



IRSEM

INSTITUT DE RECHERCHE STRATÉGIQUE
DE L'ÉCOLE MILITAIRE

11 May 2020

CHINESE STANDARDS AND THE NEW INDUSTRIAL MARKETS

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ABSTRACT

French and international firms in strategic industries face an increasingly challenging competition from China. In the automobile industry, telecoms or the railway industry, Chinese companies have become major players both at home and abroad. This paper explores the role of industrial standards in the reconfiguration of international market competition in sectors where Europeans have long been dominant. China has stepped up its contribution to the issuance of new technical standards. It is currently working on producing a unified set of technical standards for domestic use by 2035. Given the country's growing participation in international standardization bodies, this new set of domestic standards may have an international influence. The elaboration of new technical standards is an international endeavor, driven by industrial innovation, and China's new role in this process is not necessarily a threat to competition.

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INTRODUCTION

Chinese Industries Have Gone Global. China's industries combine the market advantage of unrivaled production and financial might, accumulated since the 1950s, and more recent efforts to promote academic development in science through investment¹ boosting their capacity to elaborate innovative industrial applications. China's *Made-in-China-2025* plan² strategically focuses on enabling innovation in high-tech industries such as high-end rail infrastructure, bio-medicine or advanced robotics where the country's industries are now competing with world leaders.

At the same time, the firm grip of the Chinese state on the production, development and decision process ensures that the country's resources and management skills stay focused on the trajectory set to achieve success on the international stage. The Chinese leadership has announced flagship policies seeking to multiply market opportunities overseas for Chinese companies constrained by a saturated domestic market : the Going Global Strategy of 1999 sought to depart from a manufacturing-based economy relying on massive foreign-investment and technology import to an innovation-driven model.³ It was followed by President Xi Jinping's One Belt, One Road (BRI) policy “一带一路” announced in 2014, an ambitious, ever-developing programme of investment and cross-national cooperations.

Chinese Standards are Also becoming Global. Analysts have noted that in recent years, China has committed substantial resources towards the elaboration of Chinese standards (culminating in the 2017 new Standardization Law as adopted to unify industrial standards⁴) and ensuring that international standards reflect Chinese priorities. They worry that this may shift the direction of international competition and that, in many infrastructure projects in particular, only Chinese companies will be able to meet the technical criteria if Chinese technical standards have been incorporated into tenders or national standards in their countries along the BRI.⁵

Are Standards a Strategic Tool for China? Will China's increasing contribution to the development of technical standards result in a comparative advantage for Chinese industrial champions? This paper explores the impact of China's activism in the field of standards, arguing that market advantage primarily depend on the underlying technical and development effort behind the standards.

Do Foreign Companies Also Benefit from Chinese Standards? Equally, we seek to interrogate whether the push for harmonized international standards, led by China, is creating the conditions for a greater interoperability of technologies and products beneficial to global competition.

1. Stéphanie Balme et Pierre Lemonde, “[Un rêve d'hyperpuissance scientifique](#),” *La Recherche*, mars 2020.

2. The *Made in China 2025* (MIC 2025) plan was released by China State Council in May 2015.

3. China Policy, “[China Going Global between ambition and capacity](#),” *China Going Global Strategy*, 2017, p. 3.

4. John Seaman, “China and the New Geopolitics of Technical Standardization,” *Notes de l'IFRI*, IFRI, January 2020 p. 16.

5. Björn Fägersten and Tim Rühlig, “China's standard power and its geopolitical implications for Europe,” *Swedish Institute of International Affairs Brief*, February 2019, p. 15.

Methodology. This paper is based on the professional experience of the author as a lawyer involved in the negotiations for high-stake projects in several industries, both in China and in neighbouring countries participating in BRI projects. The informal sources quoted in this paper were the result of professional conversations held by the author with other members of the negotiation teams in the course of developing and implementing the projects or interviews conducted afterwards for the preparation of this paper. Most interviewed professionals come from a legal, financial or technical background and have experience in major world industrial corporations, including sectors determined by China to be of strategic interest under its Made-in-China 2025 plan).

CHINA'S STANDARDIZATION EFFORTS

Are Standards Barriers or Facilitators of trade? Standards are either a technical result or a technological process, and are embedded in products or industrial operations. Technical standards are either industry standards developed by major industry actors' standardization bodies through a consensual process, or state-issued compulsory rules. Depending on the issuer, they act as market incentives, or carry a mandatory force. They serve as a common reference and quality marker ensuring the interoperability of products across geographic areas. The establishment of industrial standards on a world scale has been a constant concern since the Industrial Revolution, when the expansion of empires materialized in a patchwork of production zones and consumption markets unified under a single sovereign power. Their effects can be felt in the long term: a map of electric plug types reveals which parts of the world were part of the British sphere in the same way that a world map of railway gauges will offer a glimpse into the history of the Cold War, with the Soviet space distinctly following its own separate standards.

Harmonized standards facilitate trade by ensuring an easy circulation of products.⁶ Differentiated standards, on the other hand, limit market access for foreign competitors. As trade barriers, they can become either an instrument of protectionism or serve to protect a nascent domestic production sector or the enforcement of domestic values in crucial areas such as the environment, national security and public health, consumer information as well as workers' rights.⁷ For example, in the health and safety sector, European countries rely on unified standards set forth for the European Union (EU), that assign technical specifications to personal protective equipment used in the medical profession.⁸ The quality requirements in the case of respiratory masks are determined under European Standard EN149:2001+A1:2009, which lists a number of parameters from breathability to particles filtration to outwards leakage performance, together with laboratory and the description or

6. The Technical Barrier to Trade Agreement of the World Trade Organization "aims to ensure that technical regulations, standards and conformity assessment procedures are non-discriminatory and to not create unnecessary obstacle to trade". Available at wto.org

7. *Ibid.*

8. Interview with former executive stationed in China for French-based respiratory masks manufacturer Delta Plus, April 2020.

practical performance tests for the assessment of compliance.⁹ Only equipment which complies with the requirements, as certified by the CE marking, can normally be imported into EU countries,¹⁰ effectively eliminating goods manufactured according to less demanding standards for the sake of protecting medical personnel working in the EU.

Standards can become compelling references for businesses, be they established through regulation or by virtue of voluntary adhesion. Critically though, they are not exclusive in nature. They are accessible not only to the issuer, but also to any competitor with enough motivation to undergo the necessary adaptation effort and costs. In contrast to intellectual property rights such as patents and copyright, standards do not confer a monopolistic right to use a technology. In the case of Iran,¹¹ the country sought to source substitutes to pharmaceutical goods from China after the United States (US) reinstated its sanctions in 2018 and European companies stopped supplying. However the products were protected by intellectual property (IP), and the unique cutting-edge technology could not be legally replicated; in this case, IP rules limiting access to the technology were the main deterrent, not standards. (There are exceptions though: in limited cases, known as *standard-essential patents*, a patent is an inherent feature of the standard itself. It compels competitors and downstream manufacturers to pay royalty fees to the patent owner¹² if they wish to incorporate the protected technology into their products).

Finally, standards are not the only form of non-monopolistic technology barriers. Extensive sets of technical documentation (technical instructions, maintenance manuals, protocols, designs etc.) are also crucial to operating works of civil infrastructure or complex devices, and their access is a matter of language and engineer training.

Boosting Chinese Standards. China's export-led economy relies on the compatibility of its products with international markets (at the end of 2019, China remained the world's first export economy with 2,5 billion USD-worth of exported goods per year¹³). Initial Chinese manufacturing standards for export broadly consisted in a translated replication of existing international sets. In parallel, sets of local (at various levels of the state and with differentiated geographical impact), less-constraining standards were published for goods aimed at the internal market and to stimulate domestic production, by setting the production requirements at a relatively accessible level¹⁴ to encourage domestic designs.

9. European Committee for Standardization reference, available at <https://standards.cen.eu/>

10. However, in the midst of the coronavirus crisis of the spring of 2020, the EU relaxed its requirements to allow respiratory masks manufactured in China under the equivalent local standard GB19083-2019 to be imported into Europe in order to deal with the global mask shortage and expedite import clearance procedures. Note that under Announcement n°2020-53 dated 10 April 2020, the General Administration of Customs of P.R. China (available at <http://www.customs.gov.cn>; 海关总署公告2020年第53号) later strengthened China's exports requirements to only allow medical goods with a CE marking to be shipped to the EU from China.

11. Bourse & Bazaar, "When the Sun Sets in the East," *Special Report*, January 2019, p. 4.

12. Rebecca Arcesati, "Chinese standards put the screws on European companies," *Merics blog*, 29 January 2019, reflects that the US tech giants' such as Microsoft, Google and Qualcomm dominance on standard-essential patents have, partly, resulted in China becoming the second-largest payer of licensing fees in the world.

13. <http://english.mofcom.gov.cn/article/statistic/BriefStatistics/202002/20200202935349.shtml>. Note that Chinese official statistics may be subject to caution.

14. Björn Fägersten and Tim Rühlig, "China's standard power and its geopolitical implications for Europe," p. 5.

China's subsequent attempts to unify its industrial standards have been slow. The Standardization Administration of China (SAC) was created in 2001.¹⁵ In 2015, the State Council launched a reset of the standardization system and sought to encourage the contribution of operational actors. The China Standard 2035 programme¹⁶ seeks to produce a comprehensive and harmonised set of industry standards for products manufactured or industrial activities conducted in China. The ambition is for Chinese standards to serve beyond the national boundaries and extend their appeal as a reference for quality to developing markets, where Chinese companies already operate.

Engaging International Standardization Forums. China's objective is for the SAC to become a more active participant within international standardization bodies. It has applied for an increasing number of its nationals to occupy preeminent positions in these instances, both in technical committees and in the leadership bodies of these organizations.¹⁷

China has also intensified the cooperation between its domestic standardization agencies and the international professional community¹⁸ by initiating a number of international conferences and training symposiums on standards. In 2017, it founded the Qingdao Forum on International Standardization, an international conference held every two years to encourage professional connections in the area¹⁹ and in October 2019, China hosted the 83rd International Electrotechnical Commission.²⁰ One focus has been to increase interactions between Chinese standard specialists and the recipient nations of its technologies and products, particularly among the BRI countries. In the context of the digital BRI, China has pursued its Cooperative Mechanism on Northeast Asia Logistics Information Service Network, a cooperation platform with its regional neighbours Japan and Korea in order to "achieve quick flow of logistics information between The Three Countries."²¹ The aim is to deploy harmonized and translated digital standards for international freight and customs procedures and to create a one stop shop for the electronic processing of documents facilitating trade across borders.²² Other regions have carried out similar work towards data alignment.²³

Promoting Chinese Standards as International Quality Benchmarks. The reference to Chinese industrial standards is sometimes used by Chinese companies as a commercial argument and can be a determining factor in industries where Chinese domestic standards are recognized as superior to European or international ones. For instance, Chinese

15. Standardization Administration of the PRC 国家标准化管理委员会 website www.sac.gov.cn

16. 中国标准2035 Launched in March 2019 by the General Administration of Quality Supervision, Inspection and Quarantine of the PRC and the Standardization Administration of the PRC, available at http://www.gov.cn/xinwen/2019-06/08/content_5398401.htm

17. John Seaman, "China and the New Geopolitics of Technical Standardization," p. 20.

18. Björn Fägersten and Tim Rühlig, "China's standard power and its geopolitical implications for Europe," p. 10-11.

19. Qindao Forum of Standardization website <http://www.qfscn.org/english/>

20. <https://www.export.gov/apex/article?id=China-Trade-Standards>

21. <http://english.neal-net.net/>

22. Interview with Mr Rémy Marchand, an IT and international trade expert with Association Française des utilisateurs du Net et de la Société en Réseau (AFNET), April 2020.

23. See *Beyond the Border Action Plan Single Window Initiative* for data alignment between Canada and the United States, January 2013. Also *Recommandation n°34 on the Data Simplification and Standardization for International Trade* published by United Nations Economic Commission for Europe in 2011 and the Agreement to Establish and Implement the ASEAN Single Window of 09 December 2005.

standards applicable to the treatment and discharge of sewage water are among the strictest in the world. Chinese negotiators may offer to insert them as a minimum quality benchmark in a project's contractual documentation. In such case, the Chinese equipment and operation standards serves as a technical reference and also a baseline obligation, subject only to, cumulatively, higher international standards and local regulatory standards.²⁴ As the practice expands on a larger scale, Chinese standards will disseminate until ultimately they are regarded by industrial companies and their clients as the international benchmark for projects, paving the way for their conversion into international standards.

HOW DO CHINESE STANDARDS IMPACT STRATEGIC INDUSTRIES?

Why Generate New Standards? For an industrial company, elaborating a new technology and its associated standards takes a sustained budgetary effort, from developing and testing it to putting it to industrial use before it becomes a reference. The rationale can only be twofold: either create an equivalent technical alternative, for the sake of subsequently discrediting an existing reference and retaining captive customers; or developing a substantial technological improvement with an added-value that will eventually replace the old standard.

A number of factors stand in the way of merely replacing existing standards with new parameters that do not offer added technical merits. Political reasons can play a role: China has failed in its proposal, submitted to the International Standardization Organization (ISO), to replace the existing WiFi standard with its WAPI proposal, whose technical addition consisted in a number of features designed to facilitate the state control of wireless networks, for which there was no appetite among international bodies and industrial players.²⁵ The market is also a powerful deterrent as no long-term benefit can be received from simply offering an alternative with no added value to consumers. In sectors such as telecoms, the opposite held true for a number of years with major mobile phone manufacturers routinely releasing combined sets of telephone and chargers of a design that would resist any usage with competing equipment. A number of actors, including the Chinese Huawei and Xiaomi eventually moved to mutually compatible micro-USB chargers but not US-based Apple, which continued to deploy its proprietary Lightning port on all new models as a way to uphold its image as an exclusive brand. The strategy did not stop its sales from slumping

24. For instance, see the *Convention de Base pour la Réalisation d'une mine de bauxite, d'une raffinerie d'alumine, de routes, d'un chemin de fer, d'un port en eau profonde et de centrales hydroélectriques en Guinée between The Republic of Guinea, TBEA Group Co. Ltd and Guinea Evergreen Mining Intelligence S.A. dated 30 December 2017*, art. 13.2.1(A) p. 39, available at www.resourcecontracts.org: "With respect to planification, construction, installation, use and maintenance of the Project Infrastructures finance, constructed and managed by the Investor, the Project Companies, any Affiliate or sub-contractor, norms and technical standards of the People's Republic of China will apply (but such case, subject to the minimum levels set forth in international norms and technical standards), subject to compulsory legal provisions under (Guinea's)Applicable Law."

25. John Seaman, "China and the New Geopolitics of Technical Standardization," p. 23.

behind its Chinese competitors.²⁶ Ultimately, the multiplication of equivalent standards can prompt the regulator to push for harmonization and elimination of technology duplicates, in the consumer's interest.²⁷

Finally, the role of standards as competition deterrent should not be over-emphasized. Even when standards present regional disparities, engineers are trained to be flexible where necessary in order to accommodate different standards. Tender documentation for infrastructure, while published in local standards, usually allow candidates to submit a technical offer with alternative standards, provided they establish its equivalent merit. While there is variety in the range of standards for measurements, capabilities, outputs, etc. in projects worldwide, this does not constitute a barrier to competition (just like continental European companies whose technology is based on the metric system will, in the case of a tender in the United States, convert into imperial measurements in their documentation).²⁸

Technical Standards Appear As a Result of Innovation. For the most part, new technical standards appear as a consequence of technical innovations taking place in sectors where ambitions are supported by adequate level of financial investments and economic returns can be anticipated. For example, China's position as a standard-maker in the sector of electric energy transmission is the result of a long-term technical, research and development (R&D) strategy tailor-made for Chinese circumstances, supported in its implementation and economic deployment by an array of state resources and organizations. The country's geographic features combines immense potential for the production of electricity in the West (mainly, hydro power, with the Three-Gorges hydro-electric dam having the largest power-generating station in the world and wind farms mega projects mostly scattered across its vast, semi-deserted territories) with major consumption clusters in the East (the country spans over 9.5 million km², with 80% of its population concentrated on the coast and a trend of rapid urbanization) to which the electricity must be transported.

Electricity transmission presents two challenges: minimizing losses over long distances and energy storage. In 2009, the State Grid Corporation of China (SGCC) announced a massive 600 billion RMB investment plan until 2020 to develop ultra-high voltage electricity transmission (UHV) consistent with the government's intention to decarbonize its economy. In its 13th five-year plan,²⁹ China's made clear its ambition to become a leader in optimized trans-regional power transmission routes both at home and internationally. In 2015, the State Grid Corporation of China set up the Global Energy Interconnection Development and Cooperation Organization, a Beijing-based organization that over 260 businesses and scientific institutions joined to promote clean energy resources worldwide³⁰. It can be anticipated that Chinese energy and infrastructure companies will participate in challenging projects using the technology in the future, on the global scene: China's size and market

26. Véronique Riches-Flores in Jean-Loup Delmas, "Baisse des ventes d'iPhone : Apple a perdu sa spécificité et son côté unique", *20 Minutes*, 4 January 2019.

27. Arthur Marcadé, "Téléphonie : pourquoi le chargeur universel est dans l'impasse," *Le Figaro*, 10 August 2018.

28. Interview with Veolia professional engaged in the municipal waste recycling activities.

29. Chapter 30, Section 2 of the 13th five-year plan 2016-2020 by National Reform and Development Commission, available at en.ndrc.gov.cn

30. Corrado Cini and Arvea Marieni, "China plans UHV transmission lines that span continents," 22 March 2019, available at energypost.eu

features offer energy transportation companies an opportunity to test the new UHV technology at home (on a scale greater than most of its European competitors and at limited production costs), prior to exporting it to developing markets with similar needs such as Central Asian countries or the vast inlands of the African continent. China's ability to shape the standards come from its position as pioneer.³¹ However, the ability to turn this into sales and a market position originates in the possession of the technology itself, not merely from defining the attached standards.

Standard Unification Promotes Global Exports. Overall, China's efforts to promote exchanges and work towards standardization consensus have been received as a valuable technical contribution, and has generated a favourable reaction from the professional community: CEO and General Secretary of the IEC Frans Vreeswijk commended China's initiatives to organize dedicated symposiums, and underlined the need to involve shared expertise to increase efficiency in standardizing.³² China's push for harmonisation in the name of interoperability, which will enable its manufacturers to access export market more easily, is a two-way street that foreign companies can also benefit from.

Standards are Key to Certification and Market Access. Compliance with recognized production and operation standards are at the core of certification, a procedure that plays a key role in market access for many industries such as aviation. In May 2019, China and the EU concluded a bilateral Aviation Safety Agreement (BASA) to "remove the unnecessary duplication of evaluation and certification activities for aeronautical products by the civil aviation authorities and therefore reduce the costs in the aviation sector."³³ With this agreement, China accepted to rely on the airworthiness certifications of the European regulator EASA. This will allow two things: first, the sale and operation of the aircrafts manufactured or assembled in China, but under European technology (including imported spare parts) in the Chinese airspace; and second, the recognition by China of the difference in maturity with its own standards, and the gap that the Chinese regulator needs to fill. European champion Airbus currently operates its only A320 Final Assembly Line outside Europe in Tianjin. Given the market potential represented by Chinese domestic airlines for aircraft manufacturers, this recognition effectively grants an extra-territorial effect to European aeronautic standards in China and has implications across the supply chain. It is a major step towards the internationalization of the entire industry's production and the alignment of technical standards. As of the time of writing, the fate of the BASA was pending ratification by China's legislature.

31. Paulson Institute, "Power Play: China's Ultra-High Voltage Technology and Global Standard," *Paulson Papers on Standards*, April 2015, available at www.paulsoninstitute.org, also quoted in John Seaman, p. 23, footnote 33.

32. Editorial Team of International Electrotechnical Commission, "IEC Contribution to digitalization and industry 4.0," October 2019 at <https://blog.iec.ch>

33. European Commission press release of 20 May 2019 on the signature of BASA of 20 May 2019 between China and the EU Commission, available at ec.europa.eu

DO CHINESE STANDARDS EXCLUDE FOREIGN PLAYERS?

Chinese Standards are not Exclusively Chinese. The American National Standard Institute estimates that in the mid-2000s, there were over 21,000 Chinese national “GB” standards³⁴ of which roughly half were modeled on either international or advanced foreign standards³⁵ (the exact number is disputed because foreign standards may have been exactly replicated or slightly amended when translated into GB standards).³⁶ For example, the Chinese GB2626-2006³⁷ covering equipment for respiratory protection differs only slightly in substance from the US standard NIOSH 42 CFR 84 which inspired it. Protective masks are classified according to the levels of filter efficiency, known in the US as the N95 standard and in China as the KN95 standard (its European equivalent is the FFP2 category). A number of these standards are still in force today and the same trend can be observed for newly developed sectors such as the relatively young Chinese nuclear industry. To accelerate its development, the sector needs to equip itself with a workable regulatory framework that ensures a reliable level of security for its products. The quickest option for Chinese regulators was to adopt foreign standards, such as those issued by the American Society of Mechanical Engineers or Electric Power Research Institute.³⁸

Standards Elaborated in China Can Be Accessible by Foreign Companies. Industrial standards can be the consequence of a technical improvement developed through a joint collaboration between Chinese and foreign teams. The nuclear sector offers a good illustration. Whereas French firms used to lead innovation, a number of them including national champion EDF suffered a period of set-backs in Europe when several key projects involving Evolutionary Power Reactors (EPR) underwent massive delays in the early 2000s. In China however, over the same period of time, these have benefited³⁹ from their collaboration Chinese nuclear giant CGNPC, as it enabled their operational teams to continue testing their technology and equipment in China in real time.⁴⁰ While the improvements and corrections may have been specifically arranged for the Daya Bay project, the technical processes developed in the joint ventures can now be replicated elsewhere by all professionals working in the team, using the standards jointly developed in China. In its website, EDF refers to the Daya Bay Nuclear Power plant as a “showcase of French-Chinese cooperation and blueprints for future developments.”⁴¹

34. National Standards 国家标准 apply nationwide and are abbreviated as GuoBiao 国标 or GB Standards.

35. “Standards used in China,” *American National Standard Institute* website www.standardportal.org

36. John Seaman, “China and the New Geopolitics of Technical Standardization,” p. 14, footnote 14.

37. The GB 2626-2006 was recently updated by the GB 2626-2019 version, which will become effective on 01 July 2020. See SGS news release of 03 April 2020 at <https://www.sgs.com/en/news/2020/04/safeguards-04120-china-releases-an-updated-mandatory-standard-gb-2626-2019-respiratory-protection>

38. Interview with Rosatom executive, January 2019.

39. This article does not explore specific issues with respect to violations of IPR or contractual terms of cooperation that may have occurred on the Chinese projects. A separate analysis of the issues connected to excessive technology transfers beyond the agreed contractual terms, or the violations of IP rights encountered by foreign industrial partners in joint ventures will be reserved for a separate paper.

40. Interview with EDF executive, April 2019.

41. See : <https://asia.edf.com/en/edf-in-asia/activities/nuclear-activity-in-asia/daya-bay-ling-ao-nuclear-power-plants>, April 2020.

Conversely, engineers have confirmed that the Chinese nuclear industry alone, at the current stage, lacks the experience and credibility to define industry standards for international projects.⁴² Its involvement in technically challenging international nuclear projects, such as the Hinkley Point C reactors, will inevitably result in its participation in the push for innovative standards. Critically, while participating Chinese professionals will indeed contribute to and profit from the shared experience and improved expertise, any standard elaborated in the course of the mega project will become available to the industry in general.

How does China Fit in the World of International Standardization? Overall, the desire for a country serving as the world's biggest manufacturer to engage in the definition of technical specifications regulating its production lines does not appear to be illegitimate. There is an understandable Chinese interest to participate and promote industrial standards that will address its concerns as a producer. China's involvement in international forums underlines its readiness to espouse the working methodology of the main standardization bodies⁴³ and contribute to shaping the consensus.

In its effort to become a recognized member of international regulatory bodies, Beijing supports Chinese professionals who take on international positions. Most Chinese nationals occupying high-ranking positions in international technical bodies have had a career where they contributed to streamlining Chinese rules with the international working environment: for example, Dr Lu Jianqiao joined the International Accounting Standards Board in 2017, having worked previously at the Chinese Ministry of Finance⁴⁴ where he was responsible for the effort in aligning Chinese accounting standards with international practice.

For China, contributing to shape international standards in any given field is a way to obtain international recognition of its home-grown technical expertise; this doesn't prevent China from exercising its influence in order to shape standards in its favour, much like any other country. For example, Chinese scientists and administrations have lobbied the World Health Organization (WHO) for a change in past practices according to which the nomenclature of viruses was based on the place of outbreak of the disease (hence the "Spanish flu" or the "Ebola virus"). In 2008, the WHO released regulations replacing the criteria by that of its molecule structure, like in H1N1, in order to avoid stigmatizing certain minorities.⁴⁵ The US President Trump's insistence on publicly refer to Covid-19 as the "Chinese virus"⁴⁶ in March 2020, as well as China's denial that the virus originated in Wuhan, illustrate how politically sensitive a seemingly neutral standardization instrument can become. But exercising influence is not the same as imposing rules, as it requires other countries to accept that the Chinese propositions are of value to them.

Standards are Exclusive Only When They Generate Insurmountable Adaptation Costs. Being a standard pioneer only creates an exclusive market advantage if it induces adaptation costs for newcomers. The lack of interoperability or of credible alternative technology

42. Interview with Rosatom experts, January 2019.

43. John Seaman, "China and the New Geopolitics of Technical Standardization," p. 29.

44. See biography available at <https://www.ifrs.org/about-us/our-structure/iasb/jianqiao-lu/>

45. Jean-Baptiste Fressoz, "Le virus du politiquement correct," *Le Monde*, 25 March 2020, also available at <https://www.ehess.fr/fr/carnet/virus-politiquement-correct>

46. Karen Leigh, "Trump Says He'll Stop Using the Term "Chinese Virus," *Bloomberg.com*, 25 March 2020.

forces competitors to adjust their own technical solutions to bring them up to the required standards and ensure compatibility. Aligning with Chinese standards is mostly a matter of strategy and economics, to assess whether the additional budget and resources for the modifications and upgrade of infrastructure design, machinery and equipment or operational processes is sustainable. This author is unaware of tenders for international projects where foreign competitors were forced to renounce, based solely on the technical limitations imposed by Chinese standards⁴⁷ (as opposed to economic constraints).

Market Dominance is a Matter of Commercial Strategy Rather than Standards. In the early 1990s, giant American firms such as Apple and Microsoft dominated the IT sector through unrivaled technological advance. Starting in 2010, relatively modest Chinese newcomers (Huawei, Xiaomi) started incorporating in their designs the features of commercially successful products (USB ports, digital screens, smart phones) by replicating the applicable technical standards (including those with royalty-generating patent rights). They took over the American market leaders chiefly through careful economic planning, a pricing policy emphasizing strong cost control over the production process at home and a sales campaign targeting mainly the domestic Chinese market. The strategy was to concentrate their resources on improvements and functional developments to make a technical difference rather than seeking to establish alternative standards for similar functions.

Having attained comfortable market presence, Chinese IT companies are now able to use their growing financial resources to sponsor innovation. Their new wave of technology, including the high-stakes 5G, remains technically ahead of most alternatives (even though in Europe, there are a number of credible attempts to propose an alternative solution albeit not immediately functional). In addition, these technical advances give Chinese companies a heads-up to irradiate the entire industrial sector. IT technology inherently benefits from strong cross-sector connectivity: in November 2018, Xiaomi and Swedish home solutions giant Ikea stroke a partnership for the development of domestic intelligent appliances.⁴⁸ At the same time, French automotive group PSA presented its new 508L model, equipped with an interconnectivity system jointly developed with Huawei.⁴⁹

Mature Technologies can Thrive on Existing Standards. Not all technologies experience the same level of dependence on new standards. In mature industries, technical standards are routinely deployed regardless of their origin and are almost completely disconnected from commercial success. Railway transportation offers an interesting example of how a mature, interoperable (trains circulate across frontiers), heavily-regulated (due to safety concerns) and standardized technology can cross borders. The 1,435 gauge⁵⁰ appeared in the United Kingdom during the Industrial Revolution and spread across Europe and then

47. The question was specifically asked in several interviews with commercial managers from major European industries in the sectors of energy and transportation infrastructure engaged in Africa and the APAC region, August-October 2019.

48. Ikea press release, "Ikea and Xiaomi team up to make Ikea smart lighting available in China," 28 November 2018, <http://www.newsroom.inter.ikea.com>

49. Erick Fontaine, "Peugeot connecte ses voitures avec Huawei," *Les Numériques*, 15 November 2017.

50. The 1,435-meter distance measuring the distance between two parallel rails was elaborated by UK engineer and father of the modern railways Georges Stephenson in 1817 and is considered as the "normal standard" by the International Union of Railways.

around the globe as rail tracks were laid down by imperial powers. The Russian imperial state extended it to its easternmost point of Port Arthur, its nexus for international trade across the Pacific. The railway crossed into China's northeastern Manchuria where Japanese engineers picked up the gauge, along with the Russian caliber for rolling stock, in the late 1930s.⁵¹ It was first tested on high-speed trains when modern Japan started developing rails for the Shinkansen project after World War II. The PRC, having inherited the Japanese-built network, expanded it without revisiting the English standard. When Chinese rulers made a high-speed domestic network their priority in the late 2000s, Chinese engineers built an estimated 29,000 to 31,000 km of high-speed tracks⁵² (representing today roughly half of the world's networks) with unchanged gauge standards. The current set of Chinese national standards regulating infrastructure for high speed trains (as opposed to ordinary tracks or local metros) is replicated from international standards.⁵³

Practice makes perfect, and Chinese engineers are now offering commercially competitive offers to third countries in Africa and throughout the Asia-Pacific region based on the same technical standards (with limited adaptation costs to accommodate local engineering culture): the official newspaper *People's Daily* put forward a target of another 30,000 km built worldwide in the coming years.⁵⁴ This may even include major railway networks in historic European markets, such as the UK-based HS2 project. The China Railway Construction Corporation's comparative advantages in the competition with firms such as Japan Railways, or the French Société Nationale des Chemins de Fer are likely to be the financial conditions offered and the speed at which construction can be achieved, rather than the standards used.⁵⁵

The Chinese Market is Compelling Enough. Foreign companies interested in the Chinese market have no choice but to adapt their technical offer: they must cater to local standards (mandatory standards imposed by the local regulators as well as received market practices such as industry standards). This is especially true of industries where operations are local, and cannot be outsourced to a third country. In water treatment for example, all operations are domestic-based since water is by nature a local resource. In the early 2010s, China significantly rose the level of its treatment standards in an effort to curb environmental damage. The GB Standards applicable to water discharge were dramatically revisited, with critical parameters set at environmental-friendly levels that are, today, among the strictest in the world⁵⁶ (stricter than their European counterparts). All water-treatment operators in China, including for example French-based environmental services specialist Veolia which operates several projects in the industrial field throughout the country, were required to adapt their treatment process to comply with these new

51. Interview with retired SNCF executive, January 2019.

52. Simon Leplâtre, "En dix ans, le TGV a changé la Chine," *Le Monde*, 21 avril 2017.

53. Interview with sales manager of a French provider of technical solutions for railway infrastructure in China, April 2020.

54. Zhang Yuke & consorts, "Comment expliquer la position de leader du train à grande vitesse chinois," *Le Quotidien du Peuple*, 19 September 2019.

55. In "UK holds preliminary discussions with China over building HS2," *The Guardian*, 15 February 2020.

56. Integrated Wastewater Discharge Standard GB 8978-1996 sets a maximum level of Chemical Oxygen Demand (COD) between 30 and 60, with local Environment Protection Bureaus in China often enforcing a strict 30-maximum tolerance level in practice.

output standards. The exercise generated costs necessary to upgrade the performance of existing installations as well as to train professionals to adapt to the new operational and measuring protocols.⁵⁷ Ultimately, given the size of the Chinese market, most internationally-engaged companies seek to be active in China and therefore, adaptation is almost inevitable. Costs ensue not so much because of a Chinese effort to export Chinese standards on the world stage, but because of the willingness of foreign actors to penetrate its domestic market.

Flexibility is Valuable. Once absorbed, the effort pays off in terms of competitiveness. Foreign players who adapted to China have gained a new expertise which enables them to compete in other developing markets such as Africa against Chinese companies offering the same standards. In Africa, water treatment installations by Chinese contractors under EPC contracts offer a design capacity compatible with the high Chinese discharge standards (despite being operated under currently-relaxed local treatment standards).⁵⁸ In the future, environmentally-restrictive standards may become the norm, both in terms of client requirements and of local rules. Companies employing professionals able to apply and manage these high standards of operation possess a comparative advantage.⁵⁹ Effectively, competitive companies are those who are able to offer the technology, as reflected by the standards applicable to it, sought after by the market. Chinese companies will ultimately have to compete against any foreign competitor that can offer the same technology.

Standards Tend to Converge. In a globalized world where technologies travel and competition is international, standards tend to converge. Confrontation between standards almost inevitably benefits the most universally efficient and eliminates companies operating under a “technologically closed” business model. In the energy machinery business, constructors of gas turbines such as General Electric have attempted to create a market of captive clients by manufacturing hard equipment that could only be operated by its own systems of control platforms. This approach proved inefficient and the market was split, with the production of control platforms becoming a spin-off dedicated line of business with innovation guided by existing standards of hardware.⁶⁰ World-class industrial manufacturers such as Hyundai and Woodward produce platforms that are “purpose built to accurately and reliably control and protect single or multiple rotor gas turbines of all sizes.”⁶¹ In an established market with pre-existing technologies and infrastructure such as the energy sector, the China Energy Engineering Corporation (CEEC) was able to win important tenders. One such example is the central power plant in Songon, West Abidjan in the Ivory Coast (where it equipped the plant with 372 MW of combined turbine power), which the CEEC obtained not only by teaming up with local joint venture Star Energy and

57. Interviews with professional experts with experience in major world players in the field of environmental services from Veolia stationed in China.

58. Informal exchanges with executives of China Gezhouba Group Company Limited regarding the Kpong installations in Accra, Ghana, December 2019.

59. *Idem.* Currently, Veolia Water Systems offer in Africa is built on the European standards it uses at home while its professionals operating plants in China are also comfortable applying COD 30 requirements.

60. Interview with ex-Dalkia commercial manager and technical specialist, September 2019.

61. Woodward.com presentation page on its gas turbines control products.

conforming its equipment to industry standards but also, crucially, providing financing⁶² for the works.

Competition aside, another drive for the uniformization of industry standards is the need to ensure safety. Japanese seismic standards in nuclear plants, developed under the pressure of Japan's high-risk natural environment, have made their way into the security requirements for nuclear plants in France and in the USA (despite their lesser exposure to seismic risk) after the Fukushima Dai-ichi accident.⁶³ To a lesser extent, this also holds true for machinery and equipment in any capital-intensive projects where cooperation and interaction are inevitable, and safety is paramount (power plants or mining activities, among others). As a matter of practicality as well as safety, company standards as described under shared operational manuals for technicians must be easily accessible in the event of an operational incident; the degree of interoperability is ultimately mandated by the local regulations.

China Is a Hotspot for Innovation Partnerships. In the automobile industry, China's large territory and the sheer size of its consumer market gives it a comparative advantage. The combined effect of a planned economy system stimulating local production and innovation through a generous policy of state subsidies⁶⁴ and the economic rewards has created unique conditions for a race to technological break-through. The Chinese authorities' ability to decide and quickly implement the buildup of state-sponsored infrastructure networks (charging stations, and a nation-wide network of electricity distribution) ensured that investments to develop electric cars would be worthwhile. As a result, Chinese constructors of long-life autonomous batteries now enjoy a leading position, having successfully developed this key technological component for the next generation of electric cars (batteries represent 40% of the cost of an electric vehicle⁶⁵).

China's Ministry of Industry and Information Technology (MIIT) used to publish a list of battery makers compliant with its technical standards (inspired by technology progress in the industry), all 57 of them Chinese. In 2019, the MIIT announced that it would discontinue the practice in order to open its market to foreign companies. Will foreign battery makers be able to catch up with their Chinese counterparts? Or will they be better off partnering with Chinese firms, to gain access to their technology and benefit from the new Chinese standards (possibly extending them to their production centers located elsewhere?). In July 2019, French car maker Renault announced that they would take a 50% stake in JMEV, a subsidiary of Jiangling Motors Corporation Group dedicated to electric vehicles. This partnership will allow the French group to benefit from Jiangling Motors' cooperation plan⁶⁶ with Contemporary Amperex Technology Limited, one of the main battery manufacturers in China. Analysts confirm the view that "catching-up with a technology already mastered

62. Francesca Jeanne, "La Chine s'engage à financer une nouvelle centrale thermique CCG en Côte d'Ivoire," *Le Monde de l'énergie*, 30 August 2016, available at lemondedelenergie.com

63. Interview with former Veolia waste technical specialist involved in providing urgent treatment solution for contaminated water following the Fukushima incident, June 2019.

64. Bloomberg News, "China scales back subsidies for electric cars to spur innovation," *Bloomberg.com*, 26 March 2019.

65. Echo Huang, "China's breaking up the EV battery monopoly it carefully created," *Quartz!*, 25 June 2019.

66. Chris Randall, "CATL begins cooperation with Jiangling," *Electrive.com*, 29 July 2018.

by existing competitors makes it difficult to penetrate a market (whereas) working on a break-through technology allows to enter it from a competitive position.”⁶⁷

TAKE-AWAYS

China’s technical advance in high-tech, key industrial sectors will be the result of a long-term industrial strategy to push for disruptive innovations. New standards are the outcome of such technical breakthrough. Standards, which are the industrial translation of this advanced technology, can reflect a dominant market position. Unlike IP rights however, they can be embraced by competitors. Whether or not they are ultimately adopted or taken-over by the industry globally is based not on proprietary rights and monopolistic advantage, but on their technical merits. They alone cannot account for market domination, and the reasons for the overwhelming success of Chinese companies in developing markets are not inherently attributable to the development of new Chinese standards or world standards elaborated in connection with Chinese professionals.

The presence of major Chinese companies competing for international projects and offering Chinese standards on the world stage should encourage Western industrial champions to revisit cost-inefficient business models, slow and risk-averse decision-making internal procedures. It should also inspire European decision-makers to remedy the lack of a pan-European strategic vision to promote its industry, afford the means for research and development in new technologies on a level that represents a credible alternative to China’s efforts and the creation of a legal framework conducive to cost-cutting synergies.

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67. Gaëtan Monnier, IFP Energies nouvelles, in “Comment la filière des batteries pour véhicules électriques tente de se restructurer en Europe,” *Usine Nouvelle*, 6 September 2019.