abilities expand, however, standards efforts will not necessarily become more protectionist. That is because China's strategy to modernize has been based for over two decades on attracting billions of dollars in foreign investment and deeply integrating Chinese industry into global production networks. The weight of these relationships generates economic, and thus political, opposition to protectionist strategies within China. Unsurprisingly, IWNCOMM, which has no international business ties, has favored protectionist WAPI, while Lenovo and Haier, both of which are fully integrated into the global economy, have pursued the more liberal IGRS and ITopHome. The obvious contrast is with Japan, which has preferred to license technology rather than allow foreign investment and joint ventures. In 2000 the stock of foreign direct investment accounted for 17.9% of China's GDP; the comparable figure for Japan was a paltry 1.1%.⁵⁵ As a result, there has been less internal opposition within Japan to a variety of tariff and non-tariff barriers, including discriminatory standards.

The nature of China's integration into the global economy also explains why the level of contention visible in some of the high-tech standards efforts is not representative of China's overall standards efforts. Elsewhere, there is much less conflict between Chinese and foreign interests, as China has over the past two decades gradually moved to adopt international standards without much resistance. Doing so is key to China's goal of becoming a central manufacturing site for the global market. In order to reach this goal, China must accommodate many international standards related both to manufacturing and to the final products themselves. Surprisingly, one complaint from American standards groups is that the Chinese are overly committed to the International Organization for Standardization (ISO) and

⁵⁵ United Nations Conference on Trade and Development, "World Investment Report 2005: Transnational Corporations and the Internationalization of R&D," New York and Geneva, 2005, 315 and 321.

other official international groups and less open to informal international groups (in which American companies are more prominent).⁵⁶

Given the extent of China's economic liberalization to date and its location in the global economy, the most effective way for Western policymakers to promote their companies' interests is to further encourage and enhance transnational business alliances, which in turn erode the economic and political foundations for mercantilist efforts. Even though one should expect elements of Chinese government and industry to continue attempts to employ protectionist tactics, the promotion of transnational business linkages between Chinese and foreign industry is the most fundamental barrier against such efforts. In addition, Western governments, industry, and experts should expand the scope of technical and legal training to China so as to improve China's own standards system and encourage the Chinese to become more fully involved in international standards initiatives. The Chinese government and industry should be encouraged to become more fully involved in official standards development organizations such as the ISO and IEC; just as important, however, Chinese firms should also be courted to participate in international industry-led standards consortia, which are growing in number and significance.

As China industrializes and becomes more involved in the WTO and the global economy, Chinese companies are gradually learning to play the capitalist game—not only by old Chinese rules and just in China, but also by international rules and in international fora. Though foreign businesses will lose some of the standards contests in China, these defeats will not result from outright mercantilism but rather from the fact that some of these companies will be in the wrong coalition. Other foreigners will win by being in the right coalition.

⁵⁶ Author's interview.

APPENDIX

Acronym Key

ANSI:	American National Standards Institute
AVS:	audio-visual standard
BWIPS:	Broadband Wireless IP Standards Group (<i>zhongguo kuandai wuxian IP biao zhun gongzuo zu</i>)
DHWG:	The Digital Home Working Group
DLNA:	The Digital Living Network Alliance (formerly know as DHWG)
IEEE:	Institute of Electrical and Electronics Engineers
IGRS:	The Intelligent Group and Resource Sharing Working Group (<i>shanlian</i>)
IPR:	intellectual property rights
ISO/IEC JTC1 S6:	International Organization for Standardization/ International Electrotechnical Commission Joint Technical Committee Subcommittee 6
ISO:	The International Organization for Standardization
IWNCOMM (<i>jietong</i>):	created in 2000, the corporate face of Xidian University's National Key Lab for ISDN Theory and Key Technology
LAN:	wireless local area network
MII:	Ministry of Information Industry
Mofcom:	Ministry of Commerce
MOST:	Ministry of Science and Technology
SAC:	Standardization Administration of China
SEMC:	State Encryption Management Commission
TD-SCDMA:	third-generation cellular technology
TKIP:	temporal key integrity protocol, also known as Wi-Fi protected access (WPA)
WAPI:	wireless LAN Authentication and Privacy Infrastructure
WECA:	Wireless Ethernet Compatibility Alliance (known as the Wi-Fi Alliance since October 2002)
WEP:	wired equivalent privacy
Wi-Fi:	wireless fidelity
WPA:	Wi-Fi protected access