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The World’s Laboratory: China’s Patent Boom, IT Standards and the Implications for the Global Knowledge

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China’s Patent Boom, IT Standards and the Implications for the Global Knowledge Economy

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Abstract

Just as China’s factories disrupted the economics of IT hardware, its research labs have the potential to disrupt the economics of the technology itself. In 2014, China’s patent office received nearly 2.4 million patent applications, 93% from domestic applicants. China has also climbed to third place in terms of international applications, with over 21,000 WIPO PCT applications. Meanwhile, China has taken an assertive role in setting technology standards, both at the national and international levels. In the past, this has included developing and promoting alternatives to important IT standards as a means of challenging perceived monopolies by certain (foreign-dominated) technologies. More recently, China’s 2008 Anti-Monopoly Law and 2014 Regulatory Measures on National Standards Involving Patents have codified a national policy aversion to closed standards. China’s burgeoning patent portfolio, providing currency to negotiate into and around multinational patent pools, combined with the impact of its policies on standards-setting norms, could shift the economics of patent monetization in dramatic ways, foremost by putting downward pressure on royalty rates. Like previous market disruptions, China’s effect on the global knowledge economy is likely to challenge some foreign firms and benefit others.
I. Introduction

In 2014, China’s patent office received nearly 2.4 million patent applications. 93% were from domestic applicants. China has also climbed to third place in terms of international applications, with over 21,000 WIPO PCT applications.

China’s rise to its position as the “World’s Factory”\(^1\) shifted manufacturing capacity away from developed countries.\(^2\) But, more importantly, it changed the economics of global production generally. In information and communications technology (ICT or IT)—the sector that makes up 94.9% of China’s high technology exports and upon which this paper focuses\(^3\)—the globalized, geographically fragmented supply chain that distributes a huge variety of highly-specialized, affordable devices would not be possible without China's novel capacity for “ultra mass-flexible production.”\(^4\) It’s a capacity that foreign firms have put to highly-profitable use even as changing dynamics made certain business models no longer feasible.

Just as China’s factories disrupted the economics of IT hardware, its research labs could easily disrupt the economics of the technology itself. These economics are driven by intellectual-property licensing and the adoption of standards (a popular business aphorism in China has it that “third-rate companies build products, second-rate companies build technology, first-rate companies build standards”\(^5\)).

Despite the startling scale of China’s patent activity, which is explored in Part II, there are reasons to think the Chinese IT industry—which is more structurally inclined to view patents as an aspect of production rather than a free-standing source of revenue—may leverage its rights differently than comparable Western firms, and the impact of integrating this massive new fount of intellectual property into the global innovation economy remains to be seen.

Part III examines China’s increasingly assertive role in setting technology standards, both at the national and international levels. Chinese standards-setting organizations attracted significant international attention in the mid-to-late-aughts when they began putting forward home-grown alternatives to market-dominant technologies and expensive foreign patents. More recently,

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\(^2\) For example, China’s share of global exports of telecommunications and office equipment rose from around .08% in 1980 to approximately 34% in 2013, according to WTO statistics. WTO Statistics Database, http://stat.wto.org/

\(^3\) BREZNITZ AND MURPHEE, RED QUEEN, *supra* note, at 8.

\(^4\) its ability, exemplified in the Pearl River Delta’s Foxconn factories, to cheaply churn out a huge variety of highly-specialized products using the same manufacturing infrastructure, DAN BREZNITZ AND MICHAEL MURPHEE, RUN OF THE RED QUEEN 13-16 (2011).

Chinese agencies have put forward regulations that reflect a particularly militant stance on licensing terms and on proprietary standards generally.

China’s burgeoning patent portfolio, providing currency to negotiate into and around multinational patent pools, combined with the impact of its policies on standards-setting norms, could shift the economics of patent monetization in dramatic ways. Like previous market disruptions, China’s effect on the global knowledge economy is likely to challenge some foreign firms and benefit others.

II. China’s Patent Boom

A. Indigenous Innovation

In February 2006, the State Council of China issued a document styled “The National Medium- and Long-Term Science and Technology Development Plan (2006-2020).”6 Setting forth an ambitious transformational vision of a technology-centric Chinese economy by 2020,7 the Plan was quickly cited in the West as evidence of China’s “techno-nationalist” agenda.8 In particular, the 15-Year Plan established a new guiding principle for the country’s economic development: Zìzhǔ chuàngxīn (自主创新) or “Indigenous Innovation.”9

The goal of the Indigenous Innovation push is to reduce China’s reliance on foreign technology (from an estimated 60% in 2006 to less than 30% by 2020).10 Indigenous Innovation has since been promoted by government policy on both the national and local level.11 In addition to direct R&D support through state-funded research institutes, R&D investments by Chinese firms is encouraged through government procurement, tax breaks, subsidies and other incentives.12 Indigenous Innovation has also emphasized consolidating the fruits of this research through increasing Chinese involvement both nationally and internationally in patent filing and standard setting.13

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7 See PRC Central Government Website (English), China issues S&T development guidelines (February 9, 2006), http://www.gov.cn/english/2006-02/09/content_183426.htm
9 McGregor, supra note 7, at 13.
10 Serger and Breidne, supra note 7, at 147.
11 McGregor, supra note 7, at 17-19.
12 Id.
13 Id. at 26-30; Like R&D spending, it’s thought that China incentivizes patent activity by “financial remuneration, tax breaks and other benefits offered by the government in exchange for the filing of patents.” Chris Neumeyer, China’s Great Leap Forward in Patents, IPWATCHDOG, April 4, 2013, http://www.ipwatchdog.com/2013/04/04/chinas-great-leap-forward-in-patents/id=38625/. See also Patents, yes; ideas, maybe, THE ECONOMIST, Oct 14th 2010 (describing China’s “ecosystem of incentives for its people to file patents”). The state’s role in stand setting is explored in Part III infra.
B. Patent Activity in China: Growth and Scale

Measured in raw patents, China’s Indigenous Innovation has blown past expectations. The 15-year Plan’s aim to increase domestic inventors’ share of annual invention-patent grants from roughly 40% to 70% came achingly close to fruition—6 years ahead of schedule—in 2014, with 69.8% of the 233,228 invention patents granted by China’s State Intellectual Property Office (SIPO) awarded to domestic applicants.

SIPO now receives more applications than any patent office in the world, with 928,177 invention-patent applications received in 2014. In addition to invention patents, China also grants a second type of patent called a “utility model patent,” a category of intellectual property similar to rights granted in Germany, Japan and other nations but absent from U.S. law. China received another 868,511 utility model applications in 2014 (99.1% domestic), bringing the total number of SIPO patent applications (including design patents) to a staggering 2.4 million. While utility models are often disparagingly characterized as “petty patents” or “junk patents” due to the lower examination standards they entail, they cover largely the same subject matter as invention patents and are valid, enforceable intellectual property rights in China and elsewhere.

Meanwhile, Chinese patent activity has also boomed internationally. In 2013, 21,516 international Patent Cooperation Treaty (PCT) applications originated in China, up from only 1,731 in 2005, an average annual growth rate of 36.7% (by far the highest in the world), and making China the third most prolific country of origin for PCT applications overall, behind only

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14 Serger and Breidne, supra note 7, at 147.
15 SIPO, Comparative Table 1 Contemporary Quantity Comparison of Three Kinds of Patents Received from Home and Domestic between 2013 and 2014 (2013-2014 SIPO Application Statistics), http://english.sipo.gov.cn/statistics/2014/12/201502/t20150204_1071538.html
17 SIPO, Statistics December 2014 - Table 1 Distribution of Applications for Inventions Received from Home and Abroad (2014 SIPO Application Distribution), http://english.sipo.gov.cn/statistics/2014/12/201502/t20150204_1071541.html
18 Id.
21 Interestingly, these numbers seem to be leveling off. After a decade of double-digit annual growth, the total number of patent applications actually slipped between 2013 and 2014 (mainly due to a decline in design patent applications). 2013-2014 SIPO Application Statistics, supra note 14.
22 See Neurmeyer, supra note 12; McGregor, supra note 7.
23 When Chinese electrical-equipment manufacturer Chint Group was sued for patent infringement in Europe, it retaliated with a suit in Chinese court on the basis of its utility model patent. It was awarded a $45 million judgment. Neurmeyer, supra note 12.
26 2013 WIPO PCT Report, supra note 23.
the United States and Japan. Chinese telecoms ZTE and Huawei were the second and third largest individual filers respectively, trailing only Japan’s Panasonic. In the U.S. Patent and Trademark Office (USPTO), Chinese patent applications have soared 1,000% in the last decade.

These metrics come with inevitable caveats. Given the government incentives to patent, many Chinese inventors may be filing just to file rather than to protect a genuine innovation. Fewer SIPO patents are filed in multiple jurisdictions than patents in other countries, further indication, perhaps, of their comparative lack of quality. As for WIPO and USPTO applications originating in China, it’s been pointed out that many of these are filed by multinational corporations with R&D centers merely based in China, a testament more to the globalization of research than to a surge in indigenous innovation.

Nevertheless, given the sheer scale of Chinese patent activity, its sudden growth seems bound to effect the economics of technology licensing one way or another.

III. Standards

A. Standards in China

Technical standards—model specifications or criteria that encourage uniformity and compatibility within a given technical field—can have a dramatic impact on the value/cost of patent rights. Where a standard is adopted that incorporates propriety methods or configurations (a “closed” standard), licensing these rights becomes mandatory for any business wishing to create a standard-compliant product. The effect is particularly acute in IT, which, due to the nature of the often-complex systems involved, tends to evolve standards with multiple layers of interlocking inventions.

The Standardization Administration of China (SAC), established in 2001 during the departmental reshuffling in anticipation of the country’s WTO accession, establishes National

27 While still significantly less than the U.S. and Japan (who together accounted for almost half of PCT applications worldwide), China’s PCT activity is unique among countries WIPO classifies as “middle income,” with nearest-rival India clocking in an order of magnitude lower at 1,392 applications. Id. at 31.
28 Id. at 10.
29 Neumeyer, supra note 12; McGregor, supra note 7.
30 THE ECONOMIST, Patents, yes; ideas maybe (Oct 14th 2010)
34 See note 81, infra.
Standards (国标, gúobião or GBs).\(^{35}\) GBs can either be recommended or mandatory, though the latter is theoretically limited to standards involving health or safety and those necessary to enforce other laws and regulations.\(^{36}\) Of the 32,085 GBs listed in SAC’s database as of February 1, 2015, about 12% (3,894) are mandatory.\(^{37}\) Where no GB has been set by SAC, other ministries, such as the Ministry of Industry and Information Technology (MIIT, the ministry with responsibility for the IT sector) will set industry standards (业标, also translated as “trade standards”), which can also be either recommended or mandatory.\(^{38}\)

In addition, SAC represents China within international standard-setting organizations such as the International Organization for Standardization (ISO).\(^{39}\) Chinese involvement in international standards setting has become increasingly vigorous. As of February 1, 2015, SAC participates in 737 of ISO’s technical committees (for comparison, the American National Standards Institute (ANSI), the corresponding U.S. body, participates in 607),\(^{40}\) and initiatives by research bodies such as the China National Institute for Standardization (CNIS) focusing on increasing domestic expertise in standards development suggest a strong national commitment to increasing Chinese input into future international standardization efforts.\(^{41}\)

In contrast to the U.S. approach to technical standards, standards setting in China is unambiguously a matter of state policy. Unlike ANSI, a private non-profit organization, SAC is closely supervised by China’s State Council and is usually considered an arm of the state for all practical purposes.\(^{42}\) Indeed, China’s 1989 Standardization Law explicitly charges the government with responsibility for formulating and implementing technical standards.\(^{43}\)

**B. Standards and Protectionism**

Given the Chinese government’s active role in standards setting and its undisguised goal of fostering Indigenous Innovation, critics inevitably see the efforts of Chinese SSOs as animated by a protectionist agenda, especially where those efforts lead to national standards which differ

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\(^{35}\) See generally Standardization Administration of the Peoples Republic of China, English website, http://www.sac.gov.cn/sac_en

\(^{36}\) Standardization Law of People's Republic of China, Chapter 3, Article 7 (1989). For concerns about China’s mandatory GBs, see infra.


\(^{39}\) ISO, Members, http://www.iso.org/iso/home/about/iso_members.htm

\(^{40}\) Id.

\(^{41}\) Breznitz and Murphree, Rise, *supra* note 36, at 50.

\(^{42}\) Breznitz and Murphree, Rise, *supra* note 36, at 16.

\(^{43}\) Standardization Law of People's Republic of China, Chapter 1, Article 3 (1989).
from international ones. For more than a decade, the United States has repeatedly reiterated its concerns that “China seems to be actively pursuing the development of unique requirements, despite the existence of well-established international standards, as a means for protecting domestic companies from competing foreign standards and technologies.”

The U.S. preoccupation with China’s “unique requirements” is more than just grousing, since a country’s adoption of national technical standards can implicate its WTO commitments. In particular, China is subject to the Agreement on Technical Barriers to Trade (“TBT Agreement”). The TBT Agreement explicitly extends to both “technical regulations” (i.e. mandatory standards) and “standards” (i.e. voluntary standards) the core WTO principles prohibiting discriminatory trade practices and unnecessarily trade-restrictive regulations.

More importantly, it creates an additional obligation on Member States to use “relevant international standards” as a basis for setting national standards, reflecting member consensus that—regardless of whether divergent technical standards are discriminatory trade obstacles per se—uniform standards facilitate trade by, for example, encouraging economies of scale.

In terms of treaty interpretation, tension between the U.S. and China tends to center around what constitutes a “relevant international standard” for purposes of the TBT Agreement. China takes

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44 See Osama Hussain & Dennis Fernandez, Strategic Intellectual Property and Emerging Standards for Entering the Chinese Market, IPFRONTLINE, PATENTCAFE, 1 (2005) (attributing China’s actions “establishing high technology standards that differ from the international community” to “a policy to obtain its own domestic intellectual property rights”)

45 United States Trade Representative (USTR), 2014 Report to Congress On China’s WTO Compliance (December 2014) (hereinafter “2014 USTR Report”) 73. A nearly-identical line has been trotted out on a yearly basis by the USTR in its annual reports to Congress since at least 2003. USTR, 2003 Report to Congress On China’s WTO Compliance (December 11, 2003) (“. . . China is actively pursuing the development of unique requirements, despite the existence of well-established international standards. This course of action will create significant barriers to entry into its markets, as the cost of compliance will be high for foreign companies.”).

46 TBT Agreement, Article 2.1 (“Members shall ensure that in respect of technical regulations, products imported from the territory of any Member shall be accorded treatment no less favourable than that accorded to like products of national origin and to like products originating in any other country.”), Article 4.1 and Annex 3 ¶ E (tasking Member States with ensuring that SSOs within their territories abide by the same principle with respect to standards). This rule essentially extends the most-favored-nation and national-treatment principles of Article I and Article III of the General Agreement on Tariffs and Trade (GATT).

47 TBT Agreement, Article 2.2 (“Members shall ensure that technical regulations are not prepared, adopted or applied with a view to or with the effect of creating unnecessary obstacles to international trade. . . .”), Article 4.1 and Annex 3 ¶ E (tasking Member States with ensuring that SSOs within their territories abide by the same principle with respect to standards). This reiterates the principles articulated in GATT Article XX that government measures must not be a “means of arbitrary or unjustifiable discrimination” or a “disguised restriction on international trade” and must be “necessary” to accomplish some legitimate purpose (though the TBT Agreement provides only a non-exclusive list of legitimate objectives, whereas GATT Article XX’s exceptions are exhaustive).

48 TBT Agreement, Article 2.4 (technical regulations), Article 4.1 and Annex 3 ¶ F (standards).

49 TBT Agreement Preface (recognizing the importance of international standards in “improving efficiency of production and facilitating the conduct of international trade”); See also Christopher S. Gibson, Globalization and the Technology Standards Game: Balancing Concerns of Protectionism and Intellectual Property in International Standards, 22 Berkeley Tech. L.J. 1403, 1464 (2007).

50 Breznitz and Murphee, Rise, supra note 36, at 12-13.
the position that only inter-governmental organizations like ISO can set international standards triggering TBT obligations, whereas the U.S. insists that the Agreement includes industry standards set by NGOs such as IEEE.\(^{51}\) In any event, however, the U.S. and other critics of alleged Chinese protectionism point to examples of national standards that would violate WTO/TBT principles under either criteria.\(^{52}\)

China, for its part, sees technical trade barriers differently. Flipping the script, Chinese commentators have implied that the threat to free trade lies less in allowing competing national standards and more in imposing a uniform international standard that entails paying mandatory rents to entrenched (Western) market participants.\(^{53}\)

C. WAPI, TD-SCMA, EVD and China’s Other Non-Conforming Standards

The vast majority of Chinese standards are based upon international or foreign standards or are otherwise uncontroversial.\(^{54}\) In fact—according to the 2013 Report prepared by Dan Breznitz and Michael Murphee for the U.S.-China Economic and Security Review Commission—of the tens of thousands of Chinese standards developed “in the last fifteen years to 2010, there were only twenty controversial or unique standards, all in ICT.”\(^{55}\) Nevertheless, these handful of IT standards have caused significant consternation, possibly because IT is a particularly globalized industry where interoperability is particularly crucial.\(^{56}\)

The most often-cited grievance\(^{57}\) is China’s advocacy of WLAN Authentication and Privacy Infrastructure (WAPI), a wireless security protocol calculated to address widely-acknowledged vulnerabilities in Wired Equivalent Privacy (WEP), then the security specification for the IEEE

\(^{51}\) Id.

\(^{52}\) See discussion of WAPI, part II.C infra. Wi-fi is an ISO standard, and therefore the only plausible legal defense of the non-conforming WAPI standard is that it fits within the security-interest exception to the TBT Agreement.


\(^{54}\) Breznitz and Murphee, Rise, at 34 and note 28. Of the 32,085 GBs listed in SAC’s database as of February 1, 2015, 13,233 purport to be adoptions of standards set by international SSOs (mostly ISO or the International Electrotechnical Commission (IEC)). SAC National Standard Query, supra note.

\(^{55}\) Breznitz and Murphee, Rise, supra note 36, at n.28.

\(^{56}\) Andrew Updegrove, ICT Standard Setting Today: A System Under Stress, 6 CONSORTIUM STANDARDS BULLETIN NO. 4 (Apr. 2007), (noting that “[u]nlke physical products, the fruits of ICT technologies require a large number of interoperability standards in order to function and flourish” and that, due to the global nature of trade, travel, production and utilization, “[i]n ICT in particular, the concept of a national standard has become archaic.”), http://www.consortiuminfo.org/bulletins/apr07.php#feature.

802.11 wireless standard (a/k/a Wi-Fi).\textsuperscript{58} In 2003, SAC and the Ministry of Information Industry (MII, MIIT’s predecessor) adopted WAPI as a mandatory encryption standard for wireless devices sold in China.\textsuperscript{59} However, following complaints by the U.S. and resulting bilateral trade talks, this mandate was abandoned in 2004 before it was ever implemented.\textsuperscript{60}

China then began to push for adoption of WAPI as an international standard by ISO, but the technology was rejected in favor of a security protocol put forward by IEEE known as 802.11i (eventually implemented as WPA2).\textsuperscript{61} Still, China clung to WAPI, appealing ISO’s decision,\textsuperscript{62} promoting the technology through alternative channels,\textsuperscript{63} and even resubmitting the standard for international consideration as recently as 2009.\textsuperscript{64}

Given the technology’s distinctively home-grown character and the government’s dogged support for it in the face of international political and commercial resistance,\textsuperscript{65} it’s no wonder that WAPI is the poster child for China’s use of standards in the service of techno-nationalism.\textsuperscript{66} However, it’s probably appropriate to think of WAPI as something of an outlier.\textsuperscript{67} It is a fixation that China developed while its new standardization regime was in its infancy and one that is arguably rooted as much in the security paranoia of particular state actors as in a broad national economic policy designed to give domestic companies a leg up.\textsuperscript{68}

Past WAPI, China’s controversial IT standards become more nuanced. For one thing, these “Chinese” standards often incorporate significant amounts of foreign technology, making their effectiveness questionable as pure tools of techno-nationalism.\textsuperscript{69} Moreover, in nearly every case,

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\textsuperscript{58} For a detailed history of WAPI from 2003-2006, see generally Brian J. DeLacey et al., Government Intervention in Standardization: The Case of WAPI (Sept. 2006), \url{http://ssrn.com/abstract=930930}

\textsuperscript{59} DeLacey et al., supra note 57, at 11-12.

\textsuperscript{60} Id.

\textsuperscript{61} Id. at 13-15.

\textsuperscript{62} Id.

\textsuperscript{63} For example, in 2009, all three of China’s mobile carriers included WAPI-capability as a requirement for handsets on their networks. Government influence was widely suspected. See Owen Fletcher, CIO, Years on, China Pushes WAPI in Mobile Phones (May 8, 2009), CIO, \url{http://www.cio.com/article/2428329/infrastructure/years-on-china-pushes-wapi-in-mobile-phones.html}.

\textsuperscript{64} See Watch Out: WAPI is back on the Wi-Fi agenda, EE TIMES (June 19, 2009), available at \url{http://www.eetimes.com/document.asp?doc_id=1254041}.

\textsuperscript{65} WAPI has failed to be adopted by consumers even in China, where “laptop users almost universally use Wi-Fi in coffee shops to surf the Web.” Fletcher, supra note 62.


\textsuperscript{67} Breznitz and Murphee, Rise, supra note 36, at n.37.

\textsuperscript{68} Id. at n.15, quoting a “long-time observer of Chinese standards” as speculating that the WAPI case arose as a “result of pressures from parts of former military bureaucracies which had been absorbed into MIIT but not Assimilated.”

\textsuperscript{69} TD-SCMA, discussed infra notes, incorporates 148 patents, of which only 30% are owned by Chinese firms. Breznitz and Murphee, Rise, supra note 36, at 37.
government efforts to promote the standard have been far from unequivocal and have failed to result in the commercial success that Indigenous-Innovation proponents supposedly crave.70

For example, a continued point of contention in Chinese-U.S. trade relations is the Chinese government’s role in 3G mobile technology, where it has consistently given preferential treatment to the TD-SCDMA standard71 over competing standards like CDMA2000 and W-CDMA.72 It’s a dispute that appears to be following the mobile industry into the next generation, as China is accused of preferentially licensing 4G spectrum to companies using the favored TD-LTE standard at the expense of the disfavored FDD-LTE standard.73

Yet, at no point have “foreign” telephony standards been actually excluded from China. As with other divergent Chinese standards, market forces are frequently enough to outweigh whatever favoritism is inconsistently bestowed by the state.74 Government favor (not to mention arguably superior technology) has not been enough to keep China Mobile’s TD-SCDMA network from losing market share to China Telecom’s CDMA2000 network and China Unicom’s WCDMA network.75 Though currently market-dominant in 4G, China Mobile’s TD-LTE network will face increasing competition in 2015 as China Telecom rolls out its FDD-LTE network76 and China Unicom expands its mixed TD/FDD network.77 Regardless of which standard wins out, it is unlikely to be a satisfying victory for Indigenous Innovation, since both 4G specifications are multinational in origin and, in fact, are identical in 90 percent of their core technology.78

Similarly, in the field of video compression, efforts to develop alternative standards to DVD and Blu-Ray—encouraged directly by the Chinese government—led to the introduction of EVD (Electronic Video Disc) and CBHD (China Brand High Definition), respectively.79 Both standards incorporated significant amounts of foreign technology and neither enjoyed much commercial success, even within China.80

70 Id.
71 Time Division Synchronous Code Division Multiple Access,
73 According to the 2014 USTR Report, “In November 2013, however, China licensed 4G spectrum in a manner that is not technology neutral, as it licensed only the domestically favored LongTerm Evolution (LTE) standard known as LTE-TDD and not the other common standard known as LTE-FDD.” Id.
74 Breznitz and Murphee, Rise, supra note, at 37.
75 Id. at n.31.
80 Id.
WAPI aside, China’s willingness to let its homegrown technologies (to the extent they can be described as such) founder suggests that its standards agenda is more complicated than simply fostering Indigenous Innovation for its own sake. While the policies of the Chinese state are obviously multi-faceted, the primary driver of its aggressive involvement in standards setting may not be protectionism, at least in the narrow sense of sheltering particular domestic industries. And, whether or not by design, the more striking effect of this push may be to nudge international norms towards a paradigm more broadly favorable to China’s economic interests and perhaps more consonant with Chinese attitudes towards proprietary technology generally.

D. Standardization and Its Discontents

China’s manufacturing industry, the engine of its economic miracle, is haunted by the threat of ballooning production costs due to patent royalties, their already-thin profit margins choked by the increasingly dense foliage of the modern patent thickets.\(^{81}\)

This concern is illustrated especially well in the digital-video cases mentioned above. By 2003, China was manufacturing 75% of the world’s DVD players.\(^{82}\) However, adhering to DVD’s rigid video-encoding standards meant paying substantial patent royalties to the Japanese, American and European companies that had developed and (in the Chinese view) imposed the standard internationally.\(^{83}\) With no leverage to negotiate lower rates for this monopolized asset, fierce price competition and the high variable costs of this production input drove profits down to one dollar per unit by 2004.\(^{84}\) The development of EVD, while ultimately a commercial failure, broke DVD’s monopoly, and the presence of a much-cheaper competitor drastically drove down licensing rates for the embedded technology.\(^{85}\) A similar sequence played out with Blu-Ray and CBHD.\(^{86}\)

Using competing technologies to force royalty concessions—effectively, driving down price by increasing supply—arguably explains much of the Chinese push for alternative technology

\(^{81}\) See Breznitz and Murphee, Rise, supra note, at 2. Once again, this concern is especially acute with respect to ICT, which, by its nature, not only requires a particularly high degree of interoperability—see note supra—but also usually incorporates a particularly weighty catalogue of patented technology, particularly software. See Andrew Updegrove, ICT Standard Setting Today: A System Under Stress, 6 CONSORTIUM STANDARDS BULLETIN NO. 4 (Apr. 2007), http://www.consortiuminfo.org/bulletins/apr07.php#feature (ICT standards unusually susceptible to infringing patents). While the causes are disputed, the staggering increase in software patents is undeniable. See Bessen, James E., A Generation of Software Patents (June 21, 2011) Berkman Center Research Publication No. 2011-04, at Figure 1 (showing the annual grant of U.S. software patents rising from less than 5,000 for most of the 1980’s to nearly 40,000 in 2009), available at http://ssrn.com/abstract=1868979. The sheer number of patents in circulation increases the risk that patent thickets will coalesce, potentially choking innovation, especially where standards are involved. Carl Shapiro, Navigating the patent thicket: Cross licenses, patent pools, and standard setting, 1 INNOVATION POLICY AND THE ECONOMY, 119-150, 121-122 (2001)

\(^{82}\) Breznitz and Murphee, Innovation, supra note, at 206.

\(^{83}\) Id.

\(^{84}\) Id.

\(^{85}\) Prior to EVD, Chinese manufacturers were paying around $21 per unit to license DVD technology. EVD rates were set at $2/unit, eventually causing DVD patent owners to lower rates to $12-$13.50/unit. Id. at 209-210.

\(^{86}\) Id. at 210-211.
standards. But it’s merely one aspect of a larger tension. As a consequence of Chinese firms’ position in the global supply chain and possibly also of more intangible cultural attitudes towards proprietary technology, Chinese standardization policy mitigates the perceived commercial drag created when manufacturers are compelled to lease intellectual property rights simply for purposes of international compatibility.

E. SAC goes FRAND

The problems created by the interplay of standards and patents are well-known. Because the adoption of a standard, particularly a de jure mandatory standard, shelters technology choice from pure market forces, standard-essential patents (SEPs) are potential windfalls for the owners and inefficient taxes for the users. In particular, SEP owners can “hold up” manufacturers and consumers, demanding license terms that the value of their technology on its own would never warrant, a problem compounded where a multitude of rights-holders creates “patent stacking” issues.

As a result, many SSOs have guidelines incorporating—to varying degrees—FRAND or RAND commitments: rules that usually require members to disclose any SEP and to commit to licensing on (Fair), Reasonable, and Non-Discriminatory terms.

As previously noted, Chinese commentators often regard technology standards as themselves potential “technical barriers” to trade. The Chinese delegation to the WTO has repeatedly raised the argument that mandatory imposition of proprietary technology standards hampers international trade and that patents in international standards should be subject to some form of FRAND licensing if adherence to those standards is to be mandatory under the TBT Agreement, a seemingly straightforward position that the U.S. insists it cannot even comprehend.

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87 Breznitz and Murphee, Rise, supra note, at 34.
88 Fewer Chinese companies than Western ones operate on a business model relying on sale or licensing of intellectual property, and the Chinese standards-setting process in general involves less participation by commercial enterprises (as opposed to academic or research institutions) than in the West. Id. at 29-31.
90 Id.
91 See NRC, Patent Challenges, supra note 88, at 3.
92 See note supra.
93 Gibson, supra note 48, at 1429-1435.
94 After thoroughly reviewing the concerns raised by the Chinese delegation, the U.S.’s representative “could not see any such relationship” between SEP hold ups and the TBT Agreement’s focus on removing technical barriers to trade. Id. at 1431
On the national level, much to the consternation of the U.S. Trade Representative, China has emphasized developing standards that rely either on public-domain technology or technology that can be made available at reduced rates.\footnote{USTR 2014 Report, supra note 44, at 69. The USTR frames such reduced rates as below market, though, of course, the point of RAND licensing terms is to correct the market disruption caused by standardization.} SAC circulated several draft regulations on patents and standardization, each taking an incrementally more placatory tone in relation to international IP concerns, in 2004, 2009 and 2012.\footnote{D. Daniel Sokol and Wentong Zheng, \textit{FRAND in China}, 22 Texas Intellectual Property Law Journal (February 3, 2014) 71-93, \url{http://ssrn.com/abstract=2335664} (February 3, 2014 draft at 21-24).} All three drafts are clear in principle: patents don’t belong in mandatory national standards.\footnote{\textit{Id.}} Under the 2004 and 2009 drafts, moreover, where a mandatory standard simply must include patented technology, the patent-holder would have been required to negotiate a resolution with SAC, presumably involving a reduced-fee license, and, alarmingly, when such a resolution could not be reached, SAC had authority to impose a compulsory royalty-free license.\footnote{\textit{Id.}} In voluntary standards, the earlier proposed regulations would have permitted patented technology only if essential and only if owners of standard-essential patents signed a written declaration agreeing to license their technology on a royalty-free or “substantially lower[ed]” reduced-fee, FRAND basis.\footnote{\textit{Id.}}

The 2012 draft dropped SAC’s compulsory-license remedy in cases of mandatory standards (requiring only negotiation with relevant departments, failing which the standard will be put on hold) and removed the “substantially lower” royalty requirement for SEP-licensing declarations (requiring only that licenses be “fair, reasonable and non-discriminatory” (公平合理无歧视)).\footnote{\textit{Id.}} These regulations were finally enacted, substantially unaltered, as the Interim Regulatory Measures on National Standards Involving Patents (“Measures on National Standards”), issued jointly by SAC and SIPO and effective January 1, 2014.\footnote{SIPO standardization management committee, Provisional Rules on National Standards Involving Patents (December 19, 2013), \url{http://www.wipo.int/wipolex/en/text.jsp?file_id=337261}.}

While greeted with wary positivity internationally—at least in comparison to previous proposals—\footnote{See e.g. Intellectual Property Owners Association, IPO Comments on SAC Regulatory Measures on National Standards Involving Patents (Interim), \url{http://www.ipo.org/wp-content/uploads/2013/03/2013.01.18_IPO_Comments_on_SAC_Regulatory_Measures_on_National_Standards_Involving_Patents.pdf}} the Measures on National Standards are striking in their commitment to defanging patents. Under the regulations, mandatory GBs will never incorporate patented technology unless SAC cuts a deal with the patent holder, effectively ensuring that proprietary technical standards will always, one way or another, be subject to competition (and tending China up for another WTO/TBT dispute if it decides to mandate a standard in a field where an international standard does incorporate patent rights). Furthermore, while FRAND commitments are a common tool
among SSOs, “reasonable” is a notoriously slippery legal standard, and it remains to be seen how SAC—given its declared hostility towards SEPs generally—will interpret this requirement.

Chinese courts have already addressed FRAND commitments in the context of the 2008 Anti-Monopoly Law (AML), China’s recently-enacted national antitrust law. Standardization and patent licensing raise antitrust concerns in many jurisdictions. However, the AML is unique among comparable laws in specifically addressing intellectual property rights, the “abuse” (滥用) of which can constitute a violation, and AML guidelines recently issued by the State Administration of Industry and Commerce (SAIC) emphasize that abusive licensing practices—including charging “unfairly high prices”—can constitute an abuse of market dominance in violation of the AML.

In a suit by Chinese telecom giant Huawei against InterDigital, a U.S. company that develops and monetizes wireless technology, the Guangdong High People’s Court found that InterDigital’s proposed license terms for its SEPs violated Articles 17 and 55 of the AML. It also found that, under Chinese law, the license terms failed to comply with InterDigital’s FRAND commitments arising from its participation in the European Telecommunications Standards Institute (ETSI) standard-setting process. Notably, the court imposed a royalty rate calculated by some commentators as “orders of magnitude lower” than the rate commanded by other telecom SEPs.

Such aggressive interpretations of FRAND represent a stark departure from current global norms. Like the efforts to develop alternative standards discussed in III.B and III.C supra, new Chinese regulations like the Measures on National Standards and Article 55 of the AML appear calculated to drive a new patent-licensing paradigm, one where the power of SEPs is greatly diminished, the leverage of patentees neutralized and royalty rates drastically reduced. Given China’s robust participation in international standard setting and its undeniable centrality to the global economy, companies at all levels of the innovation supply chain would do well to heed the Chinese vision.

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103 Sokol and Zheng, supra note 95, at 27-34.
105 Id. at 10. Article 55 of the AML states that the law does not apply to companies exercising their intellectual property rights unless it is to restrict competition through abuse of those rights. Thus, the AML provisions with respect to monopolistic agreements (Articles 13-16) and abuse of market dominance (Articles 17-19) could apply to patent licensing. 中华人民共和国反垄断法[The Antimonopoly Law of the People’s Republic of China] (promulgated by the Standing Comm. Nat’l People’s Cong., Aug. 30, 2007, effective Aug. 1, 2008), 2007 Standing Comm. Nat’l People’s Cong. Gaz. 517, http://www.gov.cn/flfg/2007-08/30/content_732591.htm
109 Id.
110 Id.
IV. A Patent Portfolio with Chinese Characteristics

Given the increasing number of Chinese patentholders, perhaps Chinese SSOs will begin to receive domestic pushback if they impose overly austere FRAND terms. Conventional wisdom, after all, has suggested that China’s reverence for intellectual property rights will blossom in proportion to its own intellectual property holdings.\textsuperscript{111}

The profile of Chinese applicants, however, may make them less likely to drive a hard bargain in licensing their patents. In contrast to the U.S., many are universities and research centers who are motivated to pursue and patent their research and to participate in standards development by factors other than the ability to aggressively monetize their IP rights: prestige, tenure, state benefits, guanxi.\textsuperscript{112} Even profit-driven Chinese tech companies tend to be less focused on pursuing a technology-licensing-based business model than are their European or U.S. counterparts.\textsuperscript{113} The Chinese companies with large R&D capacities tend to derive most of their revenue from selling tangible goods and are therefore more ambivalent about policies that might lower the cost of patent licenses, which they often view more as production inputs rather than products unto themselves.\textsuperscript{114}

Nevertheless, Chinese firms are not indifferent to their patent portfolios. One solution to the problems associated with patent thickets—the risks and transaction costs associated with fields like IT involving large numbers of potentially blocking patents—is cross-licensing and the creation of “patent pools,” agreements whereby multiple patentholders agree to grant the licenses to multiple patents to one another or to third parties as a package.\textsuperscript{115} Patent pools are crucial in IT due to the particularly dense thickets of complementary patents necessary to implement a single technology.\textsuperscript{116}

However, patent pools can also have anti-competitive effects, and Chinese firms have long complained of being shut out of Western patent pools and charged exorbitant royalty rates by collusive patent cabals.\textsuperscript{117} Since IT patent pools often bundle together potentially substitutive technologies, the companies involved are accused of, effectively, price-fixing.\textsuperscript{118} Stockpiling a patent arsenal of their own may advantage Chinese IT companies in a variety of ways: gaining entrance to patent-pool negotiations, setting up competing pools, putting downward pressure on

\textsuperscript{112} Breznitz and Murphee, Rise, \textit{supra} note 36, at 29-32.
\textsuperscript{113} Id.
\textsuperscript{114} Id.
\textsuperscript{115} Shapiro, \textit{supra} note 80, at 134-137.
\textsuperscript{116} See Note \textit{supra}.
\textsuperscript{117} Zhan and Zhu, \textit{supra} note 5, at 194-195.
\textsuperscript{118} Id.
prices, and generally providing a counter-deterrent to aggressive strategic IP behavior by foreign firms.

For these purposes, the supposed lack of quality of Chinese patent applications\(^{119}\) may not matter as much as their quantity. Individual patents within a pool often have little or no value by themselves.\(^{120}\) Furthermore, software patents—a core component of the intellectual property rights involved in IT—have classically unpredictable boundaries, making their inclusion in patent pools less a matter of technical necessity than addressing the risk of inadvertent infringement.\(^{121}\) All that’s needed is to find a sufficient number of patents with the theoretical potential to hold up a standard or provide substitutes for some of the claims that the standard incorporates.

Between increased Chinese participation in international patent pools, competing patent pools dominated by Chinese technology and increased pressure to impose strict FRAND commitments on standards, it may become more difficult in the near future for IT patentholders to obtain the same rents they have sought in the past. For companies built around developing and exporting the fruits of R&D, this could be destabilizing.

For others, though, it could be a boon. Hardware factories in the Pearl River Delta aren’t the only companies that rely on patented technologies as a production input and who may be inclined to view high stacked royalties as a burden and patent thickets as a source of risk and inefficient transaction costs. Moreover, research, like production before it, is becoming a geographically fragmented global activity. Multinational corporations increasingly make use of the cheap engineering talent available in China’s research hubs.\(^{122}\) Thus, while the bounties of innovation may fall, the costs could drop in tandem.

V. Conclusion

China’s patent and standards activity has the potential to dramatically affect the global tech economy. However, the impact is likely to be more complex than either the dream of Indigenous Innovation promoted in China or the threat of Techno-Nationalism decried in the West.

Though perhaps motivated in part by a desire to raise retaliatory trade barriers in response to perceived trade barriers created by Western companies, China’s development of alternative technical standards is just as important in pressuring SEP rightsholders—both foreign and domestic—into concessions on licensing terms. It is a strategy that dovetails with the apparent policy priorities of Chinese representatives at international SSOs and with the aggressive Anti-Monopoly Law and Standardization regulations recently enacted at the national level.

\(^{119}\) See notes 29-30 supra.

\(^{120}\) Shapiro, supra note 80, at 134.

\(^{121}\) Bessen, supra note 80, at 10-11.

\(^{122}\) BREZNITZ AND MURPHEE, RED QUEEN, supra note 81, at 106-108. See also note 31, supra.
Meanwhile, absorbing a massive influx of Chinese brainpower into the globalized research supply chain and into international patent pools seems likely to both increase the scale of these pools and to promote greater involvement by the producers of actual technology products, parties with an interest in lowering rather than maximizing royalty rates.

Just as there were winners and losers when the world economy was disrupted by cheap Chinese manufactured goods, the sudden surge in Chinese intellectual property will hurt some foreign firms and help others. Companies whose businesses are built around extracting large bounties from their blocking patents may find their profit margins harder to maintain. On the other hand, companies on the consumption end of tech licenses may benefit from cheaper inputs and reduced transaction costs, and large multinationals may wring productivity dividends from another shift towards geographic fragmentation, this time in research rather than production.