

China and the New Geopolitics of Technical Standardization



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January 2020

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This study has been carried out within the partnership between the French Institute of International Relations (Ifri) and Policy Center for the New South.

ISBN: 979-10-373-0119-2

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How to quote this document:

John Seaman, "China and the New Geopolitics of Technical Standardization",
Notes de l'Ifri, Ifri, January 2020.

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Executive Summary

China is rapidly emerging as a formidable power in the development of technical standards, transforming the international standard-setting landscape and reintroducing an element of geopolitics into what are too often considered as benign, technical processes. From emerging technological fields such as 5G, artificial intelligence (AI), the Internet of Things (IoT) and smart cities to traditional sectors including energy, health care, railways and agriculture, China is increasingly proactive in nearly every domain where technical standards remain to be developed and set.

Technical standards are the definition of processes or technical specifications designed to improve the quality, security and compatibility of various goods and services, for instance GSM for telecommunications or WiFi for wireless Internet. They can be thought of as basic specifications or technologies on which other technologies or methods will evolve – creating lock-in effects and path-dependency for future products and technological trajectories. Defining standards can provide significant benefits for society at large, but can also carry significant implications for which technologies will dominate future markets and provide substantial advantages to those who master standardized technologies.

Chinese policymakers have become keenly aware of the relationship between technical standard-setting and economic power. Indeed, a popular saying in China posits that third-tier companies make products, second-tier companies make technology, first-tier companies make standards. In 2015, the State Council highlighted China's deficiencies in the field and set out to transform the country's standardization system, seeking to harness the capacity of standard setting not only to improve the daily lives of its citizens, but to drive innovation, boost China's economic transformation toward the industries of the future, and turn China into a premier purveyor of international technical standards.

Indeed, the ability to define technical standards is both a mark and an instrument of international power competition. Until now the field has largely been dominated by the United States, Europe, and Japan. China's latecomer status to international standard setting means that it has faced an up-hill battle in shaping the development of this space. Nevertheless, as its ability to propose core innovations in a growing number of emerging technological fields grows – as witnessed by its successes in the field of 5G,

and its ambitions in the field of AI – China’s capacity to transform the international standardization landscape will also expand and it will increasingly seek to shape international standards in line with its own interests. Already, China has proactively integrated major standard-setting bodies such as the International Organization of Standardization (ISO) and a broad range of international industry-level forums where technical standards are developed. At the same time, it has pursued a parallel, China-centered track that involves promoting “mutual recognition” of standards at the bilateral level with a large number of countries and is increasingly coordinating standardization within the context of its Belt and Road Initiative.

In effect, China’s dual-track approach to international standard setting reflects competing tendencies toward greater cooperation and convergence on standards, on the one hand, and a broader fragmentation or bifurcation of international standards regimes on the other. At the same time, the global economy faces similarly competing pressures, with protectionism and rising techno-nationalism pushing back against a new potential wave of technologically-driven globalization. As China’s emergence continues to reshape the international system more broadly and as geopolitical tensions become more pronounced, the standard-setting space will be a gauge of whether we are moving toward a more integrated, globalized world or more fragmented international economic and political systems.

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Introduction – Why Standards Matter

Against a backdrop of growing geopolitical competition, China's emergence as an increasingly important player in the development of technical standards is adding a dimension of power politics to an underappreciated domain of economic activity. The strength of Chinese companies, namely Huawei and ZTE, in defining standards for 5G technologies has galvanized much of the discussion on the topic in the last 18 months, but China's activism in the field of standardization is both broader and more ambitious. A relative latecomer to international standard-setting, China looks to increasingly become a leader in the field, particularly in areas where standards are still being developed. This presents both opportunities for deepening cooperation, but also risks of geo-economic competition and a fragmentation of international standards regimes.

Establishing technical standards has long facilitated the integration of markets, serving as a bedrock for connecting industries, services and products locally, regionally and across the globe. Technical standards, often referred to as product standards, are the definition of processes or technical specifications designed to improve the quality, security and compatibility of various goods and services.¹ Think of the dimensions of shipping containers, the width of railway gauges, the shape of electrical sockets and the voltage that passes through them, or even HTTP for the Internet or the WiFi standard for wireless networks. Indeed, standards can be thought of as basic specifications or technologies on which other technologies or methods will evolve – creating lock-in effects and path-dependency for future products and technological trajectories. As societies increasingly move into a networked digital era, with the development of 5G, the internet of things (IoT), smart cities, artificial intelligence (AI), autonomous vehicles and an

The analysis in this paper is based on both documentary research and analysis, workshop discussions and interviews with experts in policy research institutes, companies and standards development organizations in both China and Europe over the course of 2018 and 2019.

1. In principle, technical standards are considered voluntary – as distinguished from regulations, which are established by state agencies and carry penalties for non-compliance. Many technical standards – particularly in areas concerning health, safety or the environment – are developed in order to comply with base regulations, while others, particularly technology standards, respond to market needs. As will be explained further, China's standardization system incorporates a regulatory dimension through the definition of “national mandatory standards” or “GuoBiao” (GB).

ever-growing ecosystem of connected objects and social networks, the question of technical standards will only become more important. Indeed, standardization will be necessary to ensure interoperability and will be crucial in determining the ways in which people and objects will link together in a network of digital, physical and regulatory infrastructure. Not only will standards work to define both the technical parameters by which future technologies will develop, but also who will be best positioned to reap the benefits. Even more fundamentally, standards will increasingly have implications on the ethical boundaries of how technologies interact with society.²

The competitive nature of technical standards

The process of generating standards has often been thought of as benign, one in which technical experts and engineers, largely from the private sector, collaborate through standards development organizations at the industry, national or international level to agree upon solutions to overcome common problems. Yet, as one can imagine, defining standards often carries significant implications for which technologies will dominate future markets and provides substantial advantages to those who master standardized technologies. As one industry representative explained, “we participate in standardization to influence how the market will shape up”. Indeed, those capable of proposing the best technological solutions, or first movers, set the standards whereas those that lag behind are left to bear the costs of adaptation.³ Werner von Siemens reportedly put it another way in the late 1800s: “he who owns the standards, owns the market”.⁴

The information and communication technologies (ICT) sector is illustrative of the competitive dimension of standardization where switching costs are high. So-called “standards wars” were a core feature of the

2. This paper takes a narrow approach to standardization by discussing product standards and the broad parameters of standardization processes. Yet, from the early 1990s, the international standards bodies such as the International Organization for Standardization (ISO) began expanding their activities beyond technical product standards to include areas such as voluntary environmental and social (Human Rights, labor, etc.) standards, incorporating normative and conventional values into standards – culminating for instance in the adoption of a comprehensive social responsibility standard (ISO 26000) in 2010. Moving forward, issues such as the ethical standards to guide the development of AI are also discussed by standard-setting bodies. China is active in this space, but a comprehensive analysis of the issues surrounding China’s activism in these areas will be reserved for another paper.

3. W. Mattli and T. Büthe, “Setting International Standards: Technological Rationality or Primacy of Power?”, *World Politics*, No. 56, October 2003, p.4.

4. H. J. Koch, *Practical Guide to International Standardization for Electrical Engineers: Impact on Smart Grid and e-Mobility Markets*, New Jersey, Wiley, 2017.

industry's development from the 1980s, as industrial players battled over the adoption of competing standards (GSM, CDMA, TD-SCDMA, etc.) in order to preserve market share. This competition has given way to more collaborative processes through the Third Generation Partnership Project (3GPP), wherein many of the technical parameters of 5G are currently being settled. Still, some note that the 5G standards race remains a largely zero-sum game in which only one technology will ultimately be chosen as the standard solution to critical technological challenges, making it a competition for market dominance more than just market share.⁵

An increasingly geopolitical process

Because of the high stakes associated with standardization, the field is not immune to strategic, geopolitical, and geo-economic considerations. In the beginning of the 20th century and during the First World War, for instance, the control of telegraph standards proved an important element in the competition between Great Britain and Germany.⁶ The definition of railway gauge standards – for instance between Western Europe and the former Soviet Union – is another example of how technical standards can both facilitate regional integration, but also define the physical parameters of a geographical space, complicate the participation of outside competitors, and enable the development of spheres of influence. In this vein, China's emergence is introducing a new dimension of power competition to the standardization field. For much of the last four decades, international standardization has been dominated by a handful of industrialized countries, notably the United States and Europe (in particular Germany, France and the UK), and to a lesser extent Japan and even Russia, and the economic actors within them. In recent years, China has made concerted efforts to both strengthen its ability to develop competitive standards and, subsequently, to diffuse those standards abroad.⁷

The goal of the analysis that follows is to assess China's activism in the field of standardization and its implications, particularly against a backdrop of growing geopolitical competition. It will first explore how and why the concept of standardization and the development of a "China standard" has become an important component of China's strategy of economic transformation, and how its shifting standardization model differs from the

5. J. D. Ma, "From Windfalls to Pitfalls: Qualcomm's China Conundrum", MarcoPolo, 14 November 2018, <https://macropolo.org>.

6. M. Brunnermeier, R. Doshi and H. James, "Beijing's Bismarckian Ghosts: How Great Powers Compete Economically", *Washington Quarterly*, Fall 2018, pp. 161-176, www.tandfonline.com

7. B. Fägersten and T. Rühlig, "China's Standard Power and its Geopolitical Implications for Europe", *UI Brief*, The Swedish Institute of International Affairs, February 2019, www.ui.se.

two predominant models in Europe and the United States. It will then examine how China is both proactively engaging with existing forms of international standardization and, in parallel, pursuing its own path of standards cooperation through bilateral cooperation frameworks and its “Belt & Road”, with a view to promoting the use of Chinese standards. Indeed, China is playing a dual track game on international standards. As China’s emergence continues to reshape the international system more broadly and as geopolitical tensions become more pronounced, standardization will be a gauge of whether we are moving towards a more integrated, globalized world or more fragmented international economic and political systems.

From standards taker to standards maker: China's evolving model for standards development

China is often described as a latecomer to standardization. Over the course of much of its economic development in the last forty years, standards in China were largely either a means of protecting domestic industries or were imported from abroad to facilitate trade or technological development. During the last decade, improving the quality and boosting the competitiveness of home-grown technical standards has been an increasingly important dimension of public policy. Whereas China may have missed the curve on standards development in the past, it seeks to reposition itself as a major developer of technical standards for the industries of the future.⁸ Ultimately, developing viable technical standards depends heavily on the ability to generate cutting-edge innovation. As China's innovation capacity grows, for instance in the fields of ICT, AI, new energy technologies or quantum communications, its ability to shape international standards in these emerging fields will most certainly strengthen.

Understanding how standards are considered in China helps to illustrate their importance in public policy making and highlights the unique nature of China's state-driven standardization system. At the same time, it also explains how the balance between the state and private enterprise is shifting, even in the Chinese model. Indeed, nurturing technology standards is a central component of China's innovation strategy, which has led to tensions between the need to unleash market forces and private-sector initiative and the desire to maintain a robust level of state control. While the Chinese government continues to play a fundamental role, recent reforms suggest a *relative* liberalization of the process. The goal is ultimately to

8. New strategic industries, like those identified in the Made in China 2025 strategy are where we can expect China to focus much of its attention – in particular: electrical equipment, agricultural machinery, biotechnology and medical devices, new materials, energy-saving and new energy vehicles, automation, information technology, aerospace equipment, railway equipment, and ocean engineering and high-end ship building.

facilitate China's modernization and transform the country into a premier purveyor of standards globally.

Standardization in China: A traditional domain of the state

Setting standards in China has traditionally been a state-driven process, combining the need for economic development with broader public policy goals. Indeed, standards development is coordinated by the Standardization Administration of China (SAC), which lies under the State Administration for Market Regulation (SAMR), an arm of the State Council.⁹ This is a key difference from the two predominant standardization models, those of Europe and the United States. In Europe, private industry actors coordinate under the auspices of national (AFNOR, DIN, BSI, etc.) and European (CEN, CENELEC) standards development organizations, which themselves are non-governmental institutions charged with coordinating standards development. In effect, the state plays no formal role. Another European-developed model is that of the European Telecommunications Standards Institute (ETSI), which develops telecommunications standards, wherein private industries participate directly in an international setting. In the United States, where market logics predominate, there are as many as 600 standards development organizations, mostly industry associations, including the American Society of Mechanical Engineers (ASME), the Institute for Electrical and Electronics Engineers (IEEE), American Society for Testing Materials (ASTM), or the Society of Automotive Engineers (SAE).¹⁰ In such a context, the American National Standards Institute (ANSI), the association formally charged with representing American interests at the international level, plays a comparatively limited role.

Because of the central role played by the party-state in China, the country's standardization strategies are considered as a function of established political priorities rather than solely driven by technical and business considerations. In this context, the SAC is tasked with overseeing national strategy and standardization policy coordination. Much of the work in developing standards within the state machinery is done by research institutes linked to ministries. For instance, the Ministry of Industry and Information Technology (MIIT) plays a particularly central role in a wide range of high-tech fields through various affiliated institutes, such as the

9. Until institutional reforms of March 2018, the SAC was under the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ), which was also administratively under the State Council's leadership.

10. "Overview of the U.S. Standardization System", American National Standards Institute (ANSI), accessed 1 December 2019, www.standardsportal.org.

China Electronics Standardization Institute (CESI), which drives the working group on AI standards, among others, or the National Technical Committee of Automotive Standardization (NTCAS), which develops standards for electric vehicles. This central role played by government agencies also means that, in contrast to private standards development organizations, where resources are limited, standards development and diffusion can benefit from government subsidies or funding arrangements. This can further orient standardization activities in line with industrial or other public policy goals.¹¹ In effect, the task of standardizers is to combine the political requirements of China's "top level design" with the bottom-up demands from R&D activities, industrial interests, market factors and the international standards context.

Multiple rationales for standardization in China

The outsized role of the state does not mean the system is without internal competition, either from bureaucratic infighting or from opposing strategic outlooks and industrial interests, which often translate into competing visions for China's standardization pathway. As of 2017 there were 277 institutions engaged in standardization research in China, including 192 ministry-level institutions, commissions under the State Council, trade associations and industry groups, and 85 agencies at the provincial and municipal level, in addition to individual companies with independent innovation and standardization capabilities.¹² By 2020, the SAC also hopes to create up to 60 "standards innovation bases" across the country to improve standardization in a broad range of fields, from agriculture to management to energy efficiency to digital technologies. In effect, identifying the (sometimes competing) priorities of Chinese actors serves to clarify some of these competing interests and what motivates China's approach to standardization.

11. P. Wang and Z. Liang, "Beyond Government Control of China's Standardization System – History, Current Status and Reform Suggestions", in D. Ernst, *Megaregionalism 2.0: Trade and Innovation within Global Networks*, World Scientific Studies in International Economics, vol. 67, pp. 311-339.

12. H. Liu, "Analysis on China's International Standardization Strategy Based on the SWOT-PEST Analysis Paradigm", *Advances in Social Science, Education and Humanities Research*, vol. 99, 2017, pp. 238-244.

Improving health, safety and the environment

As China's middle class expands and quality of life factors take precedence over economic growth-at-all-costs, there is an increasing emphasis on improving health, safety and environmental standards. Indeed, numerous scandals, from food safety to pollution, have rocked the country in recent years, and have put political pressure on China to improve standard setting in order to better protect consumer interests and improve governance.

Here, "mandatory" standards play a unique feature of China's standardization system, wherein standards move beyond their "voluntary" nature and take on the role of regulations. For instance, China has developed 46 mandatory national standards on energy efficiency and consumption, in addition to 80 standards on water consumption and conservation and 300 national-level environmental standards, according to the China National Institute of Standardization (CNIS). Improving food safety standards or safety standards for children's toys and health products are other examples. Such efforts necessarily present a constructive area for international cooperation.

Between protectionism and trade facilitation

Throughout much of the country's economic reform and development from the late 1970s, standards were often viewed as a way to protect infant, emerging industries from external competition. In many cases, standards were even used to preserve local markets in the face of internal, Chinese competitors. Protectionist logics persist, particularly in more inefficient, state-owned industries, but as China's economy has both modernized and globalized, the need to harmonize Chinese and international standards has grown considerably. This is due to pressures from both within and without.

Exporting industries in China – in particular major technology firms such as Huawei and Haier – played a major role in highlighting the need for market access as an argument for both incorporating international standards domestically and playing a greater part in defining international standards.¹³ In parallel, external pressures, for instance conforming to World Trade Organization (WTO) rules, have also proven influential. WTO rules penalize the protectionist use of standards as technical barriers to trade, which are subject to arbitration. The WTO formally treats standards

13. D. Ernst, "Toward Greater Pragmatism? China's Approach to Innovation and Standardization", *SITC Policy Brief*, no. 18, August 2011, p.5.

developed within organizations such as the ISO and the International Electrotechnical Committee (IEC) as references, effectively facilitating their diffusion. It is estimated that the effective adoption rate of ISO/IEC standards in China today is roughly 50%.¹⁴

A tool of industrial policy and innovation

A widely-held understanding in China posits that there are three tiers of technology-based companies: the third tier makes products; the second tier makes technology; the first tier makes standards.¹⁵ In this vein, China's industrial strategy seeks to transform the country from a hub of global manufacturing and assembly into a first-tier, innovation-driven economy capable of setting global technology standards. In this respect, setting standards allows firms to gain first-mover advantage and acquire market share or market dominance.

At the same time, Chinese policymakers view standards development as a fundamental component in facilitating China's industrial transformation. In all of China's major industry and technology strategies, from Made in China 2025 to Internet Plus to Artificial Intelligence, standards development features prominently. In effect, setting standards helps to facilitate indigenous innovation. Standards harmonization can have clear benefits in boosting the effectiveness of R&D and avoiding redundancy in that competing standards require technologies to develop along separate pathways, creating the need for multiple tracks of R&D and product development.

A gauge of vulnerability, autonomy and power

China's lack of competitiveness in developing indigenous innovation and technical standards is seen as a sign of weakness and vulnerability that has cost China dearly both in nominal value terms, but also in its ability to define future technological pathways. The inability to translate domestic standards into international standards limits the maneuverability of Chinese firms abroad, which either have to bear the adjustment costs of adapting to standards in overseas markets or become isolated. Moreover, the cost of integrating foreign standards domestically can also be significant. During

14. Officially the adoption rate is 79%, but, as interviewees explained, many ISO standards are slightly modified before being translated into national, or GB standards in China. There is nevertheless a high adoption rate of 95% on standards relative to consumer goods.

15. D. Breznitz and M. Murphee, "Technology Standards in China", *ETLA Brief*, no. 3, 7 February 2013, www.etsla.fi.

the telecom standards wars, for instance, China's failure to propose competitive technology standards cost the country tens of billions of dollars in royalty fees. These factors help to explain why Huawei has dedicated roughly 15 percent of its annual revenues, or more than \$60 billion, to research and development on 5G telecoms standards.¹⁶

There is also a prevalent strategic assumption, particularly within defense industry circles in China, that the use of standards from overseas competitors in strategic sectors, notably telecommunications and information networks, creates critical vulnerabilities. As such, maintaining control over standards and critical technologies is necessary to protecting China's information networks.¹⁷ Moreover, standardization has moved beyond purely technical dimensions over the last 30 years and expanded into the realm of governance, or social and management standards, which some perceive as "strategic weapons in international competition".¹⁸ This is both perceived as a threat to China's party-state governance model, but also an opportunity to project influence through Chinese standards in these areas. At the ideological level, technological supremacy and setting global technology standards is a sign of societal progress which, beyond economic and military prowess, offers proof of China's revival as a great power and provides political legitimacy to the Chinese Communist Party (CCP).¹⁹

Standardization reform: Boosting the competitiveness of Chinese standards

Responding to these various objectives and turning China into a premier standards-developing economy would require a fundamental reorganization of China's standardization regime, a process which began in earnest in 2015. The previous configuration, based on the standardization law of 1989, proved to be overly complex and burdensome. As many as 150,000 standards (or seven times the level of the European Union) had been generated over the years, many of which were superfluous, outdated, redundant, or even, in the case of many "mandatory" standards at the local,

16. J. D. Ma, "From Windfalls to Pitfalls: Qualcomm's China Conundrum", MarcoPolo, 14 November 2018, <https://macropolo.org>.

17. D. Ernst, *Indigenous Innovation and Globalization: The Challenge for China's Standardization Strategy*, La Jolla, CA: UC Institute on Global Conflict and Cooperation; Honolulu: East-West Center, 2011, ch. 2, www.eastwestcenter.org.

18. H. Liu, "Analysis on China's International Standardization Strategy Based on the SWOT-PEST Analysis Paradigm", *op. cit.*, 2017, p. 238.

19. J. Baird Gerwitz, "China's Long March to Technological Supremacy", *Foreign Affairs*, 27 August 2019, www.foreignaffairs.com.

industry and national level, in direct contradiction to one another.²⁰ In particular, China's standardization regime proved unable to meet the challenges of generating useful standards that could facilitate innovation and meet the needs of China's economic transformation, in the first instance, and subsequently serve as a basis for formulating international standards.

Between the state, the market, and the Party

In 2015, the State Council set out on a reform path to fundamentally transform and re-tool the country's standardization system by 2020.²¹ It is noteworthy that, in addition to vast internal consultations piloted by the State Council and the heads of relevant ministries, Beijing sought the counsel of high-level representatives from standards-coordinating bodies in the United States (ANSI), Germany (DIN), the UK (BSI) and France (AFNOR) in an effort to incorporate best practices. The reform efforts have so far resulted in a new standardization law, adopted by the National People's Congress in late 2017 and enacted the following January.

In effect, the law creates the basis for a new system that can best be described as a hybrid – a cross between state control and oversight on the one hand, and market-driven action on the other. In the first instance, authority has been concentrated in the hands of the central government through the abolishment of mandatory local and industry standards, though voluntary, or “recommended” standards still remain at these levels. Both categories of mandatory and recommended standards still remain at the national level – though here too, the number of mandatory national standards is slated to be slashed in half, from 3000 to 1500, according to the CNIS. The goal of these efforts is to rationalize and streamline domestic, state-driven standards.

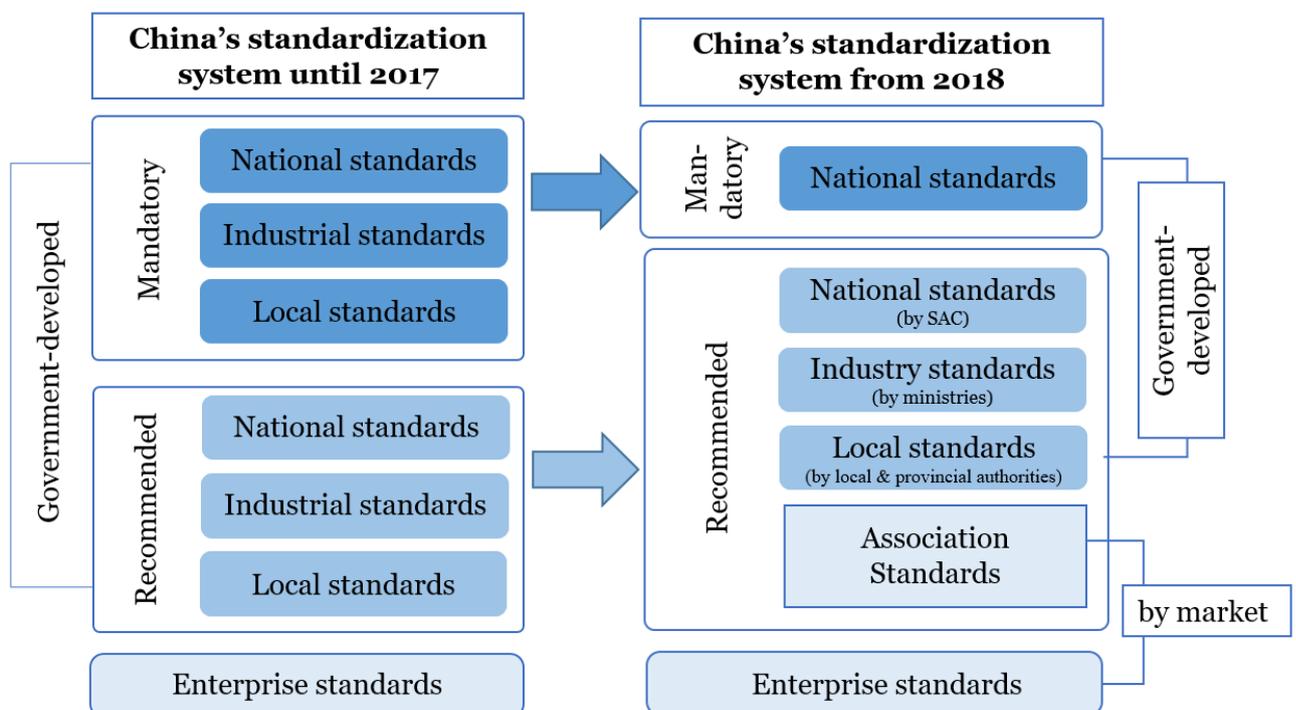
At the same time, the space for “market-issued” standards has significantly increased. In addition to enterprise standards, a holdover of the previous system, new “social organization” or association standards have been introduced, a feature that more closely resembles the American system. In particular, this shift has been made in an effort to galvanize the collaborative efforts of the private sector in favor of boosting innovation, reflecting the growing recognition in China of the important role that market forces play in this process. At the same time, the two pillars of this system – state control and market initiative – appear in stark contrast to one another,

20. O. Peyrat, “Normalisation : la stratégie chinoise”, *Paris Innovation Review*, October 9, 2012, available at: <http://parisinnovationreview.com>.

21. State Council of the People's Republic of China, *Deepening the Standardization Work Reform Plan* (深化标准化工作改革方案), 11 March 2015, available at: www.gov.cn, and *National Standardization System Development Plan*, 17 December 2015.

effectively reflecting China's efforts to "square the circle" by simultaneously introducing liberal economic reforms while maintaining a high degree of control by the state.²² Moreover, it must be underlined that in parallel to this evolution, the role of the Chinese Communist Party (CCP) within the economy and the society at large has both broadened and deepened under Xi Jinping's leadership – with, for instance, the obligation for many state-owned and major private companies to accept Party committees within their boards of directors – raising the level of opacity between political objectives and economic decision making and effectively blurring the classical lines between state and private actors.²³

Figure 1. China's Standardization System Before and After Reform



Source: author's representation

Whether the operational goals of the reform can be achieved remains to be seen, but so far one implication has been an explosion in the number of applications for association standards – due in part to the fact that financial incentives are provided simply for filing an application, regardless of

22. B. Fägersten and T. Rühlig, "China's Standard Power and its Geopolitical Implications for Europe", *UI Brief*, The Swedish Institute of International Affairs, February 2019, p. 5-8, <https://www.ui.se>.

23. N. Grünberg and K. Drinhausen, "The Party Leads on Everything: China's Changing Governance in Xi Jinping's New Era", *MERICS China Monitor*, 24 September 2019, www.merics.org.

whether or not a standard is ultimately adopted. This suggests that, for the time being, there is more quantity than quality.

A growing space for foreign-invested enterprises?

With these changes in China's standardization regime, and emerging signs that foreign investment restrictions in the country are loosening, there is a real prospect that foreign companies could increasingly become actors in developing Chinese standards as well. In November 2017, the SAC, in conjunction with the NDRC and the Ministry of Commerce, published a set of non-binding guidelines to encourage the equal treatment of foreign-invested companies in standardization work within China,²⁴ while China's new foreign investment law (specifically Article 15) is set to largely codify these guidelines when it takes effect in January 2020.²⁵ While a number of companies interviewed have seen a change in their ability to participate in standards development in the last two years, particularly those with well-established networks and partners in the country, many continue to question the changes that these new regulations will bring and the degree to which this space will continue to open.

Toward China Standardization 2035

The reform and development of China's standardization regime will certainly not stop here. In March 2018, a reflection process began on a new standardization strategy, known as China Standard 2035.²⁶ Led by the SAC and the Chinese Academy of Engineering (CAE), the reflection focuses on the efforts necessary to further strengthen the Chinese standards development system, through creating benchmarks and a "Standardization Plus" concept.²⁷ Strong attention will be paid to high value-added sectors, or "high-quality development", particularly in areas where technical standards have yet to be settled. Explicitly, and worryingly, the strategy will also focus on standards to facilitate civil-military fusion – a concept that has gained considerable traction in China and has caused a stir in strategic communities

24. "外商投资企业参与我国标准化工作的指导意见 [Guiding Opinions on Foreign Invested Enterprises' Participation in Standardization Work]", Standardization Administration of China (SAC), 29 November 2017, www.sac.gov.cn.

25. "中华人民共和国外商投资法 [Foreign Investment Law of the People's Republic of China]", 15 March 2019, <http://wzs.ndrc.gov.cn>.

26. "Chinese Standards 2035, the standardization strategy research is kicked off", Seconded European Standardization Expert in China (SESEC), May 24, 2018, available at: www.sesec.eu.

27. Liu Yuying, 国家标准委：正制定《中国标准2035》(National Standards Committee: developing China Standard 2035), *China News Service*, January 10, 2018, available at: www.chinanews.com.

overseas, particularly in Washington.²⁸ Finally, the strategy will emphasize strengthening China's role in international standard setting and the internationalization of Chinese standards.

28. U.S.-China Economic and Security Review Commission, "Technology, Trade and Military-Civil Fusion: China's Pursuit of Artificial Intelligence, New Materials, and New Energy", Commission Hearing, 7 June 2019, www.uscc.gov.

China and international standards: A dual track approach

Over the course of the last decade, China's presence in international standard-setting forums has grown considerably. As explained above, Chinese engagement in international standardization processes is driven in part by the need to improve the level of standards in China and to facilitate trade and market access for Chinese firms. But, more importantly, in recent years China's engagement has increasingly become about influencing international standards development and paving the way for the diffusion of Chinese standards in areas where China is competitive – a dynamic that will only increase as China's strategy for strengthening its domestic standardization regime takes shape.

As will be explained below, China's presence in international organizations may have grown significantly in recent years, but it is still a relative newcomer and its level of influence has only grown slowly. In parallel, however, China is pressing forward with various bilateral cooperation frameworks and the development of its Belt & Road format as a way to advance its interests more quickly.

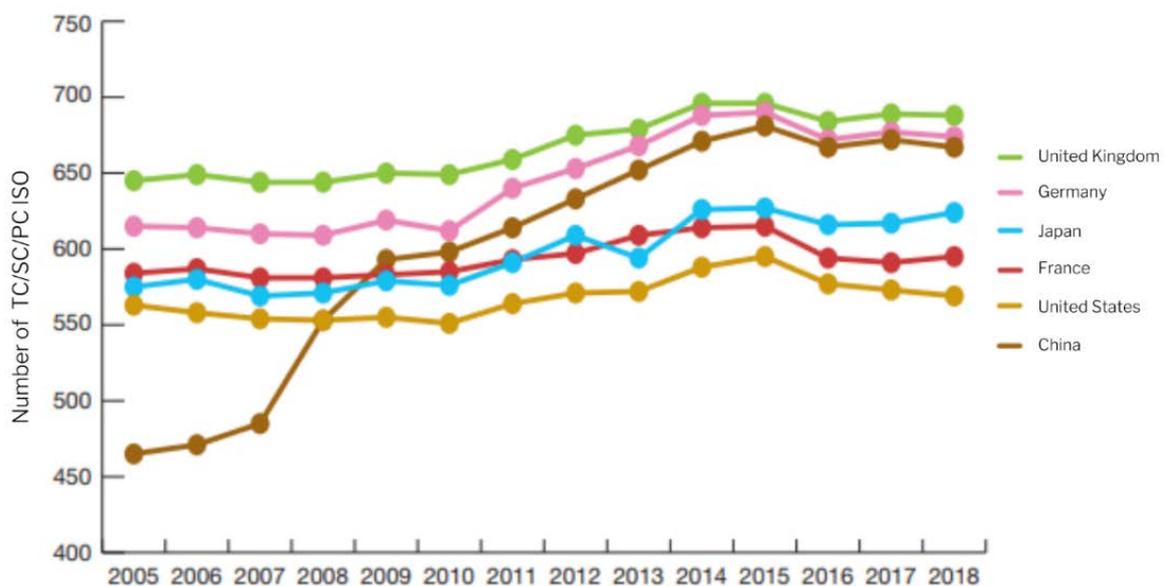
China's integration in international SDOs: the cooperative approach

China's presence in international standards development organizations – namely the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC) and International Telecommunication Union (ITU) – has grown exponentially in recent years, both in terms of participation in technical committee work and in the leadership bodies of these organizations. In 2008, thirty years after formally joining the ISO, China became the sixth permanent member of the organization's Council, and five years later, in 2013, would become a permanent member of its Technical Management Board, alongside France, Germany, Japan, the UK and the US. In 2015, Zhang Xiaogang was elected for a three-year term as the first President of the ISO from China, after a career in the iron and steel industry. Similarly, at the IEC, Shu Yinbiao, the

Chairman of the State Grid Corporation of China (SGCC), was elected in January 2019 to serve as IEC President from 2020, after being the group's Vice President from 2013-18. At the ITU, Zhao Houlin became the group's Secretary General in 2015 after serving for eight years as Deputy Secretary General. He has now begun a second term that will last through 2023.

Beyond integrating leadership structures, China has been increasingly active in technical committees, as shown in the graphs below. It has the third highest level of participation in ISO technical committees (TCs), behind France and the UK, and the second highest participation in IEC committees, behind Germany. The number of TC secretariats China holds has also grown exponentially since 2004, both in the ISO and the IEC. As of 2019, it holds 79 ISO secretariats, of which 17 are twinned with other countries,²⁹ and 10 secretariats in the IEC. At the ITU, while China holds no formal chairmanship of any study groups, representatives from Huawei, ZTE, China Telecom, China Mobile, Alibaba and CAICT all hold vice-chairmanship positions.

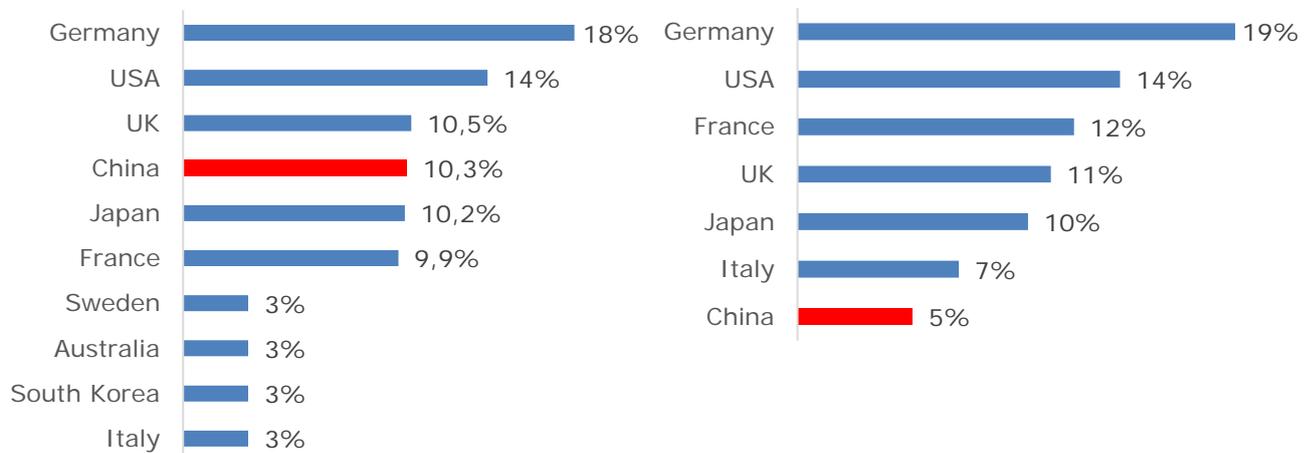
Figure 2. Evolution in Number of Participating Members in ISO Technical Committees and Sub-Committees (Most active countries)



Source: reproduced from AFNOR, *Baromètre International Edition 2019: Positionnement français dans la normalisation internationale*

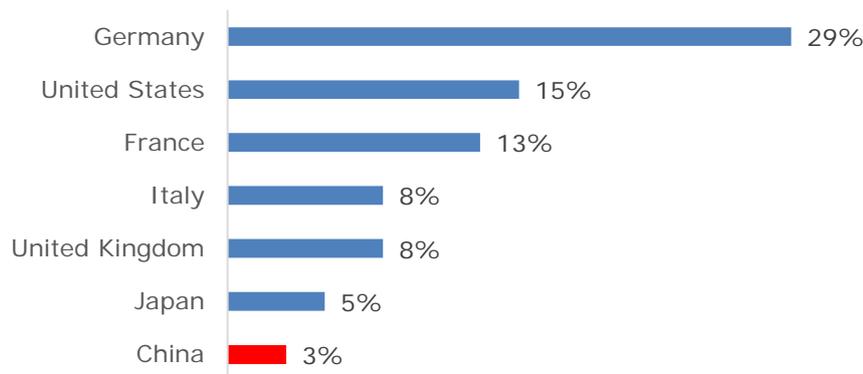
29. Twinned secretariats is a feature of the ISO that China has used far more than any other country over the years. It offers representative from “developing” countries the possibility to learn the workings of the organization in partnership with older members. China’s participation in twinned secretariats has fallen from its peak of 24.

**Figure 3. Distribution of ISO and IEC Secretariats in 2018
(Most active countries)**



Source: AFNOR, *Baromètre International Edition 2019: Positionnement français dans la normalisation internationale*

**Figure 4. Distribution of IEC Chairmanships 2018
(Most active countries)**



Source: AFNOR, *Baromètre International Edition 2019: Positionnement français dans la normalisation internationale*

A mix of successes and failures

Despite these impressive numbers, China by no means dominates these organizations, and many of its successes have also been mirrored by shortcomings and failures. In many ways, China is still in the learning and adaptation phase. One shortcoming is related to personnel issues. While it has succeeded in obtaining an increasing number of secretariats at the ISO, China has had more difficulty finding qualified personnel to hold

chairmanship positions – non-Chinese chairpersons have been appointed in more than a quarter of the China-held ISO secretariats.³⁰

A large number of Chinese standards proposals have also had difficulty finding traction, either because of their lack of relevance or technical feasibility, or simply because of procedural issues. Perhaps the most emblematic failure is China's 2006 proposal of a WLAN Authentication and Privacy Infrastructure (WAPI) standard. Based on China's own national standard, WAPI was designed to close many of the perceived security loopholes of the existing WiFi standard (ISO/IEC 8802-11, or IEEE 802.11), and would subsequently facilitate state oversight and control of wireless networks. An ISO technical review ultimately judged that the two standards were competing and that, because the WiFi standard had already been adopted, WAPI could not be. More than simply a procedural question, the WAPI/WiFi case illustrates how a seemingly benign question of defining a technical standard can have political implications – in this case opposing the notion of an Internet where users operate with greater freedom and anonymity (WiFi) with one in which state management and control plays a greater role (WAPI). Needless to say, WAPI remains the applied national standard in China today.

A second lesson China has drawn from the WAPI experience, among others, is the need to take the initiative and gain first-mover advantage, a lesson it has taken to heart, particularly as its research and innovation capacities grow. As of March 2019, for instance, China had proposed 11 standards for the Internet of Things (IoT) within the ISO/IEC framework, of which 5 have been adopted and published and 6 are still pending review.³¹ Under China's stewardship, the IEC has also taken on coordinating standards work of the Global Energy Interconnection (GEI),³² a concept largely inspired by the State Grid Corporation of China and formalized in the creation of the China-led Global Energy Interconnection Development and Cooperation Organization (GEIDCO), which seeks to develop massive, transcontinental electricity "smart grids". While the concept certainly has strong merits, China is also well positioned to advance its own technologies and technical standards, particularly in the area of smart grids, direct current (DC) and Ultra-High Voltage (UHV).³³ Furthermore, in conjunction with efforts by 27 Chinese companies to develop national standards on facial

30. AFNOR, *Baromètre International Edition 2018: Le positionnement français au niveau international (ISO et IEC)*, AFNOR, July 2018, p.11, <https://normalisation.afnor.org>.

31. SESEC, "ISO/IEC Approved China's Standards Proposal on IoT", www.sesec.eu, accessed 1 November 2019.

32. IEC, *Global Energy Interconnection White Paper*, IEC, 2016, www.iec.ch.

33. "Power Play: China's Ultra-High Voltage Technology and Global Standards", *Paulson Papers on Standards*, April 2015, www.paulsoninstitute.org.

recognition, led by Chinese AI powerhouse SenseTime and including companies such as Tencent, Ping An Insurance, Dahua Technology, Ant Financial, Xiaomi, and iFlytek,³⁴ Chinese companies such as ZTE, Dahua and China Telecom have reportedly been establishing positions at the ITU with regards to developing standards in facial recognition, video monitoring and surveillance technologies.³⁵

A growing appetite for international industry associations

In addition to these major international bodies, Chinese companies have also embraced standardization processes within the multitude of international industry associations such as the IEEE. Indeed, a broad range of Chinese corporations, including Huawei, Alibaba, Haier, Tencent, Baidu and many more are all advanced corporate members of the IEEE, and Chinese companies fill seats in each of the organization's major decision-making bodies. Moreover, Shu Yinbiao, the IEC president-elect and Chairman of the SGCC, is also a senior member of IEEE.

Similarly, Chinese firms have heavily invested in project-specific initiatives such as the 3GPP, where much of the standards development for 5G is currently taking place. China's participation in 3GPP and other ICT forums, notably through Huawei, ZTE, CATT or Oppo, was born out of the failure to produce viable Chinese telecom standards (namely TD-SCDMA). From this failure emerged the idea that, in industries such as ICT, developing stand-alone national standards may in fact be counterproductive, and efforts are best spent working to influence standards development directly at the international industry association level, when such collaborative forums exist.

Multi-bilateralism and the Belt & Road: the China-centered approach

In parallel to its integration into international standards forums, and perhaps as a result of the slow pace in driving international standardization to date, China has also pursued a more China-centered approach, namely through the multiplication of bilateral cooperation agreements and the

34. Y. Xue, "27 Companies Drafting China's First National Facial Recognition Standard", The Sixth Tone, 27 November 2019, www.sixthtone.com.

35. A. Gross, M. Murgia and Y. Yang, "Chinese Tech Groups Shaping UN Facial Recognition Standards", *The Financial Times*, 1 December 2019, www.ft.com.

development of standardization work within the context of its Belt & Road Initiative.

The give and take of bilateral agreements

At the level of bilateral agreements, China has engaged through the SAC both with major developed, or standardizing countries and with developing countries with weaker standardization traditions, in both cases with a view to promote “mutual standards recognition”. In the first instance, cooperation with countries and partners such as the United States, Germany, France or the European Union is meant to yield benefits on specific sectors of interest. Its deepening cooperation with France, for instance, is focused on areas such as the silver economy, smart cities, sustainable urban development, agribusiness, and railways.³⁶ Electric vehicle standards have also been a major topic of cooperation with countries such as the US and Germany. While the cooperation has been welcomed, there is still a degree of reticence on the part of many industrial actors in developing standards cooperation – some explicitly express concerns, for instance, that their Chinese counterparts continue to view standards cooperation as a means of technology transfer, particularly in fields where Chinese competitiveness lags behind, which many firms fear will result in a loss of their own competitive edge.

Meanwhile, cooperation with emerging economies – for instance with Mexico, which signed a Memorandum of Understanding (MoU) on standardization in 2014, or Vietnam, Myanmar and Indonesia – China is in a much better position to act as a standard setter and export its standards to gain market dominance.³⁷ At the same time, Chinese experts have explained on multiple occasions that there is a clear demand for Chinese standards, particularly in developing economies, because, as one explained, “Western standards are simply too expensive for much of the world, whereas with China the quality is improving while the price remains acceptable”. In any case, for countries in Asia in particular, where trade with China makes up a significant portion of economic activity, the gravitational pull of China’s market already acts as a de-facto means of standards diffusion.³⁸

36. “Coopération franco-chinoise: l’industrie du futur en pole position”, AFNOR, 1 June 2017, <https://normalisation.afnor.org>.

37. S. Weithmann, *The Evolvement of Standards in China: Insights from the Electric Vehicle Sector*, Nomos: Baden-Baden, 2017, p. 145-146.

38. O. Peyrat, “Normalisation: la stratégie chinoise”, *op.cit.*

Standardization and the Belt & Road

Since 2015, China has issued successive plans to integrate standardization work within the development of its Belt & Road Initiative.³⁹ Specifically, through this forum China seeks to better coordinate standards development in a broad range of sectors, including transportation, energy infrastructure, telecommunications, smart cities, e-commerce, agriculture, environmental protection, finance, development assistance, civil aviation, accounting, and healthcare services, among others. At the Belt and Road Forum held in Beijing in May 2017, China signed framework agreements on mutual standards recognition with 12 countries, including Russia, Belarus, Serbia, Mongolia, Cambodia, Malaysia, Kazakhstan, Ethiopia, Greece, Switzerland and Turkey. As of 2019, the official list has broadened significantly to include 85 standardization cooperation agreements with 49 countries and regions,⁴⁰ though scant literature exists on the depth and specific contents of such agreements.⁴¹

In April 2019, on the occasion of the second Belt & Road Forum, the CNIS unveiled two new platforms to facilitate standards cooperation, namely the “Belt & Road’ Co-constructed National Standard Information Platform” and the “Standardization CN-EN Bilingual Intelligent Translation Cloud Platform”. The first provides news updates on standards development and a classification and translation of information on standards for participating countries and organizations, which currently include 35 countries and five international organizations (of which the ISO, IEC and ITU). The second platform is a translation tool designed to facilitate the translation of technical standards between Chinese and English.⁴²

The development of such regional coordination tools, and the simple fact that standards cooperation in such a vast range of sectors is a component of the Belt & Road at all should not be overlooked. Indeed, it illustrates the degree to which China’s grand project extends well beyond the

39. Specifically, the “Action Plan to Connect One Belt, One Road through Standardization (2015-2017)” and the “Standards Connectivity Action Plan on Jointly Building the Belt and Road (2018-2020)”, <https://eng.yidaiyilu.gov.cn>.

40. Office of the Leading Group for Promoting the Belt and Road Initiative, *The Belt and Road Initiative: Progress, Contributions and Prospects*, Beijing: Foreign Languages Press, 2019, p.7.

41. As one analyst observes, a more detailed review of the terms, not only of these framework agreements but also of actual infrastructure projects with Chinese firms would need to be conducted to determine whether the use of Chinese technical standards is being contractually promoted, or whether their diffusion is rather a simple consequence of increasing Chinese economic activity. Laure Deron, “La Chine met-elle ses normes au service de sa puissance ? », *Présences chinoises en Afrique*, EHESS Seminar, Paris, 17 April 2019.

42. Seconded European Standardization Expert in China (SESEC), “The ‘Belt and Road’ Co-constructed National Standard Information Platform and the Standardization CN-EN Bilingual Intelligent Translation Cloud Platform were released”, 26 April 2019, www.sesec.eu.

realm of physical infrastructure development and targets regional integration and “soft docking” in a broad sense, with a view to expanding China’s “connectivity power”.⁴³ Beyond formal cooperation in standardization, the diffusion of Chinese technical standards is likely to be drawn forward through the deployment of technologies and methods used to develop physical infrastructure such as ports, high-speed rail and regional smart grids, and digital 5G-enabled networks through the so-called “Digital Silk Roads”. China’s growing technological prowess in these fields, its establishment of an architectural framework for promoting standards cooperation, and the massive financial means it seeks to deploy effectively make the Belt & Road a formidable platform for standards diffusion.

43. P.J. Kohlenberg and N. Godehardt, “China’s Connectivity Politics”, *SWP Comment*, no. 17, April 2018, www.swp-berlin.org.

Toward greater convergence or fragmentation of international standards?

Chinese policymakers have become keenly aware of the relationship between technical standard-setting and economic power. Indeed, the re-tooling of China's standardization system has sought to harness the capacity of standard setting not only to improve the daily lives of its citizens, but to drive innovation and boost China's economic transformation toward the industries of the future. The ability to define technical standards is also a mark and an instrument of international power competition. As China strengthens its capacity to define its own technical standards, it will increasingly seek to shape international standards in line with its own interests. Up to now, China's latecomer status to international standard setting means that it has faced an up-hill battle in shaping the development of this space. Moving forward, as China's ability to propose innovations in a growing number of emerging technological fields grows – as witnessed by its successes in the field of 5G, and its ambitions in the field of AI – its ability to transform the international standardization landscape will also expand.⁴⁴

So far, China has followed a dual track of developing technical standards through international cooperation processes while facilitating the deployment of its own standards through bilateral cooperation and concrete investment projects, notably via the Belt & Road. In effect, this approach reflects competing tendencies toward greater cooperation and convergence on standards, on the one hand, and a broader fragmentation or bifurcation of international standards regimes on the other. At the same time, the global economy faces similarly competing pressures, with protectionism and rising techno-nationalism pushing back against a new potential wave of technologically-driven globalization.⁴⁵ Moving forward, increased convergence or fragmentation in the technical standards space will play a

44. For example, see S. Sacks, "Beijing Wants to Rewrite the Rules of the Internet", *The Atlantic*, June 18, 2018, www.theatlantic.com, and J. Ding, S. Sacks and P. Triolo, "Chinese Interests Take a Big Seat at the AI Governance Table", *Blob Post, DigiChina, New America*, 20 June 2018, www.newamerica.org.

45. R. Manning, "Techno-nationalism vs. the Fourth Industrial Revolution", *Global Asia*, vol. 14, no. 1, March 2019, www.globalasia.org.

key role in determining how these competing trends play out in the long term.

Convergence, fragmentation and the China challenge

Already, international standard setting is a fragmented space. At the institutional level, organizations such as the ISO and the IEC, while seemingly positioned at the pinnacle of a global standards hierarchy, are not considered with the same degree of relevance by all actors. Whereas Europe has sought to reinforce the hierarchical nature of these institutions relative to their European and national-level equivalents, they are often seen in the United States as institutions among many. While in many areas the ISO/IEC framework remains a key platform – reportedly accounting for 85 percent of all international product standards⁴⁶ – an increasing amount of technical standards work has bypassed this system, coalescing in a broad diversity of industry associations. Even in the field of 5G, for instance, where 3GPP has catalyzed much of the work on standards, there are in fact 10 or more separate forums that work on contributing to 5G standards. Nevertheless, while fragmented and imperfect, and while some have alerted to the over-privatization of regulation through these such frameworks,⁴⁷ these spaces remain forums for international collaboration and convergence on standards, and China has embraced them. The question is, to what extent will China continue to embrace these processes, and to what degree will it choose to conduct parallel standards work and bypass these forums in the future, particularly as it deepens its Belt & Road?

The answer to this question depends in part on the degree to which China believes in its ability to shape the process. Already, it is noteworthy that China's new standardization law no longer explicitly mentions the application of ISO/IEC standards domestically. But greater convergence on standards also depends on the extent to which others, particularly the United States and Europe, are willing to engage with China in this field – which also means accepting a certain degree of accommodation relative to China's interests.

The scope for engagement with China in this space must be tied into a deeper reflection on how to engage with and formulate policies toward China more generally. One line of reflection resides at the level of the international system. Indeed, China's emergence as an increasingly proactive player in the

46. T. Büthe and W. Mattli, *The New Global Rulers: The Privatization of Regulation in the World Economy*, Princeton University Press, 2011, <https://press.princeton.edu>.

47. *Idem*.

standardization field coincides with growing frictions related to its rise and its role as a revisionist power – seeking simultaneously to transform existing international governance mechanisms⁴⁸ while developing more China-centered forums in parallel.⁴⁹

Another level of reflection resides at the crossroads between technology, society and politics. The scope of change that emerging technologies such as facial recognition and AI will bring to society mean that ethical, political and security questions are necessarily integrated into standard setting on questions such as algorithmic bias, transparency in algorithmic decision-making and data privacy. As Chinese firms are leading technology developers in these fields, China is in a strong position to set standards.⁵⁰ Deciding whether private standards-development organizations and forums such as the ISO and IEC are adequate spaces to deal with such complex, transformational issues is one question. Another is the degree to which cooperation with China on standards in a growing number of emerging technological fields is politically feasible, given that a large number of Chinese technology companies are developing their methods within a context of surveillance and censorship, and even testing their wares in conjunction with harsh repression in regions such as Xinjiang before exporting them to the global marketplace.⁵¹

The growing prevalence of geopolitical competition in standards development

Already in the United States, growing frictions with China have led to debates about the need to disentangle many of the intricate economic linkages that have been forged with the party-state and its economy over the last forty years – either in a broad, sweeping sense, or in the least in areas deemed to be strategically important, if not critical.⁵² Technological competition, security concerns and growing political and geopolitical frictions could certainly limit the scope of cooperation on technical

48. M. Okano-Heijmans, F.-P. van der Putten, *et al.*, “A United Nations with Chinese Characteristics?”, *Clingendael Report*, December 2018, www.clingendael.org.

49. A. Ekman (ed.), *et al.*, “China’s Belt & Road and the World: Competing Forms of Globalization”, *Etudes de l’Ifri*, April 2019, www.ifri.org.

50. J. Ding, S. Sacks and P. Triolo, “Chinese Interests Take a Big Seat at the AI Governance Table”, *Blob Post*, DigiChina, *New America*, 20 June 2018, www.newamerica.org.

51. D. Cave, F. Ryan and V. X. Xu, “Mapping More of China’s Tech Giants: AI and Surveillance”, *Issues Paper*, No. 24, Australian Strategic Policy Institute (ASPI), November 2019, www.aspi.org.au.

52. See for instance C. Boustnay and A. Friedberg, “Partial Disengagement: A New U.S. Strategy for Economic Competition with China”, *NBR Special Report*, no. 82, November 2019, www.nbr.org.

standards moving forward, and indeed have already manifested themselves in this space.

In late May 2019, as the US Department of Commerce placed Huawei and 68 of its affiliates on the “Entities List” in relation to sanctions on Iran, the Chinese tech giant was excluded from a number of standard-setting industry associations, including the JEDEC, which develops standards for semiconductors, the SD Association, Bluetooth SIG and the WiFi Alliance.⁵³ The IEEE then announced that, in order to comply with US regulations (the IEEE is headquartered in New Jersey), Huawei employees would no longer be allowed to participate in the association’s peer-reviewed journal editing process, sparking outrage among the Chinese academic community and concerns that Huawei’s broader participation in IEEE might be compromised. The IEEE’s decision was reversed three days later,⁵⁴ and Huawei’s participation in the other forums was quietly restored,⁵⁵ following a (perhaps temporary) reprieve from the Trump administration. The question remains open as to how the US sanctions regime will impact the participation of Chinese tech groups in standardization forums moving forward. On 9 October, the US Department of Commerce added 28 government officials and commercial organizations to the its Entities List for human rights violations in Xinjiang, including leading AI firms Hikvision, iFLYTEK, SenseTime, and Megvii.⁵⁶

This is indicative of how policy tools such as sanctions and export restrictions meant to deal with political and security-related issues are already manifesting themselves in the standards arena in relation to China. Moving forward, geopolitics will be an increasingly salient reality in the standardization space as China’s rise restructures the international system. At the same time, because of the fundamental role that standards play in facilitating connectivity and technological interoperability, the degree to which international standard setting remains a collaborative process or becomes more fragmented and fractured will help to determine just how profoundly China’s emergence will redraw the global economic map.

53. C. Shepherd, “Top Industry Standards Body Drops Huawei from Its Journals”, *The Financial Times*, 30 May 2019, www.ft.com.

54. “IEEE Lifts Restrictions on Editorial and Peer Review Activities”, IEEE Statement Update, 2 June 2019, www.ieee.org.

55. I. Zubair, “SD Association, Wi-Fi Alliance, JEDEC, and Bluetooth SIG reinstated Huawei”, Tech Lapse, 29 May 2019, <https://techlapse.com>.

56. W. Carter and W. Crumpler, “Understanding the Entities Listing in the Context of U.S.-China AI Competition”, Critical Questions, Center for Strategic and International Studies (CSIS), 15 October 2019, www.csis.org.



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