



European Chamber
中国欧盟商会



THE SWEDISH INSTITUTE
OF INTERNATIONAL AFFAIRS



THE SHAPE OF THINGS TO COME:

The Race to Control
Technical Standardisation

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Table of Contents

About the Swedish Institute of International Affairs.....	2
About the European Union Chamber of Commerce in China.....	3
Executive Summary.....	4
Introduction.....	7
Chapter 1: Technical Standardisation: A Brief Introduction.....	9
Main takeaways.....	9
Chapter 2: China's State-centric Standardisation Approach and its Impact on European Business.....	10
Main takeaways.....	10
Conditions for European business.....	15
Chapter 3: China's Growing Footprint in International Technical Standardisation.....	22
Main takeaways.....	22
Six indicators for China's increasing influence in international standard setting.....	24
1. Leadership positions.....	24
2. Participation in standardisation.....	26
3. Standard contributions.....	27
4. Standard essential patents.....	30
5. Qualitative description of China's growing footprint.....	31
6. De facto standardisation along the BRI.....	32
How China gains influence: externalising the state-centric approach.....	34
Chapter 4: Outlook: What Comes Next in China's Standardisation Development?.....	35
Main takeaways.....	35
Chapter 5. Recommendations.....	40
Recommendations for European governments.....	40
Recommendations for the Chinese Government.....	43
Recommendations for European businesses.....	47

Annexes.....	49
Annex 1: Technical standardisation: an introductory explanation.....	49
Annex 2: The politicisation of technical standards	53
The four dimensions of technical standardisation power.....	53
Annex 3: The state-centric nature of Chinese standards.....	61
China’s state-centric approach to formal standardisation.....	66
China’s state-centric approach to de facto standardisation.....	69
Annex 4: Challenges for the EU arising from China’s standardisation approach.....	72
Politicisation of technical standards.....	72
Bifurcation of international standardisation.....	72
Loss of influence.....	74
Annex 5: Abbreviations.....	76

This study is the result of collaboration between the European Union Chamber of Commerce in China (European Chamber) and the Europe Programme and Swedish National China Centre at The Swedish Institute of International Affairs (UI). It draws on the 'Geopolitics of Standards' research project that UI launched in 2018, the continuous work of the European Chamber's Standards' and Conformity Assessment Working Group, a targeted survey among European Chamber members, and more than 200 interviews conducted with European and Chinese technical standardisation experts from the public and private sectors. More than 30 of these interviews were carried out with European Chamber members specifically for the purpose of this study. All interviewees were guaranteed full anonymity.

Author biography

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About the Swedish Institute of International Affairs

Established in 1938, the Swedish Institute of International Affairs (UI) is an independent research institute on foreign affairs and international relations.

The Europe Programme and Geopolitics of Standards project

The Europe Programme at UI conducts research and analysis on the politics, cooperation and institutions of Europe. The European Union (EU), and knowledge about how the EU works and what interests are at stake from a Swedish perspective, are of special importance for Sweden and central to the work of the Programme.

Under the overarching research theme of 'Geopolitics of Standards', the Programme analyses the power of standard setting and the implications that follow. The project takes into account economic, security and normative implications ranging from issues such as data privacy to cybersecurity and the role of technical standards.

The main research questions of the project are: what are the conceptual implications of our understanding of power and the challenges arising from the technology confrontation between the US and China for the EU, and how does the EU position itself to it in general and in the field of technical standardisation in particular?

Swedish National China Centre

The Swedish National China Centre was launched in 2021 as a separate and independent entity at UI. The Centre conducts policy-relevant research on China-related topics, with a focus on issues of particular importance to Swedish interests. The Centre aims to contribute to a long-term improvement in the state of China knowledge in Swedish society.

The main target audiences of the Centre are government offices and government agencies. Other target audiences include the Swedish Parliament, municipalities, regions, universities, the private sector, trade unions and civil society. The Centre is also actively engaged in international networks.

ABOUT THE EUROPEAN UNION CHAMBER OF COMMERCE IN CHINA

FOUNDED IN

2000

BY 51 MEMBER
COMPANIES

The European Union Chamber of Commerce in China (European Chamber) was founded in 2000 by 51 member companies that shared a goal of establishing a common voice for the various business sectors of the EU and European businesses operating in China. It is a member-driven, non-profit, fee-based organisation with a core structure of 34 working groups and fora representing European business in China.

34

WORKING
GROUPS AND
FORA

The European Chamber has more than 1,700 member companies in seven chapters operating in nine cities: Beijing, Nanjing, Shanghai, Shenyang, South China (Guangzhou and Shenzhen), Southwest China (Chengdu and Chongqing) and Tianjin. Each chapter is managed at the local level by local boards reporting directly to the Executive Committee.

MORE THAN

1,700

MEMBER
COMPANIES

The European Chamber is recognised by the European Commission and the Chinese authorities as the official voice of European business in China. It is also recognised as a foreign chamber of commerce by the Ministry of Civil Affairs. The European Chamber is part of the growing network of European Business Organisations (EBOs), which connects European business associations and chambers of commerce from 42 non-EU countries and regions around the world.

Mission Statement

As a member-based organisation, the European Chamber seeks to:

- 1 Ensure greater market access and a level playing field for European companies operating in China;
- 2 Improve market conditions for all businesses in China;
- 3 Facilitate networking and communication among members and stakeholders;
- 4 Provide specific, relevant information to its members on how to do business in China; and
- 5 Update its members on economic trends and legislation in China.

Principles

- 1 We are an independent, non-profit organisation governed by our members.
- 2 We work for the benefit of European business as a whole.
- 3 We operate as a single, networked organisation across Mainland China.
- 4 We maintain close, constructive relations with the Chinese and European authorities, while retaining our independence.
- 5 We seek the broadest possible representation of European business in China within our membership: small, medium and large enterprises from all business sectors and European Member States, which operate throughout China.
- 6 We operate in accordance with Chinese laws and regulations.
- 7 We treat all of our members, business partners and employees with fairness and integrity.

OPERATING IN

9

CITIES



Executive Summary

Technical standard setting has emerged in recent years as one of the key battlegrounds in the struggle among states to gain dominance in high technology sectors. While the core competition is between the People's Republic of China (PRC) and the United States (US), there are serious implications for the European Union (EU) and European enterprises as well.

China's rapidly growing footprint in international technical standardisation is of particular significance given that its approach to standardisation is distinct from European and international practice. This is one of several factors that is leading to increased politicisation of technical standardisation, which has raised the risk of bifurcation, fragmentation and decoupling of standards internationally.

Domestically, China is undergoing standardisation reform, which has seen its system go from being state-controlled to one that is state-centric. Standards that used to be negotiated exclusively within state institutions are now developed in both state and market tiers. While this is an improvement, it means that direct and indirect mechanisms of state influence continue to exist in standard setting, with China's industrial policy exerting a strong influence over the direction that standards take.

In some respects, the reform has provided more opportunities for European firms to shape standard setting in the PRC, with a significant share of European firms already participating. This is particularly true for sectors such as civil engineering and construction, petrochemicals, and information and communication technology (ICT). However, opportunities continue to be relatively limited. China's new standardisation strategy, published in October 2021, might bring further positive developments, but whether it will precipitate fundamental changes remains to be seen.

A survey of European Chamber member companies and subsequent in-depth interviews with respondents indicate that, in order to influence domestic standard setting in China, a combination of the following is required: standardisation expertise; investments in local research and development (R&D); good government contacts; a sound corporate reputation; Chinese language skills; reasonable market share and company size; early commercialisation of innovation; collaboration with influential Chinese companies in joint ventures (JVs); efficient internal coordination; a long business history in China; knowledge of the Chinese standardisation system; and openness to dialogue with Chinese actors.

While a foreign company's ability to be involved in and shape technical standard setting in China varies across different sectors of the economy, the following nine distinct challenges exist: 1) formal barriers to participation in domestic standards working groups; 2) informal rules restricting the share of foreign-invested enterprises' (FIEs') voting rights; 3) exclusion from information coordination; 4) restricted access to technical leadership positions; 5) lack of information and transparency; 6) high participation fees; 7) monopolistic market structures due to preferential treatment; 8) hidden political agendas that impact standardisation; and 9) a lack of intellectual property (IP) protection.

Internationally, China has made considerable efforts to increase its influence in standard setting in recent years. While the country is not yet dominating international standardisation, it has made significant advances. This can be quantified by six indicators: 1) China's increased share of leadership positions in standardisation organisations; 2) its participation in international standardisation; 3) the number of contributions to standards by China / or the number of Chinese standards contributed; 4) its share of

standard essential patents (SEPs); 5) qualitative descriptions from international standard experts; and 6) the increasing role of technical standards in Belt and Road Initiative (BRI) projects.

China's growing footprint in international technical standardisation is somewhat natural given its increasing economic power and gains in innovation capacity. The strategies China adopts to increase its influence are also not radically different from those of western states. Where China differs is that the systematic support of the authorities (not least material resources) has put Chinese actors in advantageous positions and helped them gain ground in international standard setting.

While the EU maintains a vital interest in China's integration into international standard developing organisations (SDOs), China's growing influence presents challenges to the current predominant model of technical standardisation, which is private, voluntary and self-regulatory in nature. As mentioned previously, one such challenge is the growing risk of a bifurcation of international standardisation, not least in the context of the BRI. This divergence in approaches, the increased politicisation of standard setting and the EU's dwindling influence in standardisation present the three main challenges for Europe and beyond, and require swift and determined action from the EU and European companies.

China's recently published standardisation strategy is indicative of the future direction the country will take in this realm. It outlines China's ambition to engage even more in international standard setting. This includes raising the importance of participation in international SDOs and the promotion of Chinese standards abroad, as well as attracting international standard-setting consortia. The strategy also promises to further open domestic standard setting to FIEs. However, despite the market being allowed to play a stronger role, China's state-centric approach to technical standardisation will persist for the foreseeable future. Previous ideas to streamline the standardisation system or to develop a China-dominated international SDO—dubbed the 'BRI Regional Standards Forum' in a research project called China Standards 2035 (CS2035)—are not included in the strategy. However, this does not necessarily mean they will no longer be discussed and considered.

This report proposes the following actions to European governments, the Chinese Government and to European companies to address the three main challenges to standardisation: politicisation, bifurcation/decoupling, and the shift in power:

Recommendations for European governments

- Respond to the Politicisation of Technical Standardisation
 - Facilitate a three-layered strategic 'foresight dialogue' on standardisation within the EU.
 - Engage in strategic coordination with like-minded partners.
 - Invest in standardisation knowledge.
 - Incentivise international standards in connectivity initiatives.
 - Insist on transparency and the acknowledgement of fundamental values as benchmarks for standards.
- Prevent the Bifurcation of Technical Standardisation
 - Advocate the European standardisation approach to a diverse set of actors in China.
 - Continue offering support for a 'Beijing' and a 'Shanghai' agreement.
 - Insist on reciprocity in bilateral dialogues and explore concrete cooperation.
 - Impose sanctions in cases where a lack of standard reporting is identified with regard to the EU's World Trade Organization (WTO) reform proposal.



- Address challenges to certification.
- Maintain the EU's Influence in Technical Standardisation
 - Reform and strategically use Horizon Europe.
 - Support academic standardisation training.
 - Facilitate the participation of small and medium-sized enterprises (SMEs) and civil society in standard setting.
 - Support conditions for 'early mover' advantage.
 - Improve conditions for innovation.

Recommendations for the Chinese Government

- Respond to the Politicisation of Technical Standardisation
 - Provide fair and equal treatment for all companies that want to engage in domestic standardisation activities.
 - Increase inclusivity of association standards.
 - Simplify and streamline conditions for market access and certification.
 - Improve the protection and licensing of SEPs.
 - Ensure fair and transparent market surveillance.
- Prevent the Bifurcation of Technical Standardisation
 - Accept the premise of the International Organisation for Standardisation (ISO) and the International Electrotechnical Committee (IEC).
 - Increase identical adoption of international standards.
 - Comply with WTO Technical Barriers to Trade (TBT) principles.
 - Avoid using standards as trade barriers.
 - Accept international testing and certification if standards are identical.
- Consider China's Influence in Technical Standardisation
 - Consider Europe's public-private partnership (PPP) model when undertaking standardisation reform.
 - Increase meaningful communication with Europe on standardisation.
 - Deepen the current reform of standardisation and increase harmonisation of standards.
 - Push for further domestic reform and streamline the current standardisation system.
 - Commit to the civilian use of technical standardisation.

Recommendations for European businesses

- Respond to the Politicisation of Technical Standardisation
 - Make standard setting part of strategic considerations.
 - Prepare to cooperate with policymakers and business organisations on standardisation.
- Prevent the Bifurcation of Technical Standardisation
 - Increase investment in technical standard setting.
 - Prepare for sector-specific developments.
- Maintain the EU's Influence in Technical Standardisation
 - Upgrade the status of standards in employment processes.
 - Participate in the improvement of European coordination in standardisation activities.

Introduction

“Standards on industry and information technology will be based on the overall construction of China as a manufacturing power, a cyber power, a quality power and a digital China.”¹

“...[T]he EU must ensure its technological sovereignty and be a global standard setter. Indeed, while technical by nature, standardisation is a highly strategic activity. In an increasingly competitive global environment, standardisation must support EU strategic autonomy and fundamental EU policy objectives...”²

“He who owns the standards, owns the market.”³

Technical standardisation, long considered a niche subject relevant only to technical experts, has recently taken centre stage in strategic political discussions in both the PRC and the EU. While the economic importance of technical standards is well established, the current debate focusses on their political relevance. This shift, which will impact European policymakers and businesses, is a result of the competition that has emerged between the US and China to achieve dominance in the technologies that will define the economies of the future.⁴ A state’s ability to influence and define standards in high technology will be key to gaining the upper hand.

In 2021, the EU and China both developed new technical standardisation strategies.⁵ The Chinese strategy, published in early October, underlines its aim to further streamline domestic technical standardisation while emphasising its international ambitions.⁶ Non-public documents from the Standardisation Administration of China (SAC) further reflect that standardisation is seen as crucial for the governance of new technologies in an environment of a deepening power struggle.

At the time of writing, the EU had not published its strategy yet. However, the EU is already being explicit about taking a “more assertive stance on European interests in standardisation”.⁷ Observers emphasise that technical standardisation has long been a stronghold of Europe,⁸ and that China’s growing influence comes at a cost to the EU.⁹ The US-China Economic and Security Review Commission (USCC),

1 Ministry of Industry and Information Technology (MIIT) *Priorities for Standardization Work in 2021*, SESEC, 16th March 2021, viewed 2nd November 2021, available for download at <<https://sesec.eu/wp-content/uploads/2021/04/Annex-1-MIIT-Priorities-for-Standardization-Work-in-2021.pdf>>

2 *Roadmap: Standardisation strategy*, European Commission, 26th June 2021, viewed 28th July 2021, available for download at <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13099-Standardisation-strategy_en>

3 Quotation attributed to Werner von Siemens. See: Kyngé, James & Liu, Nian, *From AI to facial recognition: how China is setting the rules in new tech*, *Financial Times*, 7th October 2020, viewed 18th October 2021, <<https://www.ft.com/content/188d86df-6e82-47eb-a134-2e1e45c777b6>>

4 These technologies include semiconductors, fifth-generation mobile technology (5G), artificial intelligence (AI), automation, green technologies, biopharmaceuticals, advanced medical devices, big data, cloud computing, and aerospace and aviation equipment, among others.

5 *Roadmap: Standardisation strategy*, European Commission, 26th June 2021, viewed 28th July 2021, available for download at <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13099-Standardisation-strategy_en>; *MIIT Priorities for Standardization Work in 2021*, SESEC, 16th March 2021, viewed 2nd November 2021, available for download at <<https://sesec.eu/wp-content/uploads/2021/04/Annex-1-MIIT-Priorities-for-Standardization-Work-in-2021.pdf>>

6 For a more detailed discussion of the new national technical standardisation strategy of China, see section 4 of this report.

7 *Updating the 2020 New Industrial Strategy: Building a Stronger Single Market of Europe’s Recovery*, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions*. COM (2021) 350 final, European Commission, 2021, p.15.

8 Beattie, Alan, *Technology: How the US, EU and China Compete to Set Industry Standards*, *Financial Times*, 24th July 2019, viewed 28th July 2019, <<https://www.ft.com/content/0c91b884-92bb-11e9-aea1-2b1d33ac3271>>

9 Seaman, John, *China and the New Geopolitics of Technical Standardization*. *Notes de l’Ifri*, Ifri, January 2020, viewed 2nd November 2021, <https://www.ifri.org/sites/default/files/atoms/files/seaman_china_standardization_2020.pdf>; Rühlig, Tim, *China, Europe and the New Power Competition over Technical Standards*. *UI Brief 1/2021*, UI, Stockholm, 2021; Rühlig, Tim, *Technical Standardisation, China and the Future International Order. A European Perspective*, EU Office of the Heinrich Böll Foundation, Brussels, 2020; Fägersten, Björn and Rühlig, Tim, *China’s Standard Power and its Geopolitical Implications for Europe*, *UI Brief 2/2019*, UI, Stockholm, 2019; Arcesati, Rebecca, *Competing with China in the Digital Age, Towards a “Principles First Approach” in Europe’s China Policy*. *Drawing Lessons from the Covid-19 Crisis*, Huotari, Mikko et al., eds., MERICS, Berlin, 2020, p. 47–56; Arcesati, Rebecca, *Chinese Tech Standards Put the Screws on European Companies*, MERICS, 29th January 2019, viewed 11th April 2019, <<https://www.merics.org/de/blog/chinese-tech-standards-put-screws-european-companies>>



mandated by the US Congress, finds that “dominance of technical standards underpinning ICT and other emerging fields is integral to Beijing’s ambitions.”¹⁰

These developments are of crucial importance to European firms. The combination of the size of the Chinese market and its increasing competitiveness make it both necessary for companies to be involved in standardisation and increase the impact that Chinese standardisation practices and strategies will have on business. The European Union Chamber of Commerce in China’s (European Chamber’s) *Business Confidence Survey 2020* found that 37 per cent of respondents participate in government-led standardisation in the PRC.¹¹ In a targeted survey carried out for this study, almost 87 per cent of the responding standardisation experts from European companies characterise technical standards as “very important” or “important” with regard to their company’s investment opportunities in China.¹² The future of Chinese standard setting will therefore clearly have a significant impact on EU-China economic relations.

This study explains China’s technical standardisation policy and its effects on European stakeholders. It summarises the basic characteristics of technical standardisation, explores the political potential of standards, explains how China’s state-centric standardisation approach deviates from the European one, outlines China’s international standardisation activities and carves out the implications for European policy and business. It ends with recommendations for the EU, the Chinese Government and European businesses. The study substantiates three sets of claims:

- 1) **Despite China’s domestic standardisation reform, the system remains a state-centric one that subordinates standardisation to China’s industrial policy agenda:** China’s new standardisation strategy might bring some positive developments, but current opportunities for European companies to participate in standard setting in China continue to be relatively limited.
- 2) **China is exporting its state-centric standardisation approach internationally:** Not only is European influence decreasing, there is also a risk of a bifurcation, fragmentation or decoupling of international standards, not least in the context of standardisation activities as part of the BRI.
- 3) **These developments require swift and determined action from the EU but are also harmful to China’s long-term interests:** Investing in additional resources is a necessary but not sufficient condition for sustaining EU standardisation influence.¹³ The EU also needs to react with better coordination and regulatory reforms, and ensure that it does not further fuel the politicisation of technical standard setting.

10 *2020 Report to Congress of the US-China Economic and Security Review Commission, USCC*, December 2020, viewed 7th September 2021, <https://www.uscc.gov/sites/default/files/2020-12/2020_Annual_Report_to_Congress.pdf>

11 information taken from raw survey data and does not appear in the published version; *European Business in China Business Confidence Survey 2020: Navigating in the Dark*, European Union Chamber of Commerce in China, June 2020, <https://www.eurochamber.com.cn/en/publications-archive/774/European_Business_in_China_Business_Confidence_Survey_2020>

12 While the standardisation experts of firms might overestimate the importance of standard setting, the high confirmation rate of relevance for investment is noteworthy.

13 In 2020, the US adopted the Ensuring American Leadership over International Standards Act that describes technical standardisation in emerging technologies not only as “critical to United States economic competitiveness” but also provides a budget of no less than US dollars (USD) 1 million for a study to investigate the implications of China’s standardisation activities; Ensuring American leadership over International Standards Act of 2019, US Congress, 8th June 2020, viewed 27th July 2021, <<https://www.congress.gov/116/bills/hr/7139/BILLS-116hr7139ih.pdf>>; Australia has invested the equivalent of euro (EUR) 3.8 million “to boost Australia’s influence on international standards”: *Digital Business Plan to Drive Australia’s Economic Recovery*, Australian Government, 29th September 2020, viewed 27th July 2021, <<https://www.pm.gov.au/media/digital-business-plan-drive-australias-economic-recovery>>

Chapter 1: Technical Standardisation: A Brief Introduction

Main takeaways

- Technical standards are by nature non-binding, private and self-regulatory, providing interoperability and basic safety. They facilitate trade.
- Technical standards can be formal or *de facto*. Formal standards are developed by SDOs and industry consortia at the national, European and international levels in technical committees (TCs), subcommittees (SCs) and working groups (WGs).
- Technical standard setting approaches differ, but only recently have they become the subject of political power struggles between states.

Technical standards are omnipresent specifications that generate interoperability, product compatibility and basic safety. Although we are surrounded by technical standards, we hardly notice them and most of us are not familiar with the concept.

In a nutshell, technical standards are specifications for common use that facilitate international trade and economic growth. Technical standards are a form of private self-regulation and, while they are legally non-binding, they carry significant power. Two types of technical standards exist: formal and *de facto*.

Formal standards are the result of negotiations in TCs, SCs and WGs or other similar institutions within SDOs or industry consortia. They exist at the national, European and international levels.¹⁴

De facto standards are the result of market dominance of specific technological solutions from one or a few suppliers.

The European standard-setting system is a private-driven PPP, in which the technical standard setting of private SDOs supports economic integration, innovation and competition in the European Single Market, as well as European regulation. The US approach, by contrast, is even more market-driven. What both approaches have in common is that they are privately-run and that technical logic is applied in negotiations for formal standard setting. Technical standards are often durable because changing them can be costly. For a more detailed overview of technical standards, please refer to Annex 1 on page 49.

For a long time, technical standards were exclusively viewed through the lenses of technical and economic competition. In recent years, however, the potential for technical standards to drive competition among different states has emerged. Four dimensions of such technical standardisation power can be distinguished, namely economic, legal, political and ideational. This covers questions of the economic competitiveness of national economies during digital transformation; the legal effects of non-binding technical standards under world trade law; political dependencies as a result of technological lock-in effects alongside security implications of technical standards; and values inscribed in key enabling technologies. For more detail, please refer to Annex 2 on page 53.

¹⁴ Some of the most prominent and influential SDOs include the German Institute for Standardisation (DIN), the French Standardisation Association (AFNOR) and the Swedish Standards Institute (SIS) at the national level; the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC) and the European Telecommunication Standards Institute (ETSI) at EU level; and the International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO) internationally. Important industry consortia include the World Wide Web Consortium (W3C), the Internet Engineering Task Force (IETF), and the Institute of Electrical and Electronics Engineers (IEEE). The International Telecommunications Union (ITU) is an exception as it is an intergovernmental organisation of the United Nations (UN) with formal participation from private actors.



Chapter 2: China's State-centric Standardisation Approach and its Impact on European Business

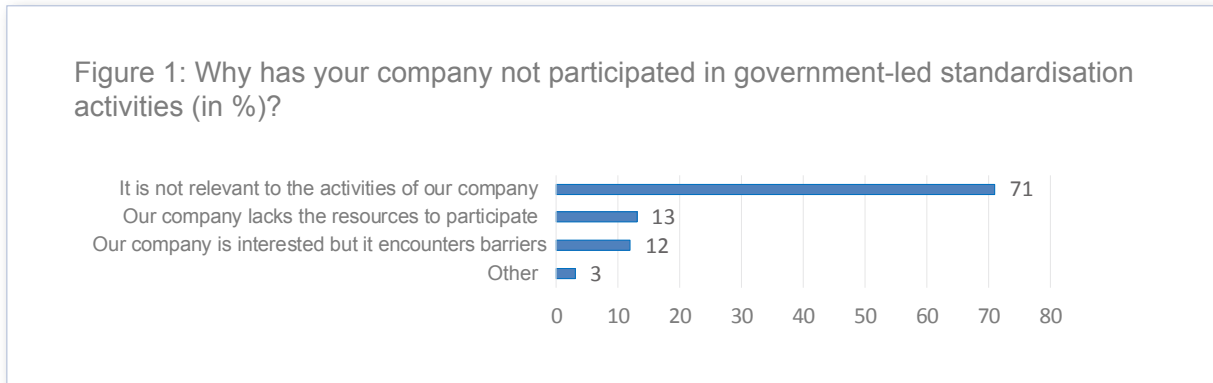
Main takeaways

- Despite recent reforms that have seen China's state-controlled standardisation system being overhauled, it still remains state-centric, which is in sharp contrast to the privately-driven European and international standardisation systems.
- The new Chinese system has introduced a market-tier to supplement the state-tier of standard setting, and the number of mandatory standards developed in the state-tier has been reduced. However, direct and indirect mechanisms of state influence continue to exist in both tiers.
- A significant number of European firms participate in domestic standardisation in China, particularly in the civil engineering and construction, petrochemicals, IT and telecommunications sectors.
- Standardisation is relevant for many European firms' investment considerations in China.
- Of the five types of technical standards currently existing in China post-standardisation reform, national standards are most relevant for European firms, followed by sector standards, association standards, local standards and Chinese enterprise standards.
- Nine archetypal barriers to European involvement in Chinese standardisation exist: formal barriers to participation in WGs; informal rules restricting the share of FIEs' voting rights; exclusion from information coordination; restrictions on technical leadership positions; a lack of information and transparency; high participation fees; monopolistic market structures due to preferential treatment; hidden political agendas impacting standardisation; and the lack of IP protection.
- Factors that are crucial for influencing standardisation in China include: technical expertise; investments in local R&D; good contacts with the political authorities, sound corporate reputation; Chinese language skills; reasonable market share and company size; early commercialisation of innovation; collaboration with influential Chinese companies; efficient internal cooperation; a long business history in China; knowledge of the Chinese standardisation system; and openness to dialogue with Chinese actors.
- Regardless of the persistent challenges, European firms plan to sustain or increase resources devoted to standard setting in China.

In sharp contrast to European and international technical standardisation, which is privately driven, China's approach is state-centric, a legacy of the PRC's past as a planned economy. However, firms have always had some influence on China's standard setting, and recent reform of the domestic standardisation system has seen the role of private actors strengthened and more opportunities emerge for FIEs to participate in standardisation activities. These developments are significant for European industry.

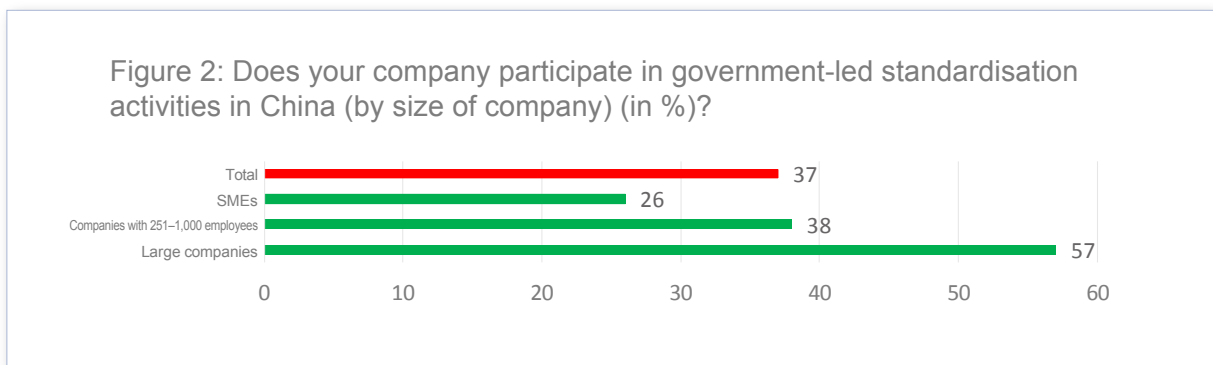
In the European Chamber's *Business Confidence Survey 2020*, 37 per cent of European firms indicate that they engage in government-led standardisation in the PRC. Of those that do not participate in Chinese standardisation, 71 per cent indicate that it is because it is not relevant to their business activities, another 13 per cent lack the necessary resources, and 12 per cent are interested but encounter barriers to participation (Figure 1).¹⁵

¹⁵ Information taken from raw survey data and does not appear in the published version; *European Business in China Business Confidence Survey 2020: Navigating in the Dark*, European Union Chamber of Commerce in China, June 2020, <https://www.europeanchamber.com.cn/en/publications-archiver/774/European_Business_in_China_Business_Confidence_Survey_2020>



Source: *European Chamber Business Confidence Survey 2020*

In terms of government-led standardisation, 57 per cent of large companies (>1,000 employees) report taking part; 38 per cent of firms with 251–1,000 employees report taking part; and just over a quarter of all SMEs (<250 employees) report taking part (Figure 2).



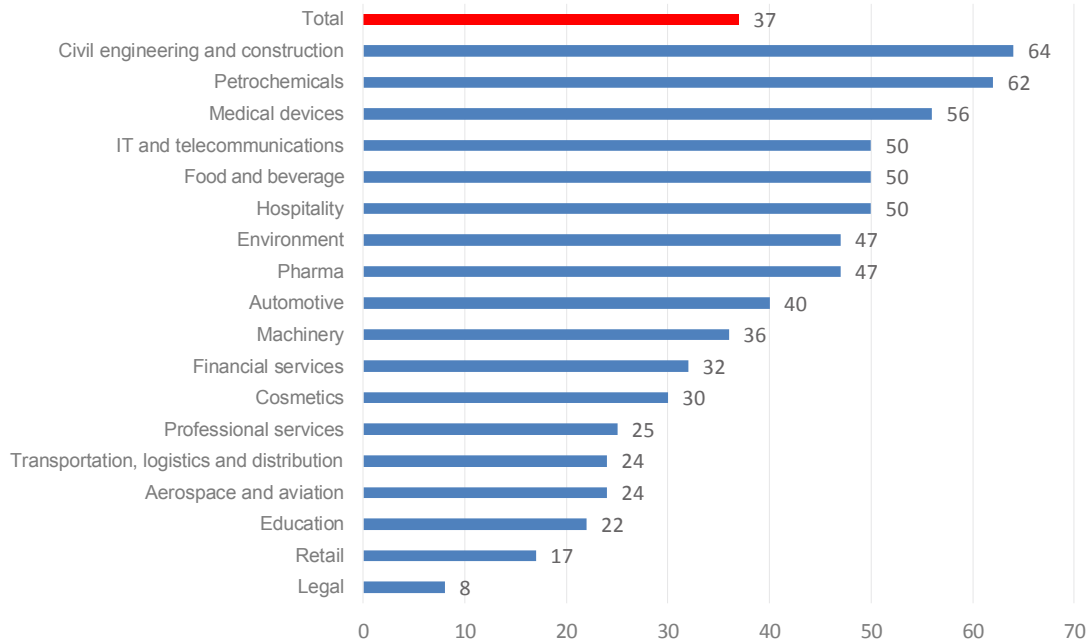
Source: *European Chamber Business Confidence Survey 2020*

The sectors most engaged are civil engineering and construction, petrochemicals, medical devices, information technology (IT) and telecommunications, food and beverage, and hospitality (Figure 3).¹⁶

¹⁶ Information taken from raw survey data and does not appear in the published version; Ibid.



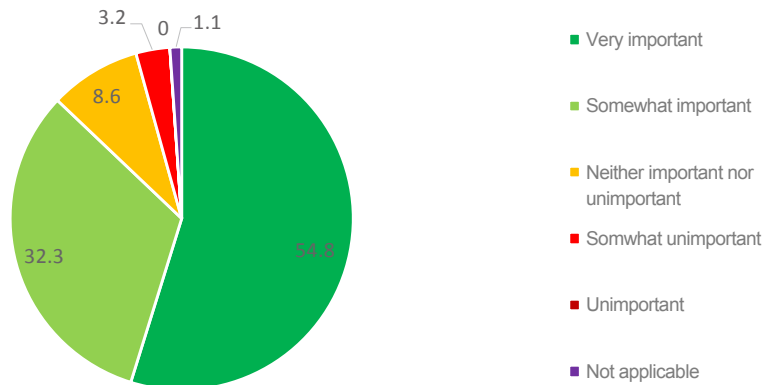
Figure 3: Does your company participate in government-led standardisation activities in China (by sector) (in %)?



Source: European Chamber Business Confidence Survey 2020

In a survey conducted for the purpose of this study by the European Chamber and UI among the Chamber's members,¹⁷ technical standardisation was also acknowledged to be of crucial importance among firms from different sectors actually involved in standard setting (Figure 4).

Figure 4: How significant are considerations about technical standards when your company is assessing investment opportunities (in %)?



Source: European Chamber and UI Standardisation Survey 2021

¹⁷ The survey had a total of 93 respondents. Sectors include automotive (4 participants), aerospace and aviation (1), chemicals and petroleum (8), civil engineering and construction (3), cosmetics (3), environment (2), fashion and textiles (1), financial services and insurance (1), food and beverage (15), government affairs (2), IT and telecommunications (9), machinery (10), medical devices (12), pharmaceuticals (1), professional services (2), retail (2), transportation, logistics and distribution, (1), utilities, primary energy and other commodities (4), and others (12).

These findings, along with other factors such as China's market size, increasing innovation capabilities and growing competitiveness in third markets, make China's recent standardisation reform highly relevant to Europe.

Following informal consultations in 2014, China launched its most recent standardisation reform on 11th March 2015,¹⁸ which has been gradually implemented over the intervening years.¹⁹ At the core of the reform is the new Standardisation Law that took effect on 1st January 2018,²⁰ replacing the previous law from 1989 that had turned overly burdensome. Many standards had become outdated or redundant, and some local mandatory standards contradicted those at the national level.²¹

This reform also institutionally and procedurally streamlined standard setting under the State Administration for Market Regulation (SAMR),²² and comprised reform of accreditation and certification in the PRC. Most impactful has been the introduction of a market-tier and the reorganisation of the Chinese standardisation system.

Before the reform, China's system consisted of four types of standards, namely national, sector, local and enterprise standards. The first three types were developed under the lead of national or local state institutions with the participation of firms; enterprise standards were specifications encouraged to be registered with local authorities. Technical standardisation was a state-controlled process and China developed not only voluntary standards but also mandatory national, sector and local standards. This system was fundamentally different from Europe's in that it was a fully state-controlled process as opposed to being voluntary, private and self-regulatory in nature.

China's standardisation reform has led to partial convergence with international and European approaches. Now, the PRC's system consists of five types of standards structured into two tiers, a state-tier and a market-tier (Figure 5). The state-tier continues to consist of national, sector and local standards that are developed under the umbrella of state institutions, and national standards can still be mandatory or voluntary. All local standards and the overwhelming majority of sector standards are now voluntary.

The new market-tier includes two types of standards. Association standards are issued by a rapidly growing number of competing industry associations. These associations do not need to receive a licence for standardisation from the SAC, an element inspired by the US' approach. Enterprise standards are product specifications developed by individual firms.

18 This came with the promulgation of *Deepening Reform Plan for Standardisation Work (Guofa [2015] No. 13)*, Central Government of China, 11th March 2015, viewed 31st March 2020, <http://www.gov.cn/zhengce/content/2015-03/26/content_9557.htm>

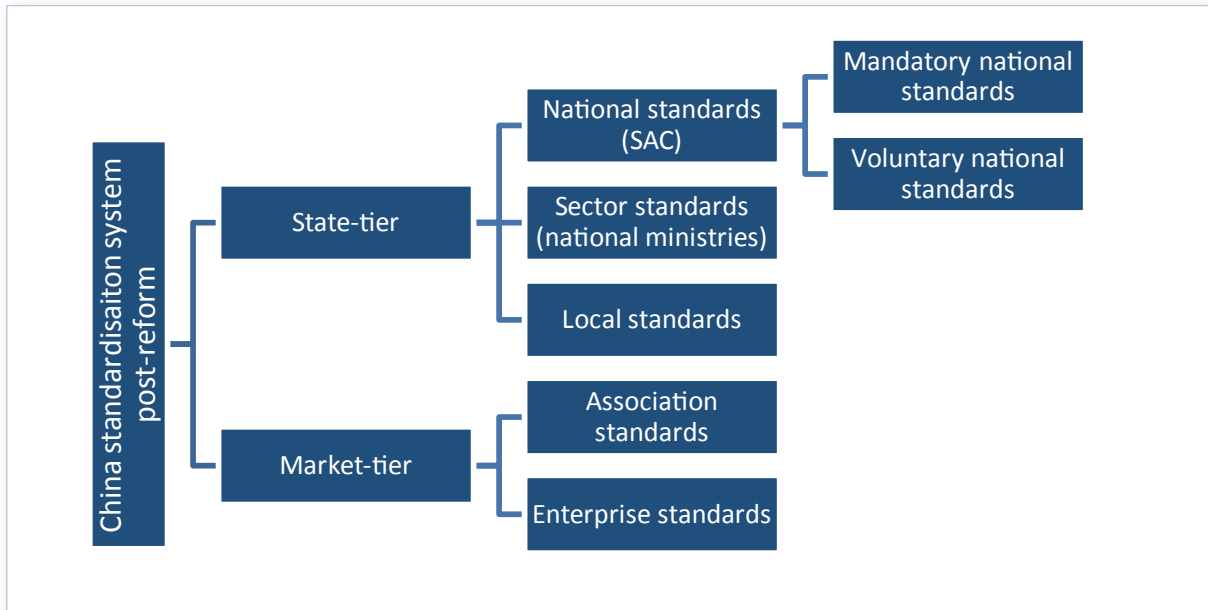
19 *SAMR issues and implements division of key tasks of the Reform Programme for Deepening Standardised Work (2019–2021)*, SAMR, 17th April 2019, viewed 17th September 2021, <http://gkml.samr.gov.cn/nsjg/bzjss/201904/t20190419_293018.html>

20 Standardisation Law, SAC, 8th November 2017, viewed 5th February 2021, <http://www.sac.gov.cn/sbgs/fffg/fl/bzhf/201711/t20171108_318652.htm>

21 Seaman, John, 'China and the New Geopolitics of Technical Standardization', *Notes de l'Ifri*, Ifri, January 2020, pp. 15–16, <https://www.ifri.org/sites/default/files/atoms/files/seaman_china_standardization_2020.pdf>

22 For example, see: *Announcement of the State Commission on the Reform of Mandatory Product Certification Marks*, CNCA, 15th March 2018, viewed 17th May 2021, <http://www.cnca.gov.cn/zwl/gg/gg2018/202007/t20200714_59635.shtml>

Figure 5: China's two-tier standardisation system post-reform



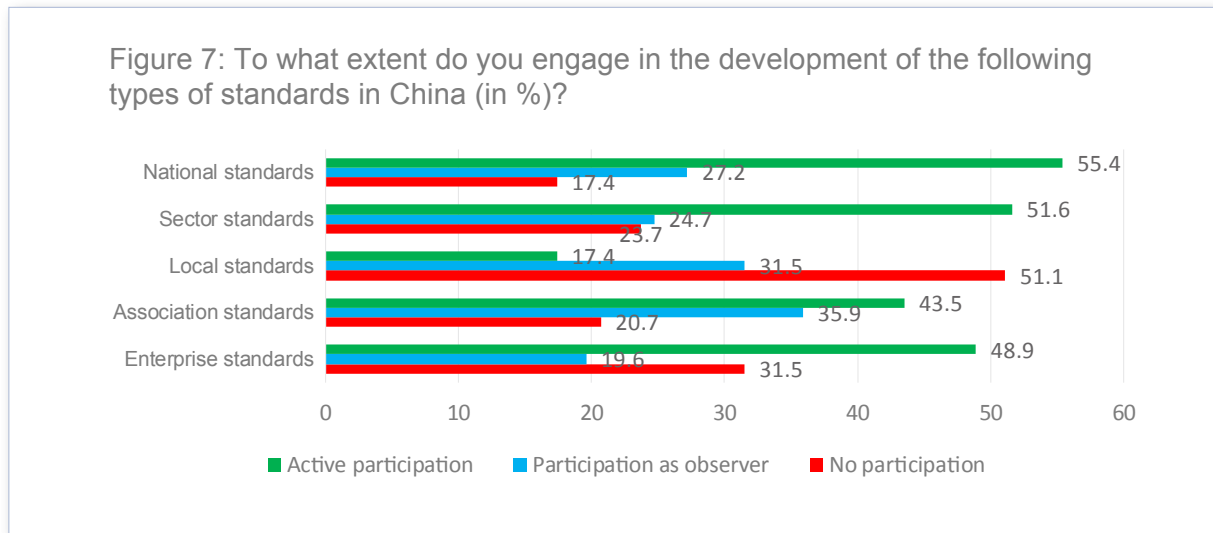
Source: Own graphic

Figure 6 illustrates the importance of the five standard types to survey respondents, with five being the highest level of importance and zero being the lowest.



Source: European Chamber and UI Standardisation Survey 2021

All five types of standards see significant involvement from European companies (Figure 7).



Source: European Chamber and UI Standardisation Survey 2021

The high level of importance that respondents ascribe to national standards reflects the fact that these standards address the most basic specifications and can be relevant for market access. China's national standards are also often used in procurement processes and referenced in binding regulations. The same, but to a lesser extent, holds for sector and association standards, which are supposed to contain more specific and higher-quality specifications. Local standards can be important in sub-national entities but not nationwide. Enterprise standards of Chinese firms are most relevant in markets of high concentration, which turns those enterprise standards into *de facto* standards; for example, in procurement processes involving the three state-owned mobile operators.

China's standardisation reform, coupled with improved transparency and access to standardisation activities for FIEs, is beneficial to European businesses, as the strengthened role of the private sector, as well as the reduction of mandatory standards, provides opportunities. However, significant challenges remain due to the system being state-centric.

For more on the state-centric nature of Chinese standardisation, please refer to Annex 3 on page 61.

Conditions for European business

Even though Chinese legislation, most prominently the Foreign Investment Law (FIL),²³ stipulates that all relevant stakeholders shall be granted equal access to and participation rights in standardisation activities, this is yet to be fully realised.²⁴ Statistical findings outlined below demonstrate that significant hurdles to technical standardisation continue to exist in the PRC.

Data from the European Chamber's *Business Confidence Survey 2020* indicate that the obstacles

23 Foreign Investment Law of the PRC, State Council, updated 24th February 2021, viewed 2nd November 2021, <http://english.www.gov.cn/services/investment/202102/24/content_WS6035aa38c6d0719374af9609.html>

24 Information according to telephone interviews with European standardisation experts, July–September 2021.



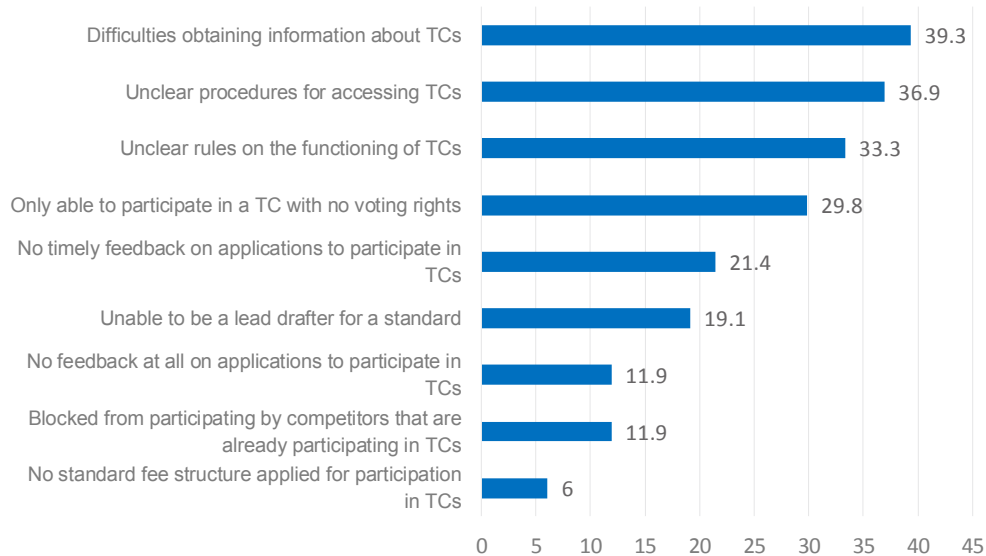
European firms face in participating in standardisation activities in China largely depend on industry sector and company size.

Barriers to participation in Chinese standard setting are particularly apparent in the pharmaceutical (30 per cent of respondents that do not participate), petrochemicals (27 per cent), automotive (24 per cent), IT and telecommunications (23 per cent), medical devices (17 per cent), and food and beverage (17 per cent) industries. Barriers to participation also appear to be more prevalent for large companies, with 60 per cent of those not involved in standard setting in China citing this as the main reason. Among companies with 251–1,000 employees not engaged in Chinese standardisation, 43 per cent cite barriers as decisive, compared to 35 per cent of SMEs.²⁵

In addition, although more than 60 per cent of European companies report increased access to standardisation activities in China, only 24 per cent report full access, according to a survey the European Chamber conducted with the Mercator Institute for China Studies (MERICS).²⁶

The barriers to full participation are more indirect than direct, as can be seen in Figure 8. In addition to the options provided to the question, “Which of the following obstacles has your company faced when trying to gain access to, or obtain equal treatment within, standardisation activities in China?”, in an open answer section, other hurdles listed include a lack of translation of Chinese standards into English; standardisation activities taking place outside formal institutions; and the existence of multiple standardisation and regulatory frameworks.

Figure 8: Which of the following obstacles has your company faced when trying to gain access to, or obtain equal treatment within, standardisation activities in China (in %)?



Source: European Chamber and UI Standardisation Survey 2021

25 Information taken from raw survey data and does not appear in the published version, *European Business in China Business Confidence Survey 2020: Navigating in the Dark*, European Union Chamber of Commerce in China, June 2020, viewed 17th September 2021, <https://www.europeanchamber.com.cn/en/publications-archive/774/European_Business_in_China_Business_Confidence_Survey_2020>

26 *Decoupling. Severed Ties and Patchwork Globalisation*, European Union Chamber of Commerce in China, 14th January 2021, viewed 17th September 2021, <https://www.europeanchamber.com.cn/en/publications-archive/869/Decoupling_Severed_Ties_and_Patchwork_Globalisation>

In-depth interviews with European firms operating in China also reveal that challenges to participation in standardisation activities vary greatly across different sectors of the economy. For example, while the lighting and food industries report close to zero discrimination against FIEs, the situation is very different in telecommunications and infrastructure.²⁷

Because not all companies in all sectors face all the same barriers, and some European enterprises might be confronted by variations of the same kind of challenge, the following—drawing on interviews conducted with European standardisation experts—provides an overview of the archetypal barriers that persist in China.

Archetypal barriers to European companies' involvement in standard setting in China

Direct barriers: Although the number of formal barriers to participation of FIEs in China has been reduced, some cases of formal exclusion still exist. A prominent example is that FIEs are barred from access to cryptography standard setting.²⁸

Voting rights: Even when TCs and their sub-groups are open to FIEs, such participants may be prevented from gaining a high share of votes. This can be achieved by either only granting European firms observer status and/or admitting enough domestic Chinese companies to ensure FIEs' share of votes is limited. For example, according to interviews with representatives from the automotive sector, FIEs are informally not allowed to gain more than 30 per cent of voting rights.²⁹

Exclusion from informal coordination: Access to formal standardisation groups such as TCs, SCs and WGs provides some, but not necessarily decisive, opportunities to shape standard setting in China. Often, Chinese actors coordinate and prepare for formal sessions in informal groups that do not include European firms. These informal gatherings—referred to as task forces or *ad hoc* groupings—often do crucial preparatory work before TC, SC and WG meetings, with the most important aspects of a new standard being settled in advance.

For example, interviews with European industry involved in chemicals standardisation indicate that new contributions are regularly assessed by informal review teams that consist only of Chinese experts before being included in the formal standardisation process.

Whereas international best practice dictates that a draft standard be published for public consultation before finally being voted into existence, in the Chinese system certain informal discussions that exclude European actors may also take place after a standard has been drafted, rendering an open and transparent drafting process meaningless.

For example, the drafting process for a particular technical standard in the furniture industry was transparent and inclusive; however, once submitted, a Chinese state-owned certifier used its advocacy power to effect changes to the draft. As a result, the draft standard published for public consultation was hardly recognisable from that developed in the WG. The public consultations were basically futile because in China published draft standards are widely taken as having achieved 'national consensus',

27 Information according to telephone interviews with European standardisation experts, July–September 2021.

28 Information according to telephone interviews with European standardisation experts, July–September 2021.

29 Information according to telephone interviews with European standardisation experts, July–September 2021.



so it is perceived as inappropriate to protest technical standards at this late stage.³⁰

Restrictions on technical leadership: Technical standard setting is heavily influenced by technical leaders, most prominently chairs and secretariats of TCs, SCs and WGs. These technical leaders largely set the agenda, receive and manage standard contributions, and steer the entire process. In China, such leadership positions are often reserved for Chinese actors.

Lack of information and transparency: The core conditions for a functioning technical standardisation process are full access to information and transparency. This continues to be a major challenge for FIEs in the PRC. Not only is obtaining information about TCs and application procedures among the most pressing concerns reported by European companies, the content of standards is not always accessible either.

One example is association standards for metros developed without FIEs' participation before subsequently turning into market access barriers. Technical standards of the China Association of Metros (CAMET), such as the Chinese Train Control System (CTCS)—which is based on but not identical to the European Train Control System—are widely used in public procurement. Yet the CTCS standards were only made available to a select group of FIEs, and updates remain completely confidential.

In the aerospace and aviation sector, a lack of transparency and coordination among Chinese regulators and stakeholders, coupled with inefficient procedures, constitute one of the main concerns of European business, and foreign companies in the medical device industry have similar experiences. In this sector, the duplication of prescriptions in standards, and regulations requiring separate registering and certification, are widespread.

The automotive industry also faces a multitude of regulators and standards, not least due to the growing relevance of communications technology in the wake of intelligent mobility.³¹

High fees: Some standardisation activities demand additional participation fees from FIEs, even if this is not a formal requirement. This type of unequal treatment is particularly present in developing association standards, which is problematic if the resulting standards are used in administrative measures or procurement, or if they are transformed into national, sector or local standards, without FIEs having been adequately involved in their development.³²

Monopolies due to preferential treatment: Of crucial importance to a company's ability to shape standardisation is the market structure in a given sector. In highly concentrated or monopolistic sectors, national champions have almost unfettered control over standardisation. In competitive market segments, a wide variety of actors, including FIEs, have better chances to influence standard setting. This is not exceptional for China, with *de facto* standards due to monopolistic market structures existing around the globe.

However, what is specific to China is the extent to which national champions—including but not

30 Information according to telephone interviews with European standardisation experts, July–September 2021.

31 Information according to telephone interviews with European standardisation experts, July–September 2021.

32 Information according to telephone interviews with European standardisation experts, July–September 2021.

limited to state-owned enterprises (SOEs)—exist in strategic sectors due to heavy state support. These sectors include energy, securities and banking, and some segments of the automotive and telecommunications sectors, among others. More diversified markets include food and beverage, most consumer products and industrial equipment.

In some sectors in which national champions have strong export interests, a strong lobby exists for the identical adoption of international standards, or standards that comply with most widespread US standards or European norms. However, these are the exception to the rule; in most cases, the dominant influence of national champions is an additional barrier to European interests.³³

Hidden political agenda: Some aspects of standardisation are affected by political agendas, although these are not necessarily transparent. As agendas change, concepts once considered taboo in China can turn into a desired political outcome.

One interviewee, for example, pointed out that before carbon neutrality was explicitly named a political priority, it was virtually absent from technical standardisation in China because it was perceived to be a politically sensitive topic.³⁴

Lack of IP protection: A final archetypal barrier is comprised of challenges related to the protection of IP,³⁵ and discriminatory financial support for patenting. Although patent information needs to be disclosed in the handling of national standards, many European firms identify improvements in this regard in mandatory standards.³⁶ At the same time, however, some companies—for example in the IT and telecommunications sectors—report that Chinese IP policy still does not conform to international practices of voluntary disclosure. Furthermore, companies like Huawei are widely believed among interviewees to receive funding dedicated to patenting in the context of standardisation. Some stakeholders also voice concerns that Chinese companies are treated preferentially by Chinese courts in litigation cases related to SEPs.

Putting aside these barriers, there are several elements that determine the likelihood of FIEs being able to influence Chinese standardisation.

According to interviews conducted with European Chamber members for this report, expertise is the most decisive factor. Investing in local R&D is another important aspect that determines a company's potential impact on standardisation in the PRC. Local R&D is particularly crucial in some sectors, including industrial equipment, ICT and chemicals. Considering the strong role of the state in standardisation, it is no wonder that interviewed European firms also indicate that having good connections with standardisation authorities is key to increasing their prospects of influencing technical standard setting. In addition, a sound corporate reputation is widely seen as pivotal.

Other factors that increase an FIEs' likelihood of exerting influence in the standard-setting process include: excellent Chinese language skills; reasonable market share and company size; early commercialisation

33 Information according to telephone interviews with European standardisation experts, July–September 2021.

34 Information according to telephone interviews with European standardisation experts, July–September 2021.

35 *2017 Report to Congress On China's WTO Compliance*, US Trade Representative, January 2018, viewed 27th October 2021, p. 15, <<https://ustr.gov/sites/default/files/files/Press/Reports/China%202017%20WTO%20Report.pdf>>

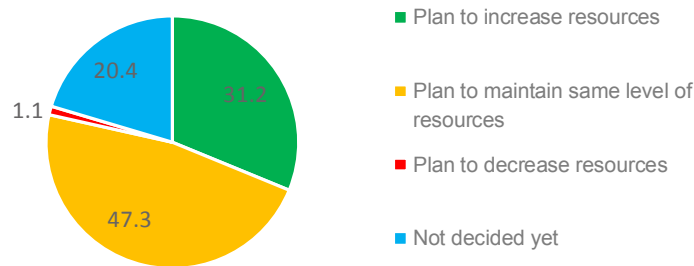
36 Information according to telephone interviews with European standardisation experts, July–September 2021.



of innovation; collaboration with influential Chinese companies in JVs; efficient internal cooperation due to China's fast standardisation process relative to internationally; a long business history in China; and knowledge of the Chinese standardisation system. Openness to dialogue and acknowledgement of Chinese firms' innovativeness and contributions to standards is also recognised as facilitating cooperative standardisation, which can provide FIEs with some level of influence.³⁷

Despite the existing challenges to participation in China's standardisation system, a majority of European firms are likely to maintain or even increase their resources devoted to technical standardisation activities in the foreseeable future (Figure 9).

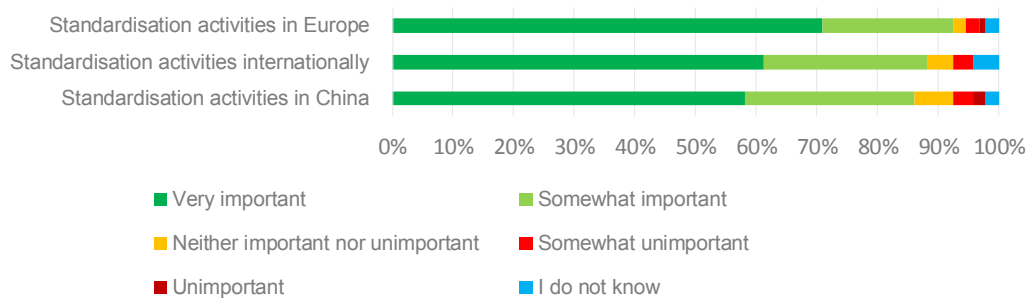
Figure 9: Please indicate your company's plan regarding the resources it will devote to standardisation activities in China over the next five years (in %)



Source: European Chamber and UI Standardisation Survey 2021

This data indicates that respondents perceive Chinese standardisation activities to be of high importance, perhaps only slightly falling short of international standardisation. Naturally, standard setting in Europe remains more important to European firms (Figure 10), but the in-depth interviews conducted with European firms in support of this report affirmed the importance of the Chinese market for many.

Figure 10: How important is your company's participation in standardisation activities in Europe, China and internationally in terms of your company remaining competitive in these respective markets (in %)?



Source: European Chamber and UI Standardisation Survey 2021

37 Information according to telephone interviews with European standardisation experts, July–September 2021.

Both the FIL and the EU-China Comprehensive Agreement on Investment (CAI) could improve European companies' access to standardisation activities in China. In both documents, the PRC guarantees equal treatment for access to and participation in domestic standardisation, at least in the state-tier at the national level, while the CAI includes provisions on improved transparency and timely notification of new standardisation projects.³⁸ However, it is questionable whether the CAI will be ratified.³⁹ Meanwhile, though the wording of both documents is generally welcomed by interviewed European firms, expectations as to whether the CAI and/or the FIL will result in improvements are mixed.⁴⁰

38 Section III: Regulatory Framework, *EU-China Comprehensive Agreement on Investment*, European Commission, 22nd January 2021, viewed 20th July 2021, <https://trade.ec.europa.eu/doclib/docs/2021/january/tradoc_159344.pdf>; Foreign Investment Law of the PRC, National People's Congress (NPC), 15th March 2019, viewed 8th November 2021, <<http://www.npc.gov.cn/englishnpc/c23934/202012/5b80fe5055504efa93b6744f9272b3c2.shtml>>

39 The CAI requires the consent of the European Parliament to enter into force. The CAI has met considerable resistance since China imposed sanctions on 10 European Parliament politicians and four other entities in March 2021, with members of parliament refusing to consider the CAI while these sanctions remain in place.

40 Information according to author telephone interviews with European standardisation experts, July-September 2021. See also: Rühlig, Tim Nicholas, *No Harm, but How Much Good for the EU? Assessing the CAI's Standardisation Clause*, The Greens/EFA in the European Parliament, Brussels, 2021.



Chapter 3: China's Growing Footprint in International Technical Standardisation

Main takeaways

- China has made considerable efforts to increase its influence in international standard setting in recent years.
- While China has made significant advances, it is not yet dominating international standardisation.
- The strategies China uses to further its influence in international technical standardisation are not radically different from those adopted by established western states. However, China's overall state-centric approach has put Chinese actors in advantageous positions and helped them gain ground in international standard setting through the provision of systematic state support (not least material resources).

Not only has China undergone domestic standardisation reform, but its influence in international standard setting has grown significantly as well. In part, this is a natural process because an increasingly innovative country is likely to submit more and better contributions to international standardisation bodies.⁴¹

However, China's growing footprint in international technical standardisation is also the result of strategic policymaking as reflected, for example, in the national standardisation strategy. In 2015, the CCP leadership reportedly established a 'Special Leading Small Group on the Major Project of Standardisation Alongside the BRI' to coordinate Chinese efforts.⁴² Some observers have even implied that the PRC is "manipulating" the international standardisation process.⁴³

As a relative latecomer to international standardisation, China is focussing its efforts on strategic sectors and new technologies that are yet to be standardised.⁴⁴ Examples include drones,⁴⁵ lithium batteries,⁴⁶ fifth-generation mobile technology (5G),⁴⁷ data security⁴⁸ and artificial intelligence (AI) among others.^{49&50}

41 This is one reason why some observers caution against dramatising China's impact on international standards that remain the result of cooperative negotiations. See: Deron, Laure G., *Chinese Standards and the New Industrial Markets*, Institut Recherche Stratégique de l'École Militaire, Paris, 2020.

42 Shi-Kupfer, Kristin and Ohlberg, Maraike, *China's Digital Rise: Challenges for Europe*, MERICS, Berlin, 2019.

43 Gu, Xuewu et al., *Geopolitics and the Global Race for 5G: CGS Global Focus*, Center for Global Studies Bonn, May 2019, viewed 27th October 2021, <<http://cgs-bonn.de/5G-Study-2019.pdf>>

44 Seaman, John, *China and the New Geopolitics of Technical Standardization. Notes de l'Ifri*, Ifri, January 2020, viewed 27th October 2021, p. 6, <https://www.ifri.org/sites/default/files/atoms/files/seaman_china_standardization_2020.pdf>

45 Cheng, Yu, *China now 'Leader' in UAS Sector*, *China Daily*, 1st September 2020, viewed 24th September 2021, <<http://global.chinadaily.com.cn/a/202009/01/WS5f4da180a310675eaf56ade.html>>

46 Crompton, Paul, *The New Global Committee on Lithium Standards Will Be Led by China*, *Bestmag*, 7th September 2020, viewed 24th April 2021, <<https://www.bestmag.co.uk/indnews/new-global-committee-lithium-standards-will-be-led-china>>; Chee, Foo Yun, *Exclusive: EU Must Engage in Lithium Standards or Lose to China*, *EU's Breton Says*, *Reuters*, 18th June 2020, viewed 7th September 2021, <<https://www.reuters.com/article/us-eu-lithium-standards-exclusive-idUSKBN23P215>>

47 *The U.S., China and Others Race to Develop 5G Mobile Networks*, *Forbes*, 3rd April 2018, viewed 11th April 2019, <<https://www.forbes.com/sites/stratfor/2018/04/03/the-u-s-china-and-others-race-to-develop-5g-mobile-networks/#58ad77a25875>>

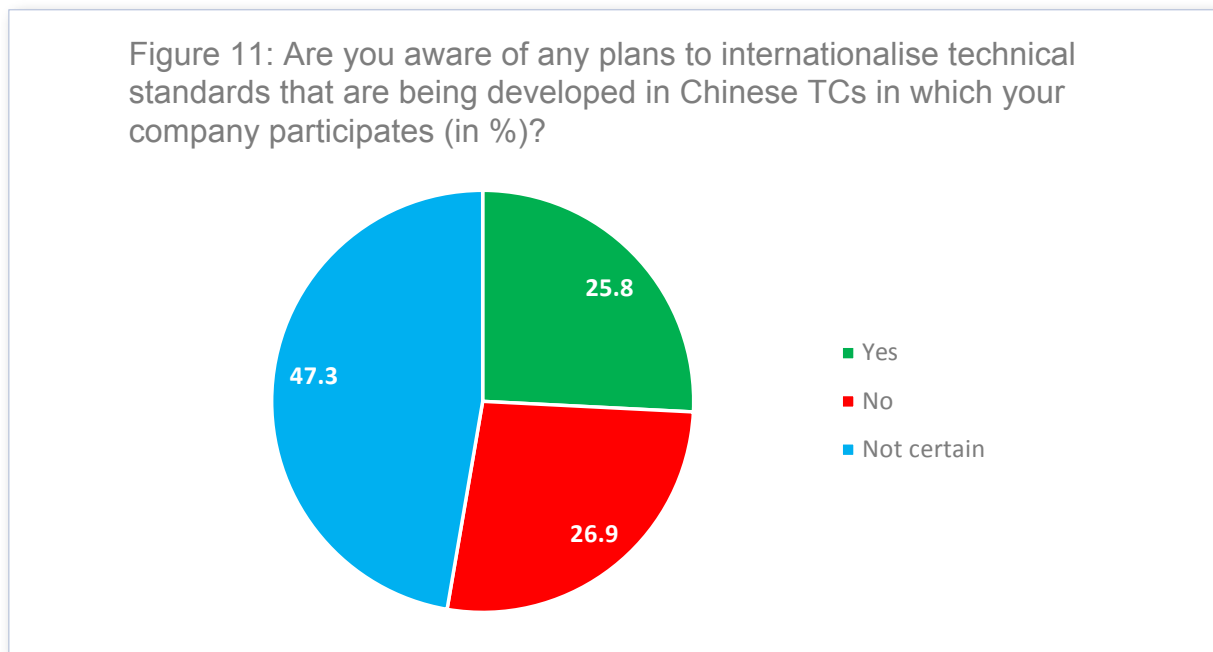
48 *Guidelines for the Construction of the Online Data Security Standards System*, *China Copyright and Media*, updated 13th April 2020, viewed 30th April 2020, <<https://chinacopyrightandmedia.wordpress.com/2020/04/10/guidelines-for-the-construction-of-the-online-data-security-standards-system/>>

49 *Guidelines for the Construction of the National New Generation Artificial Intelligence Standard System*, SAC, 4th August 2020, viewed 6th February 2021, <<http://www.sac.gov.cn/sxxgk/zcwj/202101/P020210122407767317794.pdf>>; Yan, Luo et al., *China's Framework of AI Standards Moves Ahead*, *National Law Review*, 16th July 2018, viewed 27th July 2021, <<https://www.natlawreview.com/article/china-s-framework-ai-standards-moves-ahead>>

50 China's standardisation efforts in AI drew particular global attention given the ethics surrounding AI applications related to facial recognition. This standardisation has been led by SenseTime with contributions at the domestic and international levels from Tencent, Ping An Insurance, Dahua Technology, Ant Financial, Xiaomi, iFlytek, ZTE and China Telecom, among others: Ding, Jeffrey, *Deciphering China's AI Dream*, Oxford University, March 2018, viewed 6th May 2019, <https://www.fhi.ox.ac.uk/wp-content/uploads/Deciphering_Chinas_AI-Dream.pdf>; Xue, Yujie, *27 Companies Drafting China's First National Facial Recognition Standard*, *Sixth Tone*, 7th November 2019, viewed 4th April 2020, <<http://www.sixtone.com/news/1004893/27-companies-drafting-chinas-first-national-facial-recognition-standard>>; Gross, Anna et al., *Chinese Tech Groups Shaping UN Facial Recognition Standards*, *Financial Times*, 2nd December 2019, viewed 27th October 2021, <<https://www.ft.com/content/c3555a3c-0d3e-11ea-b2d6-9b4d1957a67>>

This does not mean that the PRC is necessarily far ahead of the west in terms of standardisation of new technology. For instance, it took the SAC until May 2020 to propose the establishment of a national blockchain standardisation TC that mirrors the ISO/TC 307, in order to domestically prepare contributions to be submitted at international level.⁵¹ The ISO/TC 307 had been established in 2016. However, China's influence is significant. As of March 2019, China had proposed no less than eleven standards for the Internet of Things (IoT) within the ISO/IEC framework, of which almost half have been approved and none have been rejected.⁵²

China's standardisation activities are the result of a steep learning curve. Whereas China used to largely depend on foreign IP, it has since put into place all it needs to lead on new technology standardisation in the international arena – not least by strategically preparing standard contributions in domestic SDOs that are subsequently elevated to standard contributions at the international level. This phenomenon is recognised by 25.8 per cent of European companies that responded to the European Chamber / UI standardisation survey, although an almost equal number of respondents have not observed such activities (Figure 11).



Source: European Chamber and UI Standardisation Survey 2021

Because technical standardisation spans a wide range of products and technologies, and is in itself a highly technical process of negotiations among specialised engineers in which one proposal seldom fully prevails, measuring China's footprint in international standardisation is a complex process. Moreover, technical standards are developed in a multitude of international institutions.⁵³ Therefore, to understand China's impact, six indicators need to be taken into account.

51 *China Standardisation Newsletter: February-March 2021*, SESEC, Beijing, 2021, p. 3.

52 Seaman, John, 'China and the New Geopolitics of Technical Standardization', *Notes de l'Ifri*, Ifri, January 2020, viewed 27th October 2021, p. 23, <https://www.ifri.org/sites/default/files/atoms/files/seaman_china_standardization_2020.pdf>

53 In ICT, for example, more than 200 international SDOs exist: Schneiderman, Ron, *Modern Standardization: Case Studies at the Crossroads of Technology, Economics and Politics*, IEEE Press, Piscataway, 2015, p. 253.

Six indicators for China's increasing influence in international standard setting

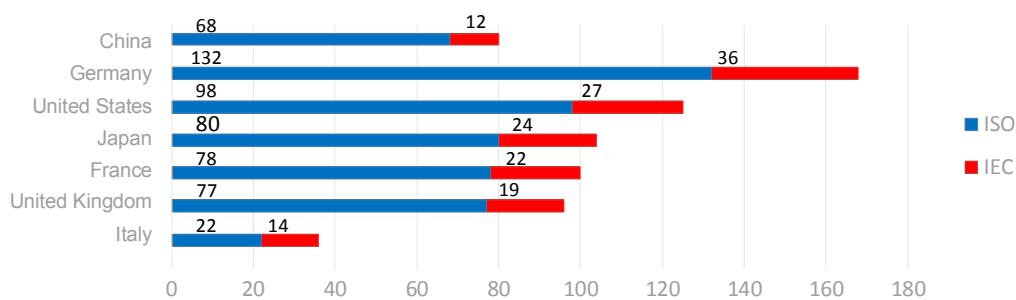
1. Leadership positions

Almost all SDOs have an institutional leadership with varying degrees of influence. The large number and diversity of international forums developing standards makes it difficult to identify the most relevant international standard-setting bodies. However, China's general influence on technical standardisation can be largely understood by considering the broadest and most famous international SDOs as proxies. In addition, depending on the sector, certain specific institutions and forums can be more important than the more general ones. In these institutions, China's influence can be equal, stronger or weaker compared to the institutions discussed below.

In the ISO, China is a permanent member of the institution's main governing bodies, the ISO Council (since 2008) and the ISO Technical Management Board (since 2013). From 2015 to 2018, Zhao Xiaogang was the first Chinese citizen to serve as rotating ISO president. The second general international SDO, the IEC, is currently led by Zhu Yinbiao, who previously also served as vice president. The third main international SDO, the International Telecommunication Union (ITU), is also currently led by a Chinese official named Zhao Houlin. Before his term as chief, he served as the ITU's deputy secretary general.

These institutional leadership positions help China to shape the agenda, but they have relatively little impact on the concrete development of standards. For this process, the secretariats of TCs, SCs and WGs are more impactful. Although secretariats are supposed to be neutral,⁵⁴ technical standardisation experts agree that secretariats exert an enormous influence by structuring, organising and coordinating the standard-setting process.⁵⁵ However, as Figure 12 demonstrates, China is far from dominating international SDOs in terms of technical leadership positions.⁵⁶

Figure 12: ISO, IEC secretariats of selected countries as of September 2021



Source: ISO/IEC

China's influence is, however, increasing. From 2011 to 2018, China's share in ISO TC and SC secretariats grew from five per cent to 8.21 per cent. In ISO WG secretariats, China's share grew from two per cent to 6.58 per cent (Figure 13).⁵⁷ According to US-China Business Council (CBC) calculations,

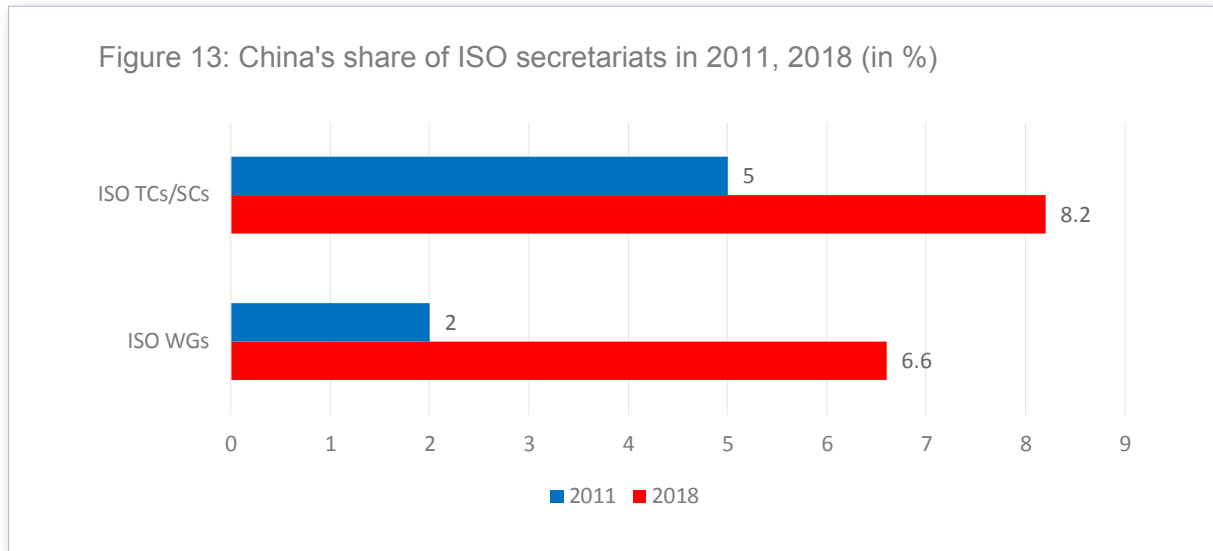
⁵⁴ *My ISO Job. What Delegates and Experts Need to Know*, ISO, 2018, viewed 23rd April 2021, <https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/my_iso_job.pdf>

⁵⁵ Interviews with international standardisation representatives, October 2018–April 2020.

⁵⁶ Data according to the websites of ISO and IEC as of 18th September 2021.

⁵⁷ Information privately obtained by the author from the German SDO DIN.

China increased its share of ISO TC/SC secretariats by 73 per cent between 2011 and 2020; and by 67 per cent for the same type of positions in the IEC between 2012 and 2020.⁵⁸



Source: DIN

China's growing influence has been a process of a broader concentration of power in the most influential international SDOs. In 2020, China took over more ISO technical leadership positions than both Germany and the US for the first time. The same holds true for the Joint Technical Committee (JTC 1), which is the primary committee developing ICT standards within the ISO/IEC framework.⁵⁹

Strikingly, China is particularly successful in gaining ground in strategic sectors. From 2015 to 2020, it has taken ISO and IEC secretariats for standardisation of rare earths (ISO/TC 298); foundry machinery (ISO/TC 306); karst (ISO/TC 319);⁶⁰ transaction assurance in e-commerce (ISO/TC 321); smart grid user interface (IEC/PC 118); high-voltage direct current (DC) transmission for DC voltages above 100 kilovolts (IEC/TC 115); low-voltage auxiliary power systems for electric power plants and substations (IEC/PC 127); and equipment for electrical and electromagnetic quantities (IEC/TC 85).⁶¹ Considering the ten key sectors identified in the Made in China 2025 initiative,⁶² it is apparent that the PRC has gained ISO and IEC secretariats in fields corresponding to its overall industrial policy strategy.

While China's share of technical leadership positions is higher in the ITU, it is not dominating. In the ITU's Telecommunication Standardisation Advisory Group (TSAG), China holds one management position, equal to other major standardisation powers like the US or Russia. Only the EU controls two management positions in the TSAG.

In ITU Study Groups, China has a 14.1 per cent share of management positions, slightly ahead of the EU

⁵⁸ *China in International Standards Setting. USCBC Recommendations for Constructive Participation, February 2020*, USCBC, Washington DC, 2020, p. 3.

⁵⁹ Information privately obtained by the author from the DIN.

⁶⁰ Karst is crucial for petroleum geology because as much as 50 per cent of the world's hydrocarbon reserves are hosted in porous karst systems.

⁶¹ Information privately obtained by the author from a European standardisation organisation.

⁶² The ten sectors are: next generation IT; high-end numerical control machinery and robotics; aerospace and aviation equipment; maritime engineering equipment and high-technology maritime vessel manufacturing; advanced rail equipment; energy-saving vehicles and new energy vehicles; electrical equipment; agricultural machinery and equipment; new materials; biopharmaceuticals and high-performance medical devices. See: *China Manufacturing 2025: Putting Industrial Policy Ahead of Market Forces*, European Union Chamber of Commerce in China, 2017, viewed 2nd November 2021, <<https://www.europeanchamber.com.cn/en/china-manufacturing-2025>>



with 13.4 per cent. South Korea has an 8.5 per cent share, Japan seven per cent, the US has 6.3 per cent and Russia 3.5 per cent. China has a stronger lead in ITU Focus Group management positions, holding 23.4 per cent of these positions, followed by the EU (12.8 per cent), the US, Japan and South Korea (all 8.5 per cent) and Russia (4.3 per cent).⁶³

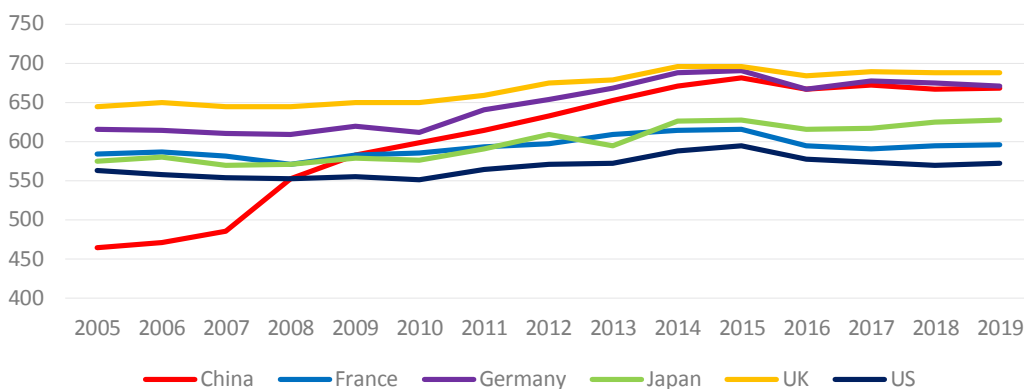
In the Third Generation Partnership Project (3GPP), a standardisation institution crucial to wireless technology standardisation, China has also gained substantial influence. In 2017, it held 10 out of roughly 60 leadership positions, up from eight in 2013. If leading international companies are compared, Ericsson (Sweden) was ahead with six positions, closely followed by Huawei (China) and Samsung (South Korea) with five each, Qualcomm (US) with four, and China Mobile (China) with three.⁶⁴

China's growing share of leadership positions allows it to adopt several tactics often criticised in western media, such as swarming the agenda, burning the clock or using its authority to praise and thereby promote Chinese interests.⁶⁵

2. Participation in standardisation

While technical leadership positions are important, they are not a necessary requirement to impact standardisation. A second indicator, participation in standard developing committees, captures which actors can submit proposals and comments to the standardisation process. Figure 14 demonstrates that China's influence has grown enormously in this regard since 2007, having surpassed that of the US, France and Japan, and falling only slightly short of the United Kingdom (UK) and Germany.⁶⁶

Figure 14: Active membership in ISO TCs and SCs



Source: Association Française de Normalisation (AFNOR)

Another measure is the number of participants. In the 3GPP, China accounted for the highest share of participants (23.7 per cent) in 2018, while representatives from firms based in the EU and the US fell

63 ITU-T Groups, ITU, viewed 28th November 2020, <<https://www.itu.int/en/ITU-T/groups/Pages/default.aspx>>

64 Zhong, Raymond, *China's Huawei Is at Center of Fight Over 5G's Future*, *The New York Times*, 7th March 2018, viewed 30th September 2018, <<https://www.nytimes.com/2018/03/07/technology/china-huawei-5g-standards.html>>.

65 Kyngé, James and Liu, Nian, *From AI to Facial Recognition: How China Is Setting the Rules in New Tech*, *Financial Times*, 6th October 2020, viewed 19th October 2020, <<https://www.ft.com/content/188d86df-6e82-47eb-a134-2e1e45c777b6>>

66 Information privately obtained by the author from the French SDO AFNOR.

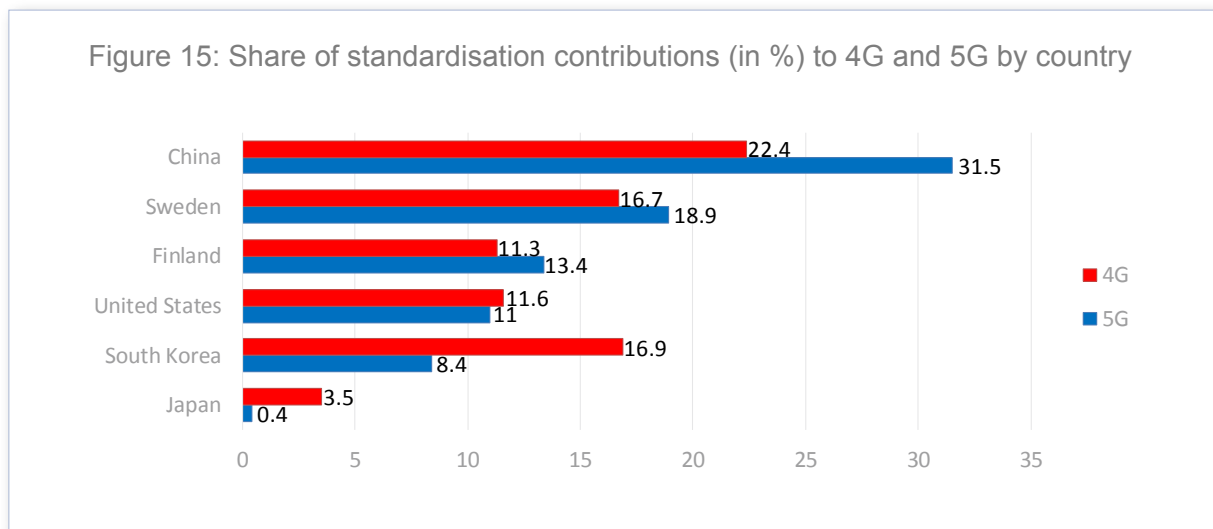
slightly short with 22.5 per cent each.⁶⁷ Reports on Chinese participation in other international standard setting institutions such as the ITU,⁶⁸ the IETF⁶⁹ and the IEEE⁷⁰ indicate a similar trend of growing Chinese participation.

3. Standard contributions

In many SDOs (including the ISO and the IEC), membership of standard developing committees requires regular contributions. However, membership does not reveal the number of contributions and whether they are adopted.

Statistics on standard contributions are rare and incomplete, because technical standardisation encompasses such a wide variety of different products and technologies. This section draws on technical standardisation contributions to the development of one key technology that has received a lot of attention in recent years: 5G. The data referred to here is mostly from IPlytics publications.

Figure 15 shows that China's share in 5G contributions ranks first and has increased from the previous generation of mobile technology, fourth-generation / long-term evolution (4G/LTE).⁷¹ If Sweden's and Finland's contributions are combined, China ranks second to the EU.

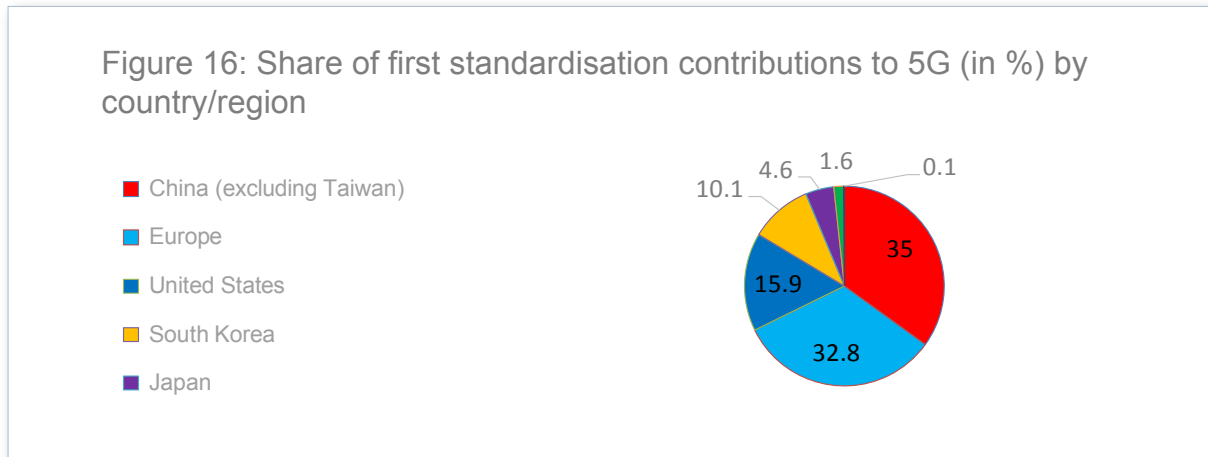


Source: *The Wall Street Journal*, based on IPlytics data

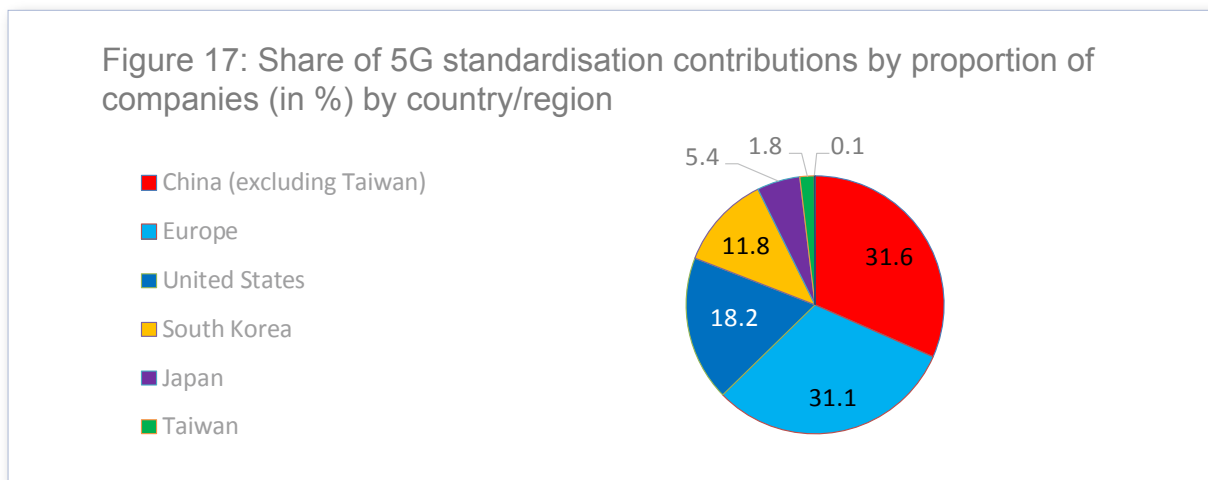
Many standard contributions are often made by a group of firms, including actors from several countries. This means that the relevance of companies' standard contributions needs to be weighted. One method of doing this is to only consider first authors, because contributing companies are normally listed in the order of their importance to a given standard proposal.

67 Calculations of the author based on data obtained privately from a government agency in an EU Member State involved in mobile network standardisation in 3GPP.
 68 Nelson, Rick, *China's Huawei Seeks to Dominate 5G Standards Development*, *Evaluation Engineering*, 30th March 2018, viewed 11th April 2019, <<https://www.evaluationengineering.com/industries/communications/wireless-5g-wlan-bluetooth-etc/article/13017349/chinas-huawei-seeks-to-dominate-5g-standards-development>>.
 69 Contreras, Jorge L., 2014, *Divergent Patterns of Engagement in Internet Standardization. Japan, Korea and China*, *Telecommunications Policy*, vol. 28, pp. 94–932.
 70 Seaman, John, *China and the New Geopolitics of Technical Standardization. Notes de l'Ifri*, Ifri, January 2020, viewed 27th October 2021, p. 24, <https://www.ifri.org/sites/default/files/atoms/files/seaman_china_standardization_2020.pdf>
 71 Pop, Valentina et al., *From Lightbulbs to 5G, China Battles West for Control of Vital Technology Standards*, *The Wall Street Journal*, 8th February 2021, viewed 17th February 2021, <<https://www.wsj.com/articles/from-lightbulbs-to-5g-china-battles-west-for-control-of-vital-technology-standards-11612722698>>

Figure 16 illustrates that Chinese companies are the main first contributors to the 5G standard, surpassing even the combined contributions of European countries.⁷²



An alternative method for calculating standardisation contributions is to attribute each contributing company an equal share of a standard contribution (all combined as one share). For example, if a standard contribution is submitted by four firms, each company is credited with 0.25 standard contributions. Figure 17 illustrates that, again, if 5G standard contributions are measured by this method, Chinese companies score highest.⁷³



Source: IPlytics

When 5G standardisation contributions are compared to their adoption, IPlytics data reveals that China is only slightly behind Europe, as can be seen in Figure 18, which summarises the adoption of standard contributions.⁷⁴ This indicates that considerable resistance exists against quite a number of contributions brought forward by Chinese actors. Reports indicate that similar findings hold in other SDOs such as the ITU as well.⁷⁵

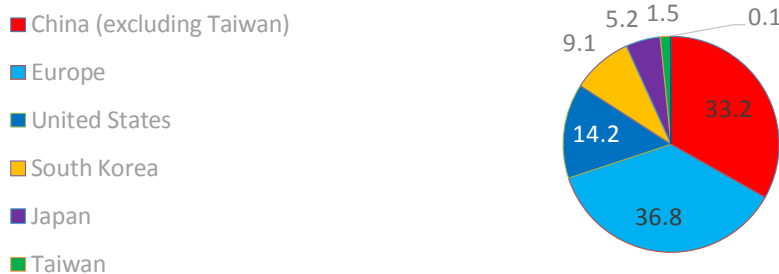
⁷² Pohlmann, Tim et al., *Study on the investigation and analysis of the patent situation in the standardisation of 5G (commissioned by the Federal Ministry for Economic Affairs and Energy)* (in German), IPlytics, Berlin, 2020.

⁷³ Ibid.

⁷⁴ Ibid.

⁷⁵ Beattie, Alan, *Technology: How the US, EU and China Compete to Set Industry Standards*, *Financial Times*, 23rd July 2019, viewed 28th July 2019, <<https://www.ft.com/content/0c91b884-92bb-11e9-aea1-2b1d33ac3271>>

Figure 18: Share of adopted 5G standard contributions (in %) by country/region



Source: IPlytics

The data from 5G standardisation is in line with findings on China's strength in standardisation in mobile network technology more broadly. Figures 19 and 20 depict all standard contributions to 3GPP in 2018 and their adoption, respectively. According to both measures, Europe is slightly ahead of China.⁷⁶

Figure 19: Share of standard contributions (in %) to 3GPP in 2018 by country/region



Figure 20: Share of adopted standard contributions (in %) to 3GPP in 2018 by country/region



Source: Own graphics based on data obtained privately from a government agency in an EU Member State involved in mobile network standardisation in 3GPP.

⁷⁶ Calculations made by the author based on data obtained privately from a government agency in an EU Member State involved in mobile network standardisation in 3GPP.

A long-term analysis published by Swedish vendor Ericsson reveals that Chinese technology giant Huawei is already second in standardisation contributions to 3GPP since the firm's establishment in 1987.⁷⁷

4. Standard essential patents

SEPs capture a lot of attention because standards of many key enabling technologies, such as 5G, consist to a large extent of patented technologies.

Very often, however, the way SEPs are discussed is misleading. Existing data only captures *declarations* of standard essentiality, which should not be confused with *actual* standard essentiality. Measuring SEPs is difficult because the actual standard essentiality of many patents remains unclear.⁷⁸ When a standardisation process starts, participating actors declare patents as standard-essential, thereby indicating that they believe the respective patent could become essential for the standard and that they are willing to license the patent under certain international licensing frameworks. Once a standard is established, no comprehensive analysis takes place on whether the standard-essentiality declaration or the initial declarations made turned out to be correct.

In some cases, firms file complaints against deviating assessments of standard essentiality by their competitors when licensing fees are demanded. In most cases, however, technology companies negotiate package deals exchanging licensing fees for groups of patents without assessing the standard essentiality of individual standards. Observers assume that all companies declare more of their patents as standard essential than turns out to be correct.

Figure 21 indicates that China is ahead of other actors in 5G SEP declarations.⁷⁹ By comparison, observers estimate that China held around six per cent of the SEPs in 4G/LTE in 2011.⁸⁰

Figure 21: Share of 5G SEPs family declarations (in %) by country/region



Source: IPlytics

However, not every patent is technologically equal in importance. Technological relevance is often

⁷⁷ *Estimating the Future 5G Patent Landscape*, Ericsson, October 2018, viewed 13th April 2019, <<https://www.ericsson.com/assets/local/patents/estimating-the-future-5g-patent-landscape.pdf>>

⁷⁸ Ibid.

⁷⁹ Pohlmann, Tim et al., *Study on the investigation and analysis of the patent situation in the standardisation of 5G (commissioned by the Federal Ministry for Economic Affairs and Energy)* (in German), IPlytics, Berlin, 2020.

⁸⁰ Lee, Edison and Chau, Timothy, *Telecom Services: The Geopolitics of 5G and IoT*, Jefferies Franchise Note, Jefferies, Hong Kong, 2017.

calculated by means of the average size of a patent family and the average number of citations of the respective patent in other declared SEPs. While the size of a patent family is used to measure how extensive the patents are, the number of citations serves to indicate how relevant a certain patent is for other components of a given technology. On 5G, the IPlytics database finds Chinese patents to be the least important, compared with those filed by other major technological leaders in 5G based in Europe, the US, South Korea, Japan, Taiwan and Canada.⁸¹

Since patent analysis and SEPs calculations are difficult, the resulting figures vary. Some indicate a smaller share for Chinese companies, but actors from the PRC always feature prominently in the published analyses.⁸² All this illustrates that China has gained a considerable share of 5G patents even though it is not dominating the new mobile technology generation.

Beyond 5G, statistics demonstrate that Europe is losing ground in terms of international patenting, especially in digital technologies including Wi-Fi 6 and industrial-use cases of 5G.⁸³ In 2018, China not only outcompeted Europe in terms of AI patents, but also the US, filing more than 2.5 times as many patents as US actors.⁸⁴

5. Qualitative description of China's growing footprint

While all these quantitative indicators point to a growth in Chinese impact on international technical standard setting, this does not capture the entire development. Therefore, assessing international perception is required to provide a qualitative description of standardisation influence.

Information gathered from more than 100 interviews with international, mostly European, standardisers conducted from November 2018 to September 2021 confirms the quantitative findings.⁸⁵ While international participants in SDOs continue to see quality issues preventing China from having greater influence, they also consistently acknowledge Chinese improvements. This development has sparked fears among standardisation experts from the US and Europe that China could outstrip western countries in international technical standardisation. These findings broadly mirror the position of media and international consultancies.⁸⁶

More than 30 interviews conducted for this study with European companies operating in China further confirm that China has made considerable, well-coordinated efforts across a wide range of economic sectors to gain influence in international standard setting. These include the submission of standard contributions to international standard bodies and applications for technical leadership positions such as secretariats in international SDOs. However, China is not equally successful in all sectors.

81 Pohlmann, Tim et al., *Study on the investigation and analysis of the patent situation in the standardisation of 5G (commissioned by the Federal Ministry for Economic Affairs and Energy)* (in German), IPlytics, Berlin, 2020.

82 See: *Cyber Creative Institute Analyzes "Application Trend of ETSI Standard Essential Patent (5G-SEP) Candidates Contributing to Realization of 5G and Proposal Trend of Contributions for Standards": Fairly Evaluate Companies Focusing on Levels Before Standards are Fixed*, Cyber Creative Institute, viewed 27th July 2021, <<https://www.cybersoken.com/file/press190206eng.pdf>>.

83 European Political Strategy Centre, *Rethinking Strategic Autonomy in the Digital Age*, European Commission, Brussels, 2019; Pohlmann, Tim, *The New Era of Standards Competition. Panel Discussion on 5G versus Wi-Fi 6 and HEVC/VVC versus AV1/VP9. How Will Technical Merit and Access to SEPs Determine the Winner?*, IPlytics, Berlin, 2020; *Who Are SEP Leaders and Standards Developers for Smart Factory Technologies?*, IPlytics, Berlin, 2021.

84 Shi-Kupfer, Kristin and Ohlberg, Maraike, *China's Digital Rise: Challenges for Europe*, MERICS, Berlin, 2019.

85 Author interviews with non-Chinese standardisation representatives, November 2018–September 2021.

86 Lee, Edison and Chau, Timothy, *Telecom Services: The Geopolitics of 5G and IoT*, Jefferies Franchise Note, Jefferies, Hong Kong, 2017; Triolo, Paul et al., *Eurasia Group White Paper: The Geopolitics of 5G*, Eurasia Group, Washington DC, 2018; Sheehan, Matt, *Standards Bearer? A Case Study of China's Leadership in Autonomous Vehicle Standards*, *Macro Polo*, 3rd June 2021, viewed 28th July 2021, <<https://macropolo.org/analysis/standards-bearer-a-case-study-of-chinas-leadership-in-autonomous-vehicle-standards/>>



6. De facto standardisation along the BRI

Technical standards are not only developed in SDOs, they can also be established as *de facto* standards. The role of standard setting in China's BRI and the Regional Comprehensive Economic Partnership (RCEP) is a useful reference in this regard.⁸⁷

To begin with, China's BRI includes an explicit standardisation dimension.⁸⁸ In 2015, China's main macroeconomic agency, the National Development and Reform Commission (NDRC), issued its first *Action Plan for the Harmonisation of Standards along the Belt and Road*.⁸⁹ In late 2017, the NDRC published another action plan setting further benchmarks.⁹⁰ As part of the plan, China began to translate its domestic technical standards into foreign languages to facilitate their adoption in third countries.⁹¹ Similarly, China proudly reports that association standards for export goods are developed in Chinese and English to spread along the BRI.⁹² By September 2019, China had signed 90 bilateral agreements on technical standardisation cooperation with 52 countries and regions.⁹³ China has also concluded 16 memoranda of understanding (MoUs) with BRI countries regarding digital standard setting as part of the Digital Silk Road.⁹⁴ Chinese experts acknowledge, however, that the agreements are vague and often meaningless.

More importantly, many concrete BRI projects incorporate Chinese technical standards. One case is the registration and authorisation of 83 Chinese standards in Turkmenistan that reportedly helped the China National Petroleum Corporation to save 15 per cent on investments in the Turkmen South Yolotan gas fields.⁹⁵ It is through these projects that the PRC disseminates its domestic technical standards to third countries without submitting them to international SDOs. Reportedly, other sectors in which China aims to spread its standards to BRI countries include ultra-high voltage transmission technologies and AI.⁹⁶

Another prominent example is the promotion of railway standards in BRI projects. For a long time, in the absence of a comprehensive set of international standards, China was mostly an adopter of European standards for railways, ranging from rolling stock to signalling for both mainlines and metros.⁹⁷ In recent years, China has not only developed—in a non-transparent manner—standards that are not identical to

87 Quantitative accounts of *de facto* standards are hardly feasible, as qualitative investigations including interviews are required. If one aims to grasp the general impact in *de facto* standard setting, focussing on specific arenas can be helpful.

88 MIIT Document (2018) 231 *Opinion on the Implementation of Standardisation of the Industrial Communication Industry for Construction of the 'Belt and Road'*, Law-lib.com, 5th November 2018, viewed 2nd November 2021, <http://www.law-lib.com/Law/law_view.asp?id=636486>

89 *Action Plan to Connect "One Belt, One Road" Through Standardization (2015-2017)*, NDRC, viewed 19th February 2019, <https://www.followingthemoney.org/wp-content/uploads/2017/06/2015_Leading-Group-for-the-BRI_Action-Plan-to-Connect-BRI-through-Standardization-2015-2017_E-1.pdf>

90 *Harmonisation of Standards for Construction of 'BRI' Action Plan (2018-2020)*, SAC, viewed 26th October 2018, <http://www.sac.gov.cn/zt/ydyll/bzhyw/201801/t20180119_341413.htm>.

91 *Administrative Measures for Foreign Language Versions of National Standards*, SAC, 26th August 2016, viewed 6th February 2021, <<http://www.sac.gov.cn/sxxgk/zcwj/202101/P020210122412450985060.pdf>>; *The "Belt and Road" Co-constructed National Standard Information Platform and the Standardization CN-EN Bilingual Intelligent Translation Cloud Platform Were Released*, SESEC, 26th April 2019, viewed 4th April 2020, <<https://www.sesec.eu/the-belt-and-road-co-constructed-national-standard-information-platform-and-the-standardization-cn-en-bilingual-intelligent-translation-cloud-platform-were-released/>>

92 *Report on the Development of Association Standards in China in Second Half of 2020*, China Standardization Press, Beijing, 2021, p. 13.

93 Based on information obtained by the author from the SAMR/SAC.

94 Chan, Jia Hao, *China's Digital Silk Road and Stopping Divergent Technology Standards*, Lowy Institute, 21st May 2019, viewed 30th May 2019, <<https://www.lowyinstitute.org/the-interpreter/china-s-digital-silk-road-and-stopping-divergent-technology-standards>>

95 Tian, Feng, *Standard Setting and Institutional Building for International Infrastructure*, *Routledge Handbook of the Belt and Road*, Cai, Fang and Nolan, Peter, eds., Routledge, London, 2019, pp. 341–345.

96 Lehmann, Jean-Pierre et al., *One Belt - One Road: China's Re-Engineering of the Global Business Environment*, IMD, July 2016, viewed 22nd September 2018, <<https://www.imd.org/research/insightsimd/one-belt-one-road-chinas-re-engineering-of-the-global-business-environment/>>; Kania, Elsa, *China's Play for Global 5G Dominance - Standards and the "Digital Silk Road"*, *The Strategist*, 27th June 2019, viewed 22nd September 2018, <<https://www.aspistrategist.org.au/chinas-play-for-global-5g-dominance-standards-and-the-digital-silk-road/>>; Polk, Andrew, *China Is Quietly Setting Global Standards*, *Bloomberg*, 6th May 2018, viewed 22nd September 2018, <<https://www.bloomberg.com/view/articles/2018-05-06/china-is-quietly-setting-global-standards>>; Gross, Anna et al., *Chinese Tech Groups Shaping UN Facial Recognition Standards*, *The Financial Times*, 2nd December 2019, viewed 27th October 2021, <<https://www.ft.com/content/c3555a3c-0d3e-11ea-b2d6-9bf4d1957a67>>

97 European railway standards are widely accepted internationally, see: *Reinforcing the Competitiveness of the Rail Supply Industry with Standardization - How to Get There?*, CEN-CENELEC, Brussels, 2018.

European ones, it has also started to promote its own standards in BRI countries. China offers funding, mostly loans, for the development of railways if they are constructed by the China Railway Corporation or other Chinese manufacturers based on Chinese standards.⁹⁸ In addition, China is also striving to take the lead on the development of international railway standards in the ISO (ISO/TC 269) and the IEC (IEC/TC 9).

One case that fully relies on Chinese technical standards is the China-Laos Railway.⁹⁹ In close collaboration with the China Railway No. 2 Engineering Group, the Vientiane Rail Welding Plant is developing the project and has adopted Chinese technology, equipment and standards. The project is an element of the BRI and forms part of a plan for a trans-Asia railway that should eventually encompass 5,500 kilometres of rail from Yunnan Province in China to Singapore, passing through Laos, Myanmar, Thailand, Vietnam, Cambodia and Malaysia.¹⁰⁰

Interviews with European rail industry representatives conducted for this study indicate that China is quite successful in spreading its own high-speed rail standards in BRI countries, such as in the case of the Jakarta-Bandung high-speed rail link,¹⁰¹ but meets increasing resistance from its partner countries in traditional mainline and metro projects.¹⁰² Other examples of BRI railway projects based on Chinese standards are the Djibouti-Addis Ababa railway,¹⁰³ Nepal's Gyirong-Kathmandu railway (railway track gauge standard)¹⁰⁴ and the Abuja-Kaduna railway in Nigeria.¹⁰⁵

The spread of Chinese railway standards is crucial to China for both political and economic purposes, creating lock-in effects (see Annex 2); deviating standards come with considerable transportation costs, as the BRI's trans-Caspian corridor demonstrates.¹⁰⁶

For European businesses, the spread of Chinese standards in BRI projects creates hurdles to market access. However, interviews with European industry conducted for this study verify that this depends on the business model of individual companies. Not all European firms are directly affected because they may not compete with Chinese enterprises in BRI markets.¹⁰⁷

Finally, the Asia-Pacific free trade agreement, the RCEP, contains a standardisation dimension with participating countries agreeing to further coordinate and cooperate.¹⁰⁸ Even though the agreement remains rather vague and unambitious, it symbolically confirms that China aims to collaborate in the field on standardisation and strives to strengthen its role internationally.

98 Cai, Peter, *Understanding China's Belt and Road Initiative*, Lowy Institute for International Policy, Sydney, 2017.

99 Ibid.

100 *China Standardization, Chinese Technology and Equipment, and Chinese Standards! China-Laos Railway will open at the end of the year*, Weixin QQ, viewed 18th September 2021, <<https://mp.weixin.qq.com/s/Kz2lvBDIhoU01BNxm6mR0A>>

101 Ding, Gang, *Indonesia on Track with China's Standards*, *Global Times*, 24th July 2019, viewed 22nd September 2019, <<http://www.globaltimes.cn/content/1159064.shtml>>; *Belt and Road Projects: Past, Present and Future*, *The Telegraph*, 25th April 2019, viewed 22nd September 2019, <<https://www.telegraph.co.uk/china-watch/business/belt-road-projects-list/>>

102 Information according to author telephone interviews with European standardisation experts, July-September 2021. See also: *The Belt and Road Initiative from a Sustainability Perspective*, Embassy of Sweden in China, Beijing, 2018.

103 Uddenfeldt, Fredrik and Hallgren, David, *China's Belt and Road Initiative. What's In for Swedish Companies?*, Business Sweden, Stockholm, 2019.

104 Yu, Jincui, *Western Countries Should Learn to Adapt to Chinese Standards*, *Global Times*, 11th July 2019, viewed 22nd September 2019, <<http://www.globaltimes.cn/content/1157572.shtml>>

105 *Belt and Road Projects. Past, Present and Future*, *The Telegraph*, 25th April 2019, viewed 22nd September 2019, <<https://www.telegraph.co.uk/china-watch/business/belt-road-projects-list/>>

106 Jakóbowski, Jakub et al., *The Silk Railroad: The EU-China Rail Connections - Background, Actors, Interests*, *OSW Studies 72*, Centre for Eastern Studies, Warsaw, 2018; Tian, Feng, *Standard Setting and Institutional Building for International Infrastructure*, *Routledge Handbook of the Belt and Road*, Cai, Fang and Nolan, Peter, eds., Routledge, London, 2019, pp. 341-345.

107 Information according to author telephone interviews with European standardisation experts, July-September 2021.

108 *Standards, Technical Regulations, and Conformity Assessment Procedures*, Australian Government, viewed 28th November 2020, <<https://www.dfat.gov.au/sites/default/files/rcep-chapter-6.pdf>>



In summary, all indicators demonstrate a general trend of China's growing footprint in international standardisation, albeit to varying degrees. In some international standard-setting bodies, such as the Internet Engineering Task Force (IETF) or the Internet Corporation for Assigned Names and Numbers, China's influence is low. Hence, while it is not accurate to conclude that China is dominating international technical standardisation, Beijing's ability to shape standards is clearly growing steadily.

How China gains influence: externalising the state-centric approach

The rapid growth of China's footprint in international technical standards bears asking the question, how did it achieve this level of influence? Academic analysis of the factors that influence international standard setting demonstrates that the interplay of three elements is crucial: technical advances, material resources and reputational gains.

The factors that allowed China grow its international footprint are not fundamentally different from those experienced by other standardisation strongholds. China has improved its technical capabilities, invested more resources in standardisation efforts and is emerging as an innovation leader in many sectors. However, this does not mean that China has followed exactly the same path as other influential standardisers. In fact, all countries engaging in international standard setting have specific practices that are drawn from their domestic standardisation approach.¹⁰⁹ China's international standardisation activities are also shaped by its state-centric domestic approach. This has been described as the externalisation of China's state-centric standard setting to the international level, and may lead to implications for the very nature of international technical standardisation and reshape international standard setting.¹¹⁰ For a deep dive on how China has developed a state-centric approach to both formal standardisation and *de facto* standard setting internationally, please refer to Annex 3 on page 61.

109 Tate, Jay, *National Varieties of Standardization, Varieties of Capitalism: The Institutional Foundation of Comparative Advantage*, Hall, Peter A. and Soskice, David, eds., Oxford University Press, Oxford, 2001, pp. 442–473.

110 Rühlig, Tim and Ten Brink, Tobias, 2021, *The Externalization of China's Technical Standardization Approach, Development & Change*, vol. 52, no. 5, pp. 1196–1221.

Chapter 4: Outlook: What Comes Next in China's Standardisation Development?

Main takeaways

- China's 14th Five-year Plan (14FYP), as well as its new national standardisation strategy, indicate that technical standard setting has never been a more strategic concern in the PRC. The strategy is jointly published by the State Council and the CPC's Central Committee (CC).
- The standardisation strategy manifests a shift in ambition for China to engage more in international standard setting. This includes raising the importance of international SDOs, as well as promoting Chinese standards abroad and attracting international standard-setting consortia.
- The strategy promises further domestic opening of China's standardisation system to FIEs, and a stronger role for the market but the continuation of guidance from the authorities. The state-centric approach to technical standardisation will persist for the foreseeable future.
- Previous ideas to streamline China's standardisation system or to develop a BRI Regional Standards Forum—as originally suggested in CS2035—are not included in the new strategy. However, this does not necessarily mean that they will no longer be discussed and considered.

Although China's FYPs no longer provide the rigorous, detailed and binding policies they did in the era of Mao Zedong, they continue to offer valuable insights into the overall direction the country will take in the foreseeable future.¹¹¹ Attempts to predict future Chinese developments in standardisation should therefore take China's latest FYP into consideration.

The 13FYP's goal to make China a "standard power" by 2020, coupled with concrete deliverables, has been achieved.¹¹² In March 2021, the National People's Congress adopted the 14FYP. Technical standards are mentioned in some form or another in around a quarter of the 14FYP's chapters, indicating the high priority that China gives to technical standard setting.¹¹³ But while the strategic value China attributes to standardisation is clear, the 14FYP contains little on China's future standardisation policy. This is not only a reflection of the general character of FYPs, it is also because China published a more detailed national standardisation strategy shortly afterwards.

At the time of writing, the national standardisation strategy had just been published and more interpretations from Chinese authorities can be expected. From the documents published so far, several preliminary conclusions can be drawn:¹¹⁴

- Technical standards have never been seen as more strategic for China. The importance of the national standardisation strategy is underlined by the fact that it was jointly published by the State Council and the CPPCC. Standards are seen as central to China's economic transformation, and the PRC is explicit that it will increase the citation of standards in regulation, certification, accreditation and public procurement. The application of standards will also be broadened to China's governance system and, for the first time, will include administrative management and social governance.

111 Hellmann, Sebastian, *Red Swan: How Unorthodox Policymaking Facilitated China's Rise*, Columbia University Press, New York, 2018.

112 *China in International Standards Setting: USCBC Recommendations for Constructive Participation*. February 2020, USCBC, Washington DC, 2020.

113 (Two Sessions press release) *Outline of the 14th Five-Year Plan for National Economic and Social Development of the PRC and the Vision For 2035*, *Xinhua*, 13th March 2021, viewed 3rd April 2021, <http://www.xinhuanet.com/2021-03/13/c_1127205564.htm>

114 *CPCCC and the State Council issue 'The Outline of the National Development Plan for Standardization'*, State Council, viewed 14th October 2021, <http://www.gov.cn/zhengce/2021-10/10/content_5641727.htm>



- The strategy manifests a shift in ambition. Standardisation is not only primarily seen in a domestic context, but equal weight is given to international standard setting. This includes the allocation of more resources, the ambition to invite international professional standards organisations to settle in China (similar to industry consortia based in the US) and the claim that technical standards should help the PRC to increase supply chain security.
- China's international standard ambitions are coupled with a commitment to increase synchronisation of international and Chinese standards. China claims to have reached an adoption ratio of 85 per cent of international standards; however, the details of these calculations do not conform to international analyses.¹¹⁵ At best, the claims can be seen as an aspiration to increase synchronisation, as some international observers have already concluded. However, it remains uncertain whether this will be an identical adoption, as is being advocated by most FIEs.
- The strategy states that China wants to improve cooperation with the ISO. While the strategy does not mention a China-dominated international SDO, it does set a goal for increasing international importance, including within the BRI, BRICS (Brazil, Russia, India, China and South Africa), the Asia-Pacific Economic Cooperation and other regional cooperation mechanisms. This implies an ambition to translate Chinese standards as a precondition for the internationalisation of Chinese standards.
- China also commits to increasing the openness of its domestic standard-setting system in accordance with the law governing FIEs. This is a repetition of promises made in the FIL that are yet to be implemented. Inclusion in the standardisation strategy is a positive sign for FIEs since it reinforces political guidance.
- Domestically, the strategy emphasises the importance of market-tier standards, primarily association standards. The dual system of state- and market-tier standardisation will remain in place. The CCP commits to strengthening the market-tier but also repeats that the leadership and coordination of the public authorities will remain in place. The emphasis on high-quality standards, and the introduction of evaluation and feedback mechanisms, could even indicate a tightening of oversight. The strategy speaks of "third-party standards quality evaluation", but how this will be implemented is not yet clear. Other reforms include the ambition to shorten the timeframe for developing standards to less than 18 months, digitalise standardisation, strengthen standardisation research, and improve the governance of SEPs and IP protection.
- The strategy identifies digital, mobility, energy, health, green transformation, finance, trade, construction, rural development and urbanisation as core sectors to focus on.

The development of this national standardisation strategy was a recommendation of CS2035, which has garnered wide attention and speculation. Some western observers have characterised CS2035 as a new 'masterplan' following on from the Made in China 2025 initiative.¹¹⁶ Others have been sceptical of such an interpretation,¹¹⁷ referring to the cooperative nature of technical standardisation, which makes it difficult to dominate standard setting.¹¹⁸

Some CS2035 results were deemed controversial among relevant authorities,¹¹⁹ and some of its recommendations did not make it into the national technical standardisation strategy. However, this does

115 For example, see: *China in International Standards Setting: USCBC Recommendations for Constructive Participation*. February 2020, USCBC, Washington DC, 2020, p. 5.
116 Kyngé, James and Liu, Nian, *From AI to Facial Recognition: How China Is Setting the Rules in New Tech*, *Financial Times*, 6th October 2020, viewed 19th October 2020, <<https://www.ft.com/content/188d86df-6e82-47eb-a134-2e1e45c777b6>>; de La Bruyère, Emily and Picarsic, Nathan, *China Standards 2035: Beijing's Platform Geopolitics and "Standardization Work in 2020"*, Horizon Advisory, New York, 2020; *China's Standards 2035 Plan Seeks to Dominate Standards for Emerging, Disruptive Technologies, and ICT Global Marketplace*, Department of Justice, Washington DC, 2021.
117 Chipman Koty, Alexander, *What is the China Standards 2035 Plan and How Will it Impact Emerging Industries?*, *China Briefing*, 2nd July 2020, viewed 27th July 2021, <<https://www.china-briefing.com/news/what-is-china-standards-2035-plan-how-will-it-impact-emerging-technologies-what-is-link-made-in-china-2025-goals/>>
118 Wilson, Naomi, *China Standards 2035 and the Plan for World Domination - Don't Believe China's Hype*, Council on Foreign Relations, 3rd June 2020, 27th July 2021, <<https://www.cfr.org/blog/china-standards-2035-and-plan-world-domination-dont-believe-chinas-hype>>
119 Information according to author interviews with Chinese standardisation officials and experts, October–November 2019.

not imply that those recommendations are irrelevant to China's future standard-setting approach. Instead, they should be regarded as not yet having achieved consensus, and some may be implemented in the future.

Initiated by the SAC and the Chinese Academy of Engineering as a research project, CS2035 was always a tool to push for further standardisation reform in China. The project team included researchers from a wide range of institutions, including the China National Institute of Standardisation (CNIS), the China Academy of Information and Communications Technology (CAICT), Beihang University and Shanghai Jiao Tong University. Author interviews with Chinese standardisation experts suggest that the SAC hand-picked researchers that predominantly advocated reform proposals it was pushing for.

While CS2035 recommendations not included in China's standardisation strategy are unlikely to be publicly promoted any time soon, the original proposals can still help to understand what was and will most likely continue to be discussed internally among relevant Chinese authorities. In 2019, CS2035 suggested the following actions for domestic Chinese standard setting:

- The standardisation system should be reduced to only two types of standards, namely national and association standards. Mandatory and voluntary national standards would continue to exist. National product standards, unless a specific need exists, would be converted into association standards. Sector and local standards would be abolished or transformed into national and association standards.¹²⁰
- Association standards should be further strengthened since they continue to account only for a small share of all Chinese standards. These standards should be rapidly developed, target new technologies, remain flexible, potentially include all relevant actors and be of high quality.
- The standard management system should be strengthened to avoid conflicting and contradictory standards, and maintain—if not increase—government oversight over technical standards. In 2021, a Ministry of Industry and Information Technology (MIIT) document further suggests that this implies a deeper integration of standards and industrial policymaking.¹²¹
- Standardisation should be strengthened to facilitate China's civil-military fusion. This suggests that standard setting should focus on strategic key enabling technologies, not only with the purpose of developing civilian and commercial applications but also military applications.
- China should strive to improve academic standardisation education in terms of both quality and quantity.

While these recommendations were generally perceived positively in Europe, plans such as civil-military fusion and the strengthening of association standards met scepticism. This is because several challenges for FIEs are particularly severe in association standard setting, such as suboptimal access, non-transparent development of standards, and the large diversity and overlap of standards, among other issues.

Similar to the national standardisation strategy, CS2035 was not limited to the domestic sphere but suggested a deeper engagement in international SDOs – the ISO and the IEC in particular.¹²² These plans sound encouraging to Europeans since they signal China's willingness to integrate into existing

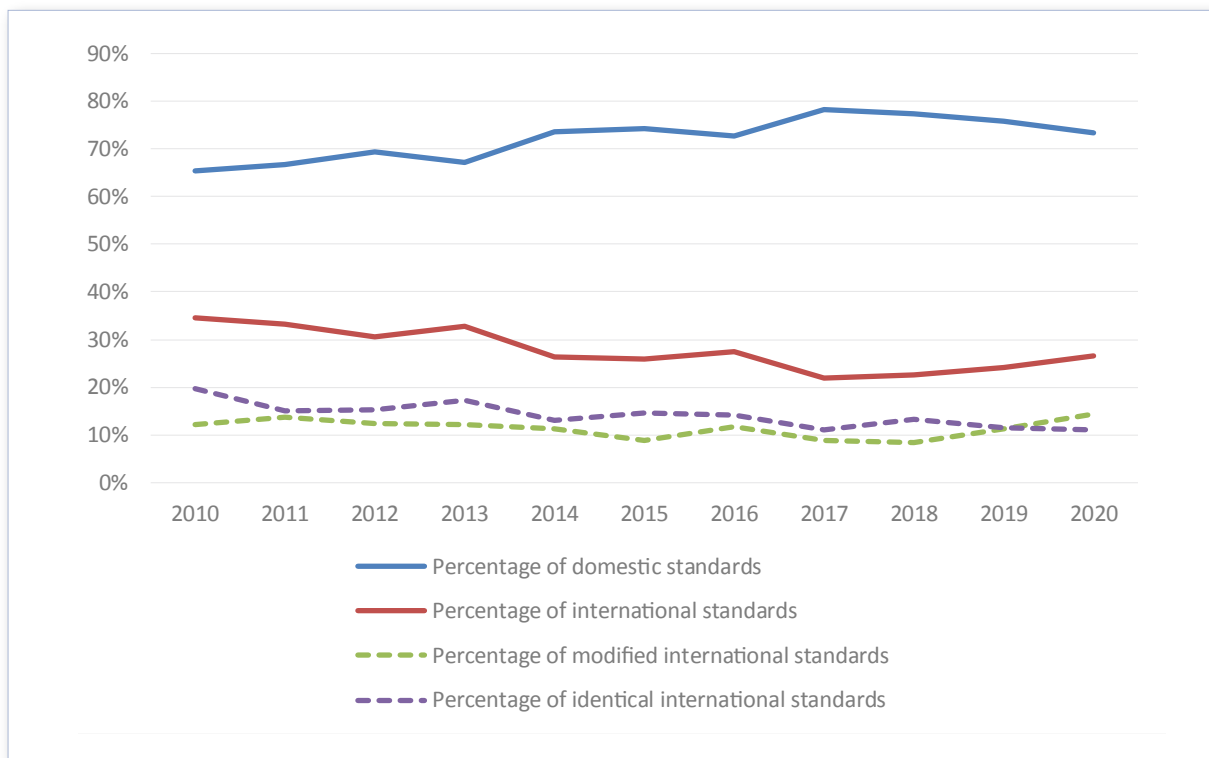
¹²⁰ Even in late 2019, it was not difficult to sense that this proposal met strong resistance. Standardisation experts from national ministries and local authorities criticised the plans. Their resistance should not be underestimated: some provinces employ several hundred officials tasked with technical standard setting while the SAC has only around 70–80 officials. This resistance implies a strong institutional interest and advocacy against the plans for abolishing sector and local standards: Information according to author interviews with Chinese standardisation experts (public officials), November 2018–September 2021.

¹²¹ *MIIT Priorities for Standardization Work in 2021*, SESEC, Beijing, 2021, available for download at <<https://sesec.eu/wp-content/uploads/2021/04/Annex-1-MIIT-Priorities-for-Standardization-Work-in-2021.pdf>>

¹²² Based on privately-obtained documents, as well as author interviews with Chinese standardisation officials, September–October 2019.

international SDOs. However, China’s rhetoric contrasts with lowering ratios of domestic adoption of international standards in recent years. Calculating such adoption ratios is anything but simple. Hence, assessments vary. Rhodium Group and BusinessEurope, for example, identify a continuous downward trend from an adoption ratio of 69 per cent in 1998 to only 21 per cent in 2017.¹²³ European Chamber member companies, in turn, have “observed that the overall percentage of new international standards issued by China has slightly increased since 2017, [they also note...] a general downward trend in the past decade, and that a number of these standards are not identical to their international counterparts” (Figure 22).¹²⁴

Figure 22: Percentage of international standards vs domestic standards issued in a given year (2010–2020)



Source: SAC, European Chamber

One way of interpreting these analyses is that they are an indication that China is striving to increase its influence in international standard setting without fully integrating into the system, thereby not accepting the premise of international standards. If this interpretation is correct, the aspirations to increase influence in international standard setting included in the national standardisation strategy need to be viewed and responded to with caution.

However, another interpretation is that not a lack of willingness, but rather domestic factors, negatively impact China’s adoption policy. The SAC aims to keep the number of national standards relatively low, implying that it would likely be hesitant to approve a high number of standardisation initiatives. Therefore,

¹²³ *The EU and China: Addressing the Systemic Challenge - A Comprehensive EU Strategy to Rebalance the Relationship with China*, BusinessEurope, Brussels, 2020, pp. 85.

¹²⁴ *Standards and Conformity Assessment Working Group Position Paper 2021/2022*, European Union Chamber of Commerce in China, 23rd September 2021, viewed 20th October 2021, <https://www.eurochamber.com.cn/en/publications-archive/949/Standards_and_Conformity_Assessment_Working_Group_Position_Paper_2021_2022>

faced with the need to prioritise the development of some national standards over others, Chinese standardisers have a self-interest in developing their own standards instead of filling their quota through the adoption of international standards. The underlying reason is that the development of standards requires more work, which generates and safeguards employment, than the process of the adoption of standards.¹²⁵

If this interpretation holds true, the national standardisation strategy could serve as a means to break domestic resistance and increase Chinese identical adoption of international standards. The establishment of no less than 17 TCs in China that mirror those in the ISO could be another sign of the PRC's growing willingness to engage with international SDOs.¹²⁶

Apart from deepening engagement in international SDOs, CS2035 also proposes the establishment of a BRI Regional Standards Forum.¹²⁷ This new institution could be registered as a non-governmental organisation, according to information from participants of the project, and be open to technical standardisation experts from BRI countries. It could both facilitate coordination among members in preparation for standardisation in the ISO and the IEC, and develop BRI regional standards. If implemented, the latter would imply that China is establishing an international SDO to rival the ISO and the IEC, and developing a new type of international standard. If the forum merely coordinates BRI countries' efforts in the ISO and the IEC, it would still most likely strengthen the PRC in these institutions, but would not undermine existing international SDOs.

While the idea of such a forum had been part of the CS2035 proposal in 2019, it was not mentioned at the Qingdao Standards Forum 2021, or included in the national standardisation strategy. However, the aspiration of a Chinese-controlled, international SDO is not new, and it is too early to tell whether the idea is indeed off the table.

This begs the question, will China ultimately integrate into the existing international standardisation system or simply strive to project its own power by means of technical standards and undermining international SDOs? Although speculative at this time, it needs to be mentioned that the two actions are not mutually exclusive.

While the national standardisation strategy is an encouraging sign, since it emphasises the importance of existing SDOs, China could adopt different sector-specific practices in parallel. Hence, the PRC's plans are not reassuring for the EU, which should continue to carefully follow China's actions.

125 Information according to telephone interviews with European standardisation experts, July–September 2021.

126 *SESEC IV, China Standardisation Newsletter. June–July 2021*, SESEC, Beijing, 2021.

127 Based on privately obtained documents as well as author interviews with Chinese standardisation officials, September–October 2019.



Chapter 5: Recommendations

European and international observers are concerned about the current environment in technical standard setting. China's growing footprint in this area is one among several factors fuelling three developments that require action, namely, the politicisation, the bifurcation and the power shift in standardisation. For a deep-dive on these challenges, please refer to Annex 4 on page 72.

Recommendations for European governments

European policymakers from both the European Commission and EU Member States need to tackle the three main challenges of politicisation of technical standards, the threat of a bifurcation of international standard setting and the loss of European influence. More generally, the EU is strongly advised to make standards a default part of its trade and industrial policy, and consider standardisation as one of several important issues when deciding on competition law reform. Standardisation is of enormous strategic importance—and will only become more so—and therefore requires more attention.

Respond to the Politicisation of Technical Standardisation

Although China has made remarkable progress with its state-steered approach to technical standard setting, the EU should not abandon its privately-driven PPP approach that made it a global technical standardisation power. However, with technical standards having become a subject of political competition, the EU needs to systematically coordinate its strategic priorities and advocate a non-political approach.

- *Facilitate a three-layered strategic standardisation dialogue within the EU:* At least once a year, all EU Member States and the European Commission should meet for a dialogue on technical standardisation to identify and coordinate strategic goals and concerns from the perspective of public authority. As a first step, this dialogue should create consensus over strategic sectors including 5G, AI, IoT, quantum technologies, semiconductors and robotics (layer 1). In direct conjunction, public representatives should engage in dialogue with the EU's SDOs to communicate these strategic priorities (top-down) and understand the challenges SDOs face (bottom-up). This dialogue should support coordination and identify needs for financial support for European SDOs (layer 2). In strategic sectors, the European Commission should further sponsor information-exchange forums for European SDOs and European industry, similar to China's IMT 2020 (5G) Promotion Group, to concretely prepare for international standardisation (layer 3).
- *Coordinate strategically with like-minded partners:* The EU is not the only international actor advocating a technical approach to standard setting. Australia, Japan and New Zealand are the most obvious like-minded partners to coordinate efforts. The US is a more complicated partner. On the one hand, the EU and the US share the premise that standardisation is privately-driven, and there is great overlap of interests in values inscribed in technology standards. On the other hand, there are two challenges that complicate cooperation, not least in the EU-US Trade and Technology Council's (TTC's) working group on technical standardisation. First, since both partners agree standardisation should remain privately-driven, coordination among policymakers must walk a fine line so that it does not encroach on the domain of private standardisers. Second, the US and the EU have very different standardisation systems. Therefore, the TTC working group should primarily serve a coordinating function in new

technologies and communicate strategic goals similar to the 'layer 1' dialogue suggested in the previous recommendation. It should also focus on low-hanging fruit and strive for what is realistically feasible, as well as to coordinate efforts to establish human rights as a criterion in the assessment of standard setting (see below).

- *Invest in standardisation knowledge:* In 2020, the US invested USD 1 million in a National Institute of Standards and Technology study of China's technical standardisation efforts in new technologies. Similarly, Australia has dedicated euro (EUR) 3.8 million to boost Australia's influence in international standardisation.¹²⁸ The EU should follow such examples and investigate more deeply the political implications of standardisation in different sectors and contexts. This could include a deep dive into strategic sector standardisation such as in AI, and a comprehensive analysis of technical standardisation in Chinese-financed BRI projects.
- *Incentivise the adoption of international standards in connectivity initiatives:* States participating in the BRI are increasingly aware that incorporating Chinese technical standards comes with inherent technological dependencies. The EU should therefore try to alleviate any related unease by incorporating and incentivising the adoption of international standards in all financing vehicles, primarily through its new Global Gateway initiative.¹²⁹ Success will depend to a large extent on the EU's financial contributions.
- *Insist on transparency and the acknowledgement of fundamental values as benchmarks for standards:* Technical standards are inscribed with values that touch upon human rights concerns, among others. With more political representatives taking an increasingly direct and prominent role in standard setting, fundamental human rights should be acknowledged as a criterion – at least in strategic sectors such as AI. The EU could advocate SDOs and standard-developing industry consortia to adopt a self-commitment to basic human rights. For example, the Internet Research Task Force (IRTF) has already developed human rights guidelines,¹³⁰ and the IETF has a similar solution for privacy considerations.¹³¹ Targeted support for the involvement of civil society groups should also help to ensure that human rights remain an active focus of standardisation.

Prevent the Bifurcation of Technical Standardisation

The EU has no interest in the bifurcation, fragmentation or regionalisation of technical standardisation into two or more spheres. Such a decoupling of standards will shrink markets, hamper international trade and reduce innovation. Therefore, the EU should continue to cooperate with China but be clear about international rules and demand reciprocity.

- *Target a diverse set of actors in China to advocate the European approach to standardisation:* The EU's Seconded Standardisation Expert in China (SESEC) explains and advocates the European approach to technical standardisation. This engagement should receive additional funds so it can be further extended to state and industry players, creating momentum for more aspects of the European approach to be adopted beyond government authorities. Importantly, such activities need to be coordinated with the SAC.

128 *Ensuring American Leadership over International Standards Act of 2019*, US Congress, 8th June 2020, viewed 27th July 2021, <<https://www.congress.gov/116/bills/hr7139/BILLS-116hr7139ih.pdf>>; *Digital Business Plan to Drive Australia's Economic Recovery*, Australian Government, 29th September 2020, viewed 27th July 2021, <<https://www.pm.gov.au/media/digital-business-plan-drive-australias-economic-recovery>>

129 *2021 State of the Union Address by President von der Leyen*, europa.eu, 16th September 2021, viewed 2nd November 2021, <https://ec.europa.eu/commission/presscorner/detail/ov/SPEECH_21_4701>

130 *Human Rights Protocol Considerations Research Group*, IRTF, viewed 2nd November 2021, <<https://irtf.org/hrpc>>

131 *Privacy Considerations for Internet Protocols*, IETF, July 2013, viewed 2nd November 2021, <<https://datatracker.ietf.org/doc/html/rfc6973>>



- *Continue offering support for a 'Beijing' and a 'Shanghai' agreement:* China has voiced interest in concluding a 'Beijing Agreement' and a 'Shanghai Agreement' with the ISO and the IEC, resembling the European Vienna and Frankfurt agreements that strengthen international standards. The EU has rich experience and expertise in this regard and should uphold its offer to facilitate Chinese efforts.
- *Insist on reciprocity in bilateral dialogues and explore concrete cooperation:* The European Commission should proactively seek an indication from European industry and SDOs to raise discriminatory practices within China at the EU-China dialogues, and not be shy to bring these issues to the WTO / TBT Committee. While the CAI has promising clauses, it will not fully solve existing European concerns, even if it is ratified. The EU should also request proper implementation of the FIL, so that improved access of FIEs to Chinese standardisation is guaranteed by law. In addition, EU-China and national dialogues of EU Member States with the PRC should explore the potential of common interests in technical standard cooperation in specific sectors, with a focus on concrete deliverables. One ongoing example is EU-China collaboration on green investment taxonomy standard setting. All this should be part of continued EU efforts to deepen the dialogue with China without neglecting differences in interests and values.
- *Impose sanctions in cases where a lack of standard reporting is identified with regard to the EU's WTO reform proposal:* Despite progress, China still falls short of its reporting duties to the WTO's TBT Committee on technical standards. The EU should not only continue to raise this with China, but also develop a simple sanctions mechanism for dealing with violations of reporting duties and include it in its WTO reform proposal.
- *Address challenges to certification:* The EU should continue to demand the recognition of international certification in China.¹³² It should further be explicit that notified bodies (NBs) fall under the EU's foreign direct investment (FDI) screening mechanism to avoid Chinese takeovers in critical sectors with a high market concentration of NBs, particularly in smaller EU Member States.

Maintain the EU's Influence in Technical Standardisation

The EU would be advised to consider adopting the below measures in order to strengthen innovation through competition and the provision of reliable and fast digital infrastructure, and to facilitate both a rapid formulation of standard contributions from European innovation and their timely publication.

- *Reform and strategically use Horizon Europe:* The EU could make better use of its research funding to promote innovation in strategic sectors and the development of standard contributions. For example, the EU can include standard contributions as deliverables alongside publications and patents in its Horizon calls. To leverage research funding, the EU could further reform Horizon Europe to better coordinate with member state funding schemes and introduce an additional layer of competition. For innovation in key enabling technologies, EU Member States could join forces in a new bloc-wide registry of national funding schemes. When nationally-funded research projects are two-thirds complete, an independent scientific review could identify the most promising nationally funded projects to receive Horizon Europe funding for the final stage. Thereby, EU Member States' and EU funding would be leveraged by means of a Europe-wide competition mechanism.

¹³² *Standards and Conformity Assessment Working Group Position Paper 2021/2022*, European Union Chamber of Commerce in China, 23rd September 2021, viewed 20th October 2021, <https://www.europeanchamber.com.cn/en/publications-archive/949/Standards_and_Conformity_Assessment_Working_Group_Position_Paper_2021_2022>

- *Support academic standardisation training:* In China, thousands of engineering students graduate every year from programmes that either exclusively train them in technical standardisation or include modules exposing them to standard setting. In Europe, engineers normally learn about standardisation only after they start working. The EU should promote and fund the establishment of academic standardisation education in the bloc, particularly programmes that provide practical knowledge of standard setting. In addition, civil society actors should be encouraged and supported to participate in international standard setting. With no commercial interests in China, they would be free to speak up and emphasise the ‘values dimension’ of standardisation.¹³³
- *Facilitate the participation of SMEs and civil society in standard setting:* Technical standards are mainly developed by large companies. However, academic research suggests that SMEs have a higher success rate when they engage in standardisation.¹³⁴ The EU should provide additional funding via Small Business Standards (SBS) to support SME participation in standardisation, particularly at the international level. Relatively small amounts of financing can create the desired incentive and help strengthen European influence. In addition, the EU could provide financial incentives for non-profit civil society actors to get more involved in international standard setting. In the absence of business interests, civil society actors can be freer to address the values dimension of standardisation.
- *Support conditions for ‘early mover’ advantage:* The EU remains relatively strong in research and innovation but faces challenges in early commercialisation. For critical new technologies, the EU should consider setting up a special supportive framework, under which entrepreneurs could submit their innovations for scientific review. The framework could also allow them to apply for temporary exceptions from certain regulation that impedes timely commercialisation and—if needed—receive funds to bridge the ‘valley of death’ between innovation and commercialisation. Such support would facilitate new technological innovation and quicker market deployment, both favourable early steps for standardisation. The review could assess innovativeness, prospects of market success, and the potential to serve the EU’s strategic interests and public good, as well as analysing the risks if regulation is temporarily suspended.
- *Improve conditions for innovation:* Europe can only remain a technical standardisation stronghold if it continues to be an innovation powerhouse. This requires focussing efforts on rolling out the most innovative technology for basic wireless infrastructure, known as standalone 5G, and deepening the Digital Single Market to streamline conditions and thereby create reliable investment conditions in key enabling and foundational technologies. Another example is the reform of public procurement in digital technologies. In cutting-edge, critical technological infrastructure, the EU and its member states should divide procurement into several stages. In the first stage, a relatively high number of suppliers should be chosen to pilot a given infrastructure, followed by a competitive review of deployment. The second and third rounds of procurement should each reduce the number of contracts awarded. This procedure induces more competition in the procurement process in terms of quality, price and timely deployment.

Recommendations for the Chinese Government

European and Chinese interests may not always align, but China should also be aware of politicisation, bifurcation and influence in its standardisation policy, as they have negative implications for China as well

¹³³ For more concrete proposals see also: *Task Force Bildt Report: Operationalizing the Recommendations of the Bildt Report*, ETSI, viewed 15th October 2021, <<https://www.etsi.org/images/files/ETSI-Report-of-the-Task-Force.pdf>>

¹³⁴ Gupta, Kirti, *The Role of SMEs and Startups in Standards Development*, 12th July 2017, viewed 30th September 2018, <<http://dx.doi.org/10.2139/ssrn.3001513>>



as the EU.

Respond to the Politicisation of Technical Standardisation

China may have adopted a state-steered approach to technical standard setting, but its ultimate goal is the state's economic transformation. High standards, China's leadership appears to hope, will facilitate China moving up the value chain, improving the quality of Chinese technology inventions and helping it transform into a digitalised and carbon-neutral society. Such improvements, however, require a central focus on technical expertise. Therefore, strengthening market mechanisms and industry involvement would allow China to achieve its core goal. While the politicisation of standardisation is in part a result of China's own approach, it is not actually in China's interests.

- *Provide fair and equal treatment for all companies that want to engage in domestic standardisation activities:* An approach to technical standards that promotes technical quality should not discriminate against actors due to their origin. Therefore, China should fulfil the promises it has made in its FIL, as well as its standardisation strategy, and grant all interested stakeholders—including FIEs—fair access to all TCs, SCs and WGs. In addition, China should guarantee equal rights to all entities participating in standard development committees, ensuring transparency regarding membership requirements, fees and information disclosure, while encouraging inclusive standard setting across standard development associations. European firms should be granted the same rights in Chinese standardisation as China's companies enjoy in European SDOs.
- *Increase inclusivity of association standards:* China is advised to refrain from elevating association standards that are not developed in an inclusive manner to national or sector standards, and to provide inclusive mechanisms for review and commentary in the process of incorporating association standards into a standard type under the state-tier or administrative measures.
- *Simplify and streamline conditions for market access and certification:* Market competition is indispensable for China's economic transformation to a 'quality power' moving up the value chain. Hence, it should be in the country's interests to streamline market access. This is not to say that China has no legitimate interest in properly regulating its domestic markets by means of mandatory standards, compulsory certification, administrative licensing and other regulations. However, such measures would serve China better if they are properly synchronised and made fully transparent. For example, at the moment, not all mandatory approval schemes for market access are based on national mandatory standards. This should be amended, not least in order to comply with WTO obligations. In other words, China should not necessarily lower market access requirements, but instead provide the most effective and transparent framework possible. This includes allowing manufacturers to use their own testing laboratories if they meet all necessary accreditation requirements, and making it easier for international laboratories and certification bodies to provide testing accepted in China.
- *Improve the protection and licensing of SEPs:* A growing share of technical standards, particularly in the ICT sector, consists of patented technology that needs to be licensed under fair, reasonable and non-discriminatory (FRAND) terms. This internationally agreed framework should be fully implemented and guaranteed in China as well. China's patent disclosure regime is undergoing improvements, and this process should continue in order to make sure all companies, including FIEs, are remunerated according to FRAND terms for their SEPs.

- *Ensure fair and transparent market surveillance:* In China, voluntary standards are often *de facto* mandatory. Market access should, however, be limited to compliance with laws, regulations, mandatory standards and certification schemes. Quality issues that are not part of mandatory prescriptions should not be a subject of market access but rather civil liability.

Prevent the Bifurcation of Technical Standardisation

Just like the EU, China should not have an interest in the bifurcation of technical standardisation. Notably, China opts for regional standardisation under the umbrella of the BRI almost exclusively in fields in which the country is not (yet) able to compete on quality. In technological areas in which China is advanced, such as 5G, it makes sense for China to strive for influence in global standards. Thereby, China indirectly acknowledges that increasing product quality should come with global standards. If China wants to contain the emerging power competition over high technology, standardisation could be an important tool since cooperation is essential for technical standard setting. However, this will require China to implement several policy amendments.

- *Accept the premise of the ISO and the IEC:* At the core of a unitary international standardisation system are the ISO and the IEC. China has increased its engagement in these organisations and should continue doing so, coupled with a clear commitment to the premise of international standards. This implies that China should promote harmonisation with international standards within BRI projects instead of pursuing distinct standards. Most harmful would be the establishment of a regional BRI standardisation organisation. The fact that China has not mentioned the BRI Regional Standards Forum in its standardisation strategy is an encouraging sign. If China would publicly declare it will not establish a BRI Regional Standards Forum or any similar institution, it would send an even stronger signal.
- *Increase identical adoption of international standards:* Active engagement in international standard development is only one aspect; equally important is that China implements international standards domestically. In recent years, the rate of adoption of international standards has declined in China, despite aspirations to the contrary, not least because domestic incentives stand in the way of reversing this trend. Most prominently, national TCs have only a limited informal quota of standards, and a self-interest in fulfilling this quota with labour-intensive standardisation that sustains domestic employment. China should lift such informal restrictions and actively encourage the identical adoption of international standards to underline its commitment to international standard setting.
- *Comply with WTO / TBT principles:* Despite improvements, China continues to fall short of its notification commitment to the WTO's TBT Committee with regard to mandatory standards, technical regulations and conformity assessment procedures, including administrative licensing, which ultimately has an impact on market access. In addition, China should continue its work to limit the scope of mandatory standards to the protection of the environment, health and safety, in line with the TBT Agreement. To further streamline its domestic standardisation system, China should fully abolish mandatory sector standards.
- *Avoid using standards as trade barriers:* Traditionally, China used technical standards as trade barriers. In light of China's economic transformation, this is less and less the case. This process should be further accelerated.



- *Accept international testing and certification in cases where standards are identical:* In some cases, even when Chinese and international standards are identical, China continues to require Chinese tests and certificates. This artificially increases costs for conformity assessment with no benefit. Therefore, China should increase mutual recognition with no additional testing.

Consider China's Technical Standardisation Influence

While the EU and China compete over technical standardisation, there can be no doubt that growing Chinese influence is a natural and legitimate result of the country's increasing innovativeness. At the same time, it is in China's interest to further reform its domestic system and carefully study the EU's approach. Some of the following recommendations form part of China's national standardisation strategy, so relevant Chinese authorities are encouraged to implement them in a timely manner.

- *Consider Europe's PPP model when undertaking standardisation reform:* Because national conditions for technical standard setting vary in China and the EU, it is understandable that China does not adopt wholesale the European standardisation system. However, in contrast to the US, the EU's model is not purely market-driven but also provides for greater guidance of public actors. It is therefore in China's interest to continue carefully studying the European PPP model and to incorporate the EU's experiences into its own standardisation development.
- *Increase meaningful communication with the EU on standardisation:* While China is recommended to deepen communication with the EU and European SDOs, recent years have rather seen the reverse trend, perhaps partly as a result of the COVID-19 pandemic. China should soon restore and further develop communication with European actors to facilitate cooperation, deepen understanding of the European standardisation approach and consider partial incorporation of some aspects into further reforms. This cooperation should be based on reciprocity and aim for concrete deliverables.
- *Deepen the current reform of standardisation and increase harmonisation of standards:* Although China aimed for concluding standardisation reform by 2020, it could continue further. This could include, for example, expanding the reform to exempted areas of mandatory national standards, introducing a reasonable transition period for mandatory standards in practice, reconfirming that association standards remain voluntary and strictly avoiding their inclusion in administrative measures, and making sure to obtain authorisation of copyright owners when referencing IP in standards. Another example would be further reform of the disclosure regime of enterprise standards by explicitly allowing enterprises to make self-declarations on their own websites.
- *Push for further domestic reform and streamline the standardisation system:* Of the future directions of standardisation reform proposed in CS2035, the most important is the streamlining of the standard system into two types, namely national and association standards. This should be implemented, but also coupled with a reform of the association standards system to improve its performance.
- *Commit to civilian use of technical standardisation:* China's standardisation efforts have suffered from international pushback, not least due to the explicit linkage of civilian and military purposes of standard setting. This 'civil-military fusion' is damaging China's international reputation and the influence that it holds on standard setting. To reverse this trend, China should commit to developing standards for civilian purposes and make this a clearly-communicated domestic policy.

Recommendations for European businesses

European businesses—whether operating in China or not—are, or will be, directly affected by the politicisation, bifurcation and power shifts in technical standardisation. This requires them to adapt to the current environment in order to remain competitive and relevant in global markets.

Respond to the Politicisation of Technical Standardisation

While the politicisation of technical standards may not be in the interest of European businesses, they cannot neglect this development if they want to avoid falling victim to this trend. The following two recommendations should be considered.

- *Make standard setting part of strategic considerations:* Although technical standardisation has long been considered a technical issue, recent developments have seen it become an increasingly political matter. This requires European firms to incorporate standardisation into strategic considerations, and ensure that it is addressed at the chief executive level.
- *Be ready to cooperate with policymakers and business organisations:* In the past, technical standard setting was largely a private matter, carried out in private National Standard Bodies (NSBs) or European Standardisation Organisations (ESOs). It was in the interest of industry to mostly keep public participation limited. The politicisation of standardisation should not lead European business to abandon its privately-driven approach to standard setting, but strategic cooperation among policymakers and clear communication of conditions on the ground to public authorities will be required. Close collaboration with business organisations like the European Chamber and BusinessEurope is also crucial. Exchange of information and leveraging these organisations to raise and advocate common industry concerns is essential for improving or at least preserving the conditions in domestic and international standard setting.

Prevent the Bifurcation of Technical Standardisation

A bifurcation of standards into different spheres of influence would make markets smaller and harm European export interests, while also raising companies' R&D costs and reducing efficiencies. The following two recommendations should therefore be heeded:

- *Increase investment in technical standard setting:* Although the European Chamber / UI survey shows that nearly a third of respondents are planning to increase investment in standardisation activities over the next five years, nearly half are maintaining their current level of spending, and just over a fifth have not yet decided. Preventing a bifurcation of international standard setting requires a presence in standard setting forums, so it is in the medium- and long-term interest of all European enterprises to sustain, if not increase, their commitment and resources devoted to standardisation. This should apply not only to material resources, but also the commitment to international SDOs, while the primacy of international over national or regional standards should be sustained and strengthened. This should also include advocating for the use of international standards in third countries.
- *Prepare for sector-specific developments:* It is unlikely that there will be a complete bifurcation of technical standardisation. In some sectors, global standards will most likely prevail, while in others



some international standards may fall apart. In its *Position Paper 2021/2022*, the European Chamber recommends that companies establish ‘decoupling teams’ to evaluate the implications of a potential disconnection from certain global systems, and to prepare mitigation strategies.¹³⁵ Standardisation should be a key area for such teams to monitor. In cases where decoupling of standard setting is a risk, European industry should consider increasing its commitment to international standards and actively engage Chinese competitors in order to disincentivise China from establishing alternative international institutions.

Maintain the EU’s Influence in Technical Standardisation

Ultimately, Europe’s strength in technical standardisation is derived from European industry. In addition to increasing resources, the following two proposals should be considered:

- *Upgrade the status of standards in employment processes:* Acknowledging the central importance of standardisation also requires attracting talent. Europe is lacking young, qualified standardisation experts not only due to a lack of relevant education, but also suboptimal employment opportunities. European enterprises should therefore make standard-setting competence a selection criterion in employment processes and thereby strengthen their footprint in standardisation by means of increased expertise.
- *Contribute to the improvement of European coordination in standardisation activities:* For a long time, ‘Team Europe’ coordination in standardisation activities has been considered risky because of the fear that the US could protest against national delegations being permitted to vote in a unitary manner, thereby distorting standard setting. At the extreme, EU Member States feared they could be reduced to one single European vote in international standardisation. Though this is unlikely given Europe’s power, interviews conducted for this study point to a clear lack of coordination within Europe as a major weakness when compared with China’s standardisation practices.¹³⁶ European industry stakeholders should therefore strive for improved alignment in technical standardisation.

¹³⁵ *European Business in China Position Paper 2021/2022*, European Union Chamber of Commerce in China, 23rd September 2021, viewed 2nd November 2021, <<https://www.eurochamber.com.cn/en/publications-position-paper>>

¹³⁶ Information according to telephone interviews with European standardisation experts, July–September 2021.

Annexes

Annex 1: Technical standardisation – an introductory explanation

Every day, we rely on a multitude of technical standards, mostly without even noticing it.¹³⁷ This study is printed on a standardised paper size, with standardised colours and fonts, typed on a standardised keyboard and in a word processing programme that is interoperable with an operating system due to technical standards. It is the result of collaboration and interviews with experts that required written and oral communication by means of messaging services, email or mobile phone connections, all of which rely on technical standards, not least the Internet Protocol. If you read this study digitally, your device is powered by standardised power sockets. One example is universal serial bus (USB), which is a standard for cables, connectors and protocols that enables charging and the exchange of data on a wide range of devices regardless of manufacturer. Your device might be connected to the internet by a 4G/LTE or even a 5G network that was standardised only recently. An alternative is Wi-Fi, which is a family of radio technologies built upon technical standards that allows for wireless local area networking (WLAN) of a wide range of technological equipment. This list of examples could be continued.

In a nutshell, technical standards are specifications for common use that exist mainly for two purposes. First, to generate basic safety. Public laws and regulations for basic safety often lack technical precision and require technical standards to provide methods and the necessary detail for implementation. Second, technical standards generate interoperability, providing a basis for products of all kinds to be applicable in a wide range of contexts across countries and manufacturers. Only compatible standards allow interoperability between different products. Consumers profit from these 'network effects' or 'network externalities', as they are called.¹³⁸

Both functions mean that technical standards facilitate the globalisation of production and trade. Technical standards exist at national, EU and international / global levels.¹³⁹ Since laws and regulations apply only in states or within the EU, technical standards are particularly important for international trade. Defining unitary technical specifications beyond distinct areas of jurisdiction, technical standards provide information and thereby reduce transaction costs. A recent study on the impact of technical standards on Nordic countries confirms positive macroeconomic effects: 39 per cent of their labour productivity growth and 28 per cent of their gross domestic product (GDP) growth during the period 1976–2014 can be linked to technical standards.¹⁴⁰

Technical standards have their origin in industry products. Over time, more and more services have been included, and technical standards now cover a wide range of issues from environmental and labour conditions to management standards.¹⁴¹ Since technical standards raise quality and safety, improve transparency, reduce costs and generate markets, it is no wonder that the European Commission has announced plans to facilitate a broader set of standards, particularly in the services sector, which currently

137 Yates, JoAnne and Murphy, Craig N., *Engineering Rules: Global Standard Setting since 1880*, Johns Hopkins University Press, Baltimore, 2019.

138 Bonardi, Jean-Philippe and Durand, Rodolphe, 2003, *Managing Network Effects in High-tech Markets*, *The Academy of Management Journal*, vol. 17, no. 4, pp. 40–52.
Katz, Michael L. and Shapiro, Carl, 1986, *Technology Adoption in the Presence of Network Externalities*, *Journal of Political Economy*, vol. 94, no. 4, pp. 822–841.

139 Brunsson, Nils et al., 2012, *The Dynamics of Standardization: Three Perspectives on Standards in Organization Studies*, *Organization Studies*, vol. 33, no. 5-6, pp. 613–632.

140 *The Influence of Standards on the Nordic Economies*, Menon, 2018, viewed 7th September 2021, <<https://www.sis.se/globalassets/nyheterochpress/rapport-nordic-market-study---influence-of-standards-final.pdf>>

141 Murphy, Craig N. and Yates, JoAnne, *The International Organization for Standardization (ISO): Global Governance Through Voluntary Consensus*, Routledge, London, 2009; Tamm Hallström, Kristina, *The Use of Democratic Values in the ISO 26000 Process on Social Responsibility*, *Organizing Democracy: The Construction of Agency in Practice*, Sundström, Göran et al., eds., Edward Elgar, Cheltenham, 2010, pp. 48–64.



accounts for only two per cent of all standards.¹⁴²

Technical standards are neither laws nor legally-binding state regulations. Instead, the technical specifications that technical standards are come into being mainly through two mechanisms that generate two types of standards. The first type is formal standards that are the result of negotiations among primarily private actors. Commercial companies often dominate, but associations, consumer organisations and public regulators have a role too. For example, globally, ICT standardisation consortia predominantly consist of vendors and other commercial entities (93.6 per cent) followed by consumer groups (3.8 per cent), and universities and research institutions (2.5 per cent). Only 0.2 per cent of its members represent governmental agencies.¹⁴³

The documents that result from standard negotiations in these institutions are normally established by consensus and require some form of approval from an internal, recognised body (for example, a general assembly of all members). Such bodies can be standard development organisations (SDOs) that exist at national, EU and international levels, or industry consortia that develop technical standards, among other work items. Prominent SDOs include: the German Institute for Standardisation (DIN), the French Standardisation Association (AFNOR) and the Swedish Standards Institute (SIS) at the national level; the European Committee for Standardisation (CEN), the European Committee for Electrotechnical Standardisation (CENELEC) and the European Telecommunication Standards Institute (ETSI) at the EU level; and the International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO) internationally.

Industry consortia are particularly prominent in the standardisation of digital technologies. Among the most influential are the World Wide Web Consortium (W3C), the Internet Engineering Task Force (IETF) and the Institute of Electrical and Electronics Engineers (IEEE). An exceptional case is the International Telecommunications Union (ITU), which is an intergovernmental organisation within the system of the UN that allows for formal participation of private industry. In both SDOs and industry consortia, private actors are dominant, which is why technical standardisation is widely described as a form of private self-regulation. Similarly, the implementation of standards by means of accreditation and certification often lies with non-state actors.¹⁴⁴

Within formal SDOs, technical standards are developed in highly-specialised committees. In the ISO and the IEC, these groups are referred to as technical committees (TCs), subcommittees (SCs), and working groups (WGs). Participants meet on a regular basis and the TCs, SCs and WGs are coordinated by secretariats, chairs and vice chairs.

The second type of standards is *de facto* standards. These technical standards emerge from market dominance of products and specific technological solutions developed by one or only a few companies. When products gain such a strong market position that other products are designed in a way to be compatible with them, they serve as *de facto* standards.¹⁴⁵ For example, no authority has ever found Microsoft's operating system (OS) Windows or Apple's macOS to be global standards but most software applications are developed according to their technical specifications. Software that is neither compatible

142 *The Influence of Standards on the Nordic Economies*, Menon, 2018, viewed 7th September 2021, <<https://www.sis.se/globalassets/nyheterochpress/rapport-nordic-market-study---influence-of-standards-final.pdf>>.

143 Pohlmann, Tim, *Back To Basics Summer Webinar Part 2: SSOs, Patent Pools and Licensing*, IPlytics, Berlin, 2020.

144 Fouilleux, Eve and Loconto, Allison, 2017, *Voluntary Standards, Certification, and Accreditation in the Global Organic Agriculture Field, A Tripartite Model of Techno-politics, Agriculture and Human Values*, vol. 34, no. 1, pp. 1-14.

145 Gilbert, Richard J, *Networks, Standards, and the Use of Market Dominance: Microsoft (1995), The Antitrust Revolution: The Role of Economics*, Gilbert, Richard J., ed. Oxford University Press, Oxford, 1998, pp. 409-429.

nor complementary with Windows or macOS face a tough market situation. Hence, *de facto* standards become influential by means of bandwagon and imitation processes.¹⁴⁶

Despite not being laws or legally-binding regulations, technical standards are powerful in practice, and it is difficult to circumvent them by noncompliance.¹⁴⁷ Increased interconnectedness of a wide range of devices from smartphones to connected cars, smart home appliances, the development of smart cities or smart healthcare—in other words, the digitalisation of the world around us (the ‘Internet of Things (IoT)’)—makes interoperability a requirement that is more decisive than ever for products to be competitive on world markets.¹⁴⁸

Technical standards are durable because the costs of changing (‘switching costs’) can be high, and the uncertainty of subsequent market acceptance high.¹⁴⁹ Ultimately, technical standards only become relevant if companies find the technical specifications useful, needed and of common use and therefore implement them.

International standardisation largely resembles the approaches of the largest innovation powerhouses of the last decades, the EU and the US.¹⁵⁰ Notably, technical standardisation is largely driven by private industry in both Europe and the US. Where the approaches differ is in terms of their degree of formalisation. In the EU, standardisation has primarily focussed on and developed in formal standard setting, whereas the US has excelled at *de facto* standardisation and has even incorporated mechanisms of *de facto* standardisation into its formal standard setting.

While technical standards can be developed by any association in the EU, technical standard setting in Europe focusses on a hierarchical, institutional set of technical standardisation. Through licensing, Europe has identified a select number of SDOs as National Standard Bodies (NSBs) and European Standardisation Organisations (ESOs). At the national level, NSBs are most crucial while ESOs shape standardisation at the European level. The membership of two of the three existing ESOs, namely CEN and CENELEC, consists of NSBs. The ETSI’s membership is more diverse and includes relevant industry stakeholders with additional participation of research institutions, non-governmental organisations and government agencies. Around 20 per cent of standards developed by ESOs are established in response to requests from the European Commission to implement regulations in the public interest.¹⁵¹ These standards are known as harmonised European Norms (hENs) and take precedence over contradictory national standards. This European approach aims to set a framework that enables efficient, private standard development by avoiding contradictory standards; it is often described as a public-private partnership (PPP). This ‘new approach’ to standard setting was established in the mid-1980s to serve European economic integration and the deepening of the Single Market.¹⁵²

146 Werle, Raymund and Iversen, Eric J., 2006, *Promoting Legitimacy in Technical Standardization*, *Science, Technology & Innovation Studies*, vol. 2, no. 1, pp. 19–39.

147 Borraz, Olivier, 2007, *Governing Standards: The Rise of Standardization Processes in France and in the EU*, *Governance: An International Journal of Policy, Administration and Institutions*, vol. 20, no. 1, pp. 57–84; Brunsson, Nils et al., 2012, *The Dynamics of Standardization: Three Perspectives on Standards in Organization Studies*, *Organization Studies*, vol. 33, no. 5–6, pp. 613–632.

148 Bildt, Carl et al., *Calling the Shots: Standardization for EU Competitiveness in a Digital Era*, ETSI, Sophia Antipolis, 2019.

149 Farrell, Joseph and Saloner, Garth, 1985, *Standardization, Compatibility, and Innovation*, *Rand Journal of Economics*, vol. 16, no. 1, pp. 70–83.

150 Nicolaidis, Kalypto and Egan, Michelle, 2001, *Transnational Market Governance and Regional Policy Externalities: Why Recognize Foreign Standards?*, *Journal of European Public Policy*, vol. 8, no. 3, pp. 454–473; Tate, Jay, *National Varieties of Standardization, Varieties of Capitalism: The Institutional Foundation of Comparative Advantage*, Hall, Peter A. and Soskice, David, eds., Oxford University Press, Oxford, 2001, pp. 442–473.

151 Bildt, Carl et al., *Calling the Shots: Standardization for EU Competitiveness in a Digital Era*, ETSI, Sophia Antipolis, 2019, p. 16.

152 Egan, Michelle, *Constructing a European Market: Standards, Regulation, and Governance*, Oxford University Press, Oxford, 2001; Borraz, Olivier, 2007, *Governing Standards: The Rise of Standardization Processes in France and in the EU*, *Governance: An International Journal of Policy, Administration and Institutions*, vol. 20, no. 1, pp. 57–84.



Internationally, Europe is particularly strong in formal SDOs, with the ISO and the IEC at the core.¹⁵³ The CEN and CENELEC have formalised their cooperation with the ISO and the IEC through several agreements. As a result of the Frankfurt and Vienna agreements, the CEN and the CENELEC give priority to international standards. As of June 2021, 34 per cent of CEN standards and 73.5 per cent of all CENELEC standards were identical to ISO and IEC standards respectively. Another five per cent of CENELEC standards were based on IEC standards.¹⁵⁴ The CEN has committed to consult with the ISO before developing a new standard; the CENELEC only develops a new hEN when the same has failed at the IEC level, or the international standard does not adequately reflect specific European requirements.

ENs have also received acceptance outside of Europe. The CEN and the CENELEC have three affiliated SDOs, 17 companion standardisation bodies, five cooperation agreements and seven MOUs with non-European SDOs. An additional 24 non-European SDOs adopt European standards.¹⁵⁵

While the EU's formalised system strives to avoid conflicting and contradictory standards, the US has no formal mechanism to achieve the same. Instead, a high number of standard-developing companies, consortia and organisations compete for market acceptance.¹⁵⁶ Only the National Institute of Standards and Technology at the US Department of Commerce and the American National Standards Institute serve coordinating functions. In contrast to the EU, the strength of the US in international standard setting lies primarily outside formal SDOs. Instead, the US has a multitude of competing industry consortia, alongside *de facto* standards resulting from market dominance, making it far stronger than the EU in this area. In fact, many US-based standard-developing institutions identify themselves as international if some of their members are non-US companies.

Since both formal and *de facto* standardisation mostly rely on private companies and largely exclude public actors, many technical standards have long been perceived as non-political.¹⁵⁷ This is changing with the recent rise in politicisation of technical standardisation, with China's growing footprint in this area a driving factor.

153 Tate, Jay, *National Varieties of Standardization, Varieties of Capitalism: The Institutional Foundation of Comparative Advantage*, Hall, Peter A. and Soskice, David, eds., Oxford University Press, Oxford, 2001, pp. 442–473.

154 *Global Outreach*, CEN-CENELEC, June 2021, viewed 13th October 2021, <https://www.cencenelec.eu/media/CEN-CENELEC/European%20Standardization/Documents/IC/cen_cenelec_globaloutreach.pdf>

155 *Reinforcing the Competitiveness of the Rail Supply Industry with Standardization - How to Get There?*, CEN-CLC, Brussels, 2018.

156 Krislov, Samuel, *How Nations Choose Product Standards and Standards Change Nations*, Pittsburg University Press, Pittsburgh, 1997.

157 Genschel, Philipp and Werle, Raymund, 1993, *From National Hierarchies to International Standardization: Modal Changes in the Governance of Telecommunications*, *Journal of Public Policy*, vol. 13, no. 3, pp. 203–225.

Annex 2: The politicisation of technical standards – the four dimensions of technical standardisation power

The recent perception of standards once again becoming political tools¹⁵⁸ is not least the result of growing concerns in Europe and the US about China's standardisation policies and ambitions.¹⁵⁹ Competition over investment, innovation, IP, standard setting and patents is at the core of the emerging US-China power struggle. State subsidies, the utilisation of non-tariff barriers to trade, including standards, and espionage to support its own economy may not be practices unique to China, but Chinese national champions have profited from such activities. This has led European and US observers to argue that China is responsible for the politicisation of technical standards and their underlying patents.¹⁶⁰

Technical standardisation has been high on China's agenda, particularly since the adoption of the 12FYP in 2011.¹⁶¹ In 2021, China's MIIT announced the aim to develop more than 1,500 standards, mostly in key areas, and stated it "encourages Chinese enterprises and institutions to take the lead in formulating over 100 international standardisation projects".¹⁶² Non-public documents from the SAC describe China as being in a "third phase" of technical standard development. The first phase is described as being for initial research and exploration, followed by the "open development" of standards in the second phase. In the third phase, China is explicit in describing the goal of technical standards to enhance its industrial policy, facilitate digital transformation and strengthen its international power, as well as to serve the ideological foundations of CCP rule and "uphold overall Party leadership".¹⁶³

Yan Xuetong, an influential Chinese scholar based at Tsinghua University in Beijing, identifies competition over new digital technologies as driving a new bipolarity between the US and China, and explicitly names technical standardisation as part of this struggle: "Digital technology advancement [... is] a crucial factor shaping the characteristics of the emerging bipolar world. [...] For instance, both US-China competition over the 5G standard of mobile communications and US–Soviet competition for ideological influence are driven by the motivation to achieve international dominance."¹⁶⁴

It is against this backdrop that senior European and US officials are voicing concern. Rush Doshi, shortly before becoming director of China in the Biden Administration's National Security Council, wrote: "China is also contesting standards in the hard infrastructure of internet connectivity. Its government is investing billions so Chinese chipmakers can beat American rivals in the race for 5G mobile internet standards. [...] These efforts are all supplemented by a campaign to shape global standards, a key policy priority for China enshrined in high-level planning documents that [...] could shape the future of telecommunications in ways that advantage China."¹⁶⁵

The temporary ban of employees of Chinese technology giant Huawei as reviewers in the IEEE—a core industry consortium based in the US that develops technical standards—is also indicative of the fact that

158 Technical standards had been subject to state competition in the early 20th century, in particular in the context of essential military goods: Timmermanns, Stefan and Epstein, Steven, 2010, *A World of Standards but not a Standard World: Towards a Sociology of Standards and Standardization*, *Annual Review of Sociology*, vol. 36, no. 1, pp. 69–89.

159 *National Technical Standard Innovation Base Construction Master Plan (2017–2020)*, SAC, 10th April 2017, viewed 6th February 2021, <http://www.sac.gov.cn/sxxgk/zcwj/202101/t20210122_347066.html>

160 For example, see: Lewis, James A., *How 5G Will Shape Innovation and Security: A Primer*, CSIS, Washington DC, 2018.

161 Ikegami, Daisuke, 2013, *International Standardization Trends in China*, *NTT Technical Review*, vol. 11, no. 11, pp. 1–6.

162 *MIIT Priorities for Standardization Work in 2021*, SESEC, Beijing, 2021, available for download at <<https://sesec.eu/wp-content/uploads/2021/04/Annex-1-MIIT-Priorities-for-Standardization-Work-in-2021.pdf>>

163 Ibid.

164 Yan, Xuetong, 2020, *Bipolar Rivalry in the Early Digital Age*, *Chinese Journal of International Politics*, vol. 13, no. 3, pp. 313–341.

165 Doshi, Rush and McGuinness, Kevin, *Huawei Meets History: Great Powers and Telecommunications Risk, 1840–2021*, Brookings Institution, March 2021, viewed 11th April 2021, <<https://www.brookings.edu/wp-content/uploads/2021/03/Huawei-meets-history-v4.pdf>>



technical standardisation has become a part of a global power struggle.¹⁶⁶

One might argue that technical standards are a measurement of the innovation capacity of an economic entity. From this perspective, the study of technical standards can be used as a proxy to calculate the technological innovativeness of a country. If one further assumes that technological leadership is a crucial source of state power, advancement in technical standards indicates an increase of state power. However, the current debate on the role of technical standards goes beyond treating standards as a proxy for innovation. The ability to shape technical standardisation, observers in China, Europe and the US assume, is a source of power in itself.

What is counterintuitive is that technical standards are being utilised for the purpose of gaining state power, since technical standardisation follows a different logic than other exclusionary tactics used in geopolitical conflicts. For example, sanctions and export controls aim to increase the costs of or even fully exclude a (potential) adversary from access to strategic technologies. By sharp contrast, technical standards follow an inclusionary logic providing interoperability and access.

Another reason why the utilisation of technical standard setting as a way to increase state power is counterintuitive is that standards are legally non-binding and voluntary. While technical standards may well have always been more political than was widely acknowledged, this observation does not explain how highly technical specifications developed by private industry on a voluntary basis lend themselves to power competition among states.

If states strive to gain power, how does the ability to shape technical standards translate into influence? This question can be answered by looking at technical standardisation power from an economic, legal, political and ideational perspective (Figure 23).

Economic dimension

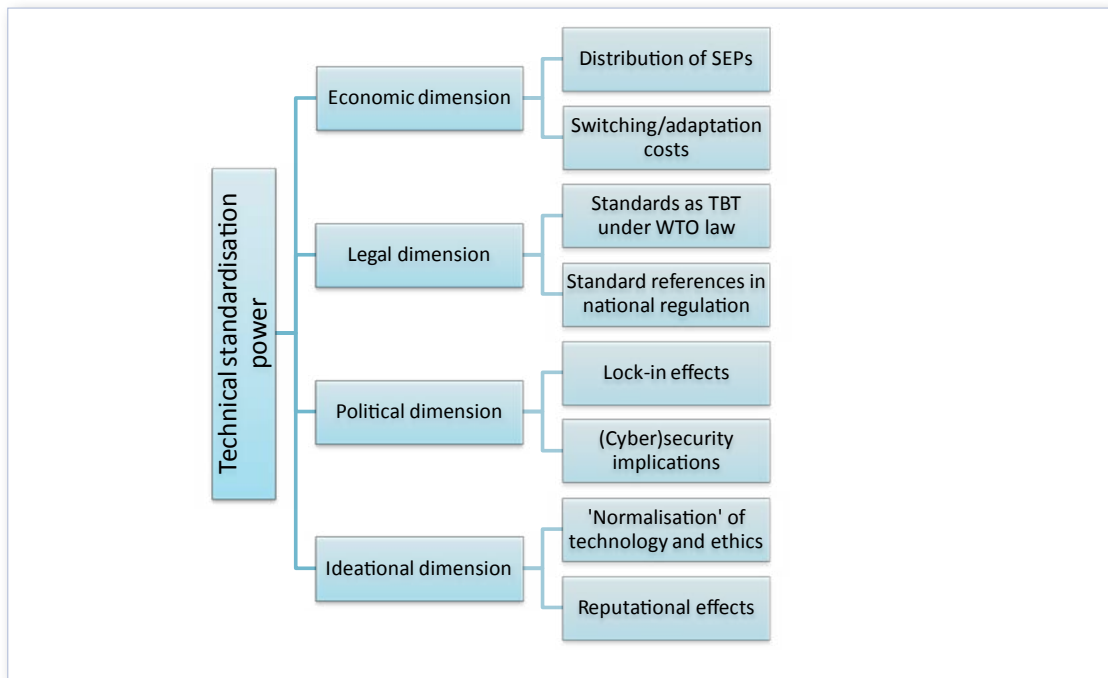
In many cases, patents implement standards. An estimated 55 per cent of all ICT standards are patented technology. This includes a wide variety of applications in fields as varied as telecommunications, e-commerce, electronics, life sciences, healthcare, manufacturing and automotive.¹⁶⁷

At first glance, this stands in stark contrast to the purpose of technical standards. Technical standards spread technological solutions across manufacturers to establish interoperability and guarantee basic safety. Patents serve the opposite purpose: they provide ownership of the IP required to make or use a technology, and protect inventions to prevent competitors from utilising them. This contradiction is resolved through licensing. When patent holders declare their patents to be standard-essential, they automatically commit to license their patented technology on FRAND terms.

¹⁶⁶ *IEEE Lifts Restrictions on Editorial and Peer Review Activities: IEEE Statement Update*, IEEE, 2nd June 2019, viewed 8th April 2020, <<https://www.ieee.org/about/news/2019/statement-update-ieee-lifts-restrictions-on-editorial-and-peer-review-activities.html>>; *Top industry standards body drops Huawei from its journals: The IEEE has banned reviewers employed by tech company, sparking outrage in China*, *Financial Times*, 29th May 2019, viewed 28th March 2020, <<https://www.ft.com/content/6564035e-820d-11e9-b592-5fe435b57a3b>>; Zhang, Dan, *Chinese Scholars Establish Own Academic Evaluation System Following IEEE's Huawei Ban*, *Global Times*, 6th August 2019, viewed 8th September 2019, <<http://www.globaltimes.cn/content/1160546.shtml>>.

¹⁶⁷ *Video Recording and Presentation Slides: IPlytics Webinar Series: SSOs, IPR Policies, Patent Pools and SEP Licensing*, IPlytics, 11th August 2020, <<https://www.iplytics.com/general/world-ssos-ipr-policies-patent-pools/>>

Figure 23: Four dimensions of standardisation power



Source: Own graphic

While FRAND might sound as if no commercial interests are involved, this is misleading. SEPs are available to all suppliers and not just to the patent holder, hence no competitor can be denied access. However, the licensing of SEPs comes with enormous amounts of royalty fees that manufacturers must pay to the inventors of the underlying innovative technologies. For example, US high-technology company Qualcomm earned EUR 5.2 billion by licensing technology in 2017, accounting for more than 20 per cent of the company's revenue; and Finnish telecommunications vendor Nokia generated EUR 1.65 billion the same year in the same way, which was seven per cent of its total revenue.¹⁶⁸ China, having been the second largest payer of licence fees over the last 15 years,¹⁶⁹ has identified the impact on competitiveness. The country is now striving to increase its share of SEPs,¹⁷⁰ or develop its infrastructure and technology projects without western standards, while also spreading Chinese standards by means of the BRI.

At a time when digital connectivity affects more and more sectors that used to be non-digital, such as automotive, home appliances and healthcare, experts argue that the licensing of SEPs will most likely be very different across industry sectors.¹⁷¹ However, the importance of patents in technical standards will only increase.

The potential impact is not limited to the payment of royalties for SEPs either. Companies that fail to establish their technological solutions as technical standards must redesign their products to comply

168 Strumpf, Dan, *Where China Dominates in 5G Technology*, *The Wall Street Journal*, 26th February 2019, viewed 13th April 2019, <<https://outline.com/dVsKLJ>>

169 In 2014, Qualcomm received no less than USD 8 billion in licensing fees from China: Polk, Andrew, *China Is Quietly Setting Global Standards*, *Bloomberg*, 6th May 2018, viewed 22nd September 2018, <<https://www.bloomberg.com/view/articles/2018-05-06/china-is-quietly-setting-global-standards>>

170 Arcesati, Rebecca, *Chinese Tech Standards Put the Screws on European Companies*, *MERICCS*, 29th January 2019, 11th April 2019, <<https://www.merics.org/de/blog/chinese-tech-standards-put-screws-european-companies>>

171 *Video Recording and Presentation Slides: IPlytics Webinar Series: SSOs, IPR Policies, Patent Pools and SEP Licensing*, IPlytics, 11th August 2020, <<https://www.iplytics.com/general/world-ssos-ipr-policies-patent-pools/>>



with other standards. This results in what is widely referred to as ‘switching’ or ‘adaptation’ costs.¹⁷² Hence, those that successfully set international technical standards can not only expect royalties from SEPs but also avoid adaptation costs. Given the considerable size of both royalties and fees, there is a clear correlation with competitiveness. In other words, successfully establishing technical standards in technological fields that are crucial for the ongoing digital industrial revolution brings significant advantages in economic competitiveness to national economies.

Legal dimension

International technical standards are voluntary technical specifications. Through the backdoor, however, standards can become part of international trade law. The Agreement on Technical Barriers to Trade (TBT), the Agreement on Government Procurement, the review of the Agreement on Sanitary and Phytosanitary Measures and the General Agreement on Trade in Services (GATS) under the framework of the WTO all treat international standards as crucial benchmarks for the facilitation of international trade and as important qualifications of what counts as a legitimate exception, for example under the pretext of basic safety requirements.¹⁷³

According to the TBT Agreement, six procedural founding principles need to be fulfilled for a specification to be considered an international standard, namely transparency, openness, impartiality and consensus, effectiveness and relevance, coherence, and a development dimension that implies standard setting must be open to developing states.¹⁷⁴

International standards are important benchmarks under international trade law. For example, Article VI: 5b of the GATS stipulates that international standards of relevant international organisations serve as a yardstick to ensure that trade in services is not more burdensome than necessary to ensure their quality.¹⁷⁵ While states are not compelled to comply with the standards, they risk facing litigation in the WTO if they do not.¹⁷⁶ This implies that if domestic technical standards deviate from international standards, in principle, the judiciary of the WTO could find a state to be noncompliant with international trade law unless the respondent can provide a reasonable explanation for such deviations, such as specific requirements for the protection of human health and safety, or environmental protection. This is more crucial than one might think given that around 80 per cent of trade is affected by technical standards and associated technical regulations,¹⁷⁷ and explains why some legal scholars suggest challenging Chinese protectionist tactics through the WTO judiciary by means of technical standards.¹⁷⁸

Apart from these indirect effects of voluntary technical standards on international trade law, domestic technical standards can also have extraterritorial effects. States (and the EU) regularly reference technical standards in legally-binding documents, mostly in regulations. The European Commission, for example, regularly requests ESOs to develop hENs to support regulation.¹⁷⁹ In China, some urban rail standards

172 Bütthe, Tim and Mattli, Walter, *The New Global Rulers: The Privatization of Regulation in the World Economy*, Princeton University Press, Princeton, 2011, p. 9.

173 Graz, Jean-Christophe, *The Power of Standards: Hybrid Authority and the Globalisation of Services*, Cambridge University Press, Cambridge, 2019, p. 89.

174 Dackö, Carolina, *What makes a Technical Specification a WTO Compliant Standard?*, Mannheim Swartling, viewed 15th October 2021, <<https://www.mannheimerswartling.se/app/uploads/2021/04/what-makes-a-technical-specification-a-wto-compliant-standard.pdf>>

175 *World Trade Report 2021: Trade and Public Policies - A Closer Look at Non-tariff Measures in the 21st Century*, WTO, Geneva, 2012, pp. 185–186.

176 Borraz, Olivier, 2007, *Governing Standards: The Rise of Standardization Processes in France and in the EU*, *Governance: An International Journal of Policy, Administration and Institutions*, vol. 20, no. 1, pp. 57–84.

177 *Regulatory Reform and International Standardisation: Working Party of the Trade Committee - TD/TC/WP(98)/FINAL*, OECD, Paris, 1999.

178 Hillman, Jennifer, *The Best Way to Address China's Unfair Policies and Practices in Through a Big, Bold, Multilateral Case at the WTO: Testimony Before the US-China Economic and Review Security Commission*, June 8, USCC, 8th June 2018, viewed 5th August 2019, <<https://www.uscc.gov/sites/default/files/Hillman%20Testimony%20US%20China%20Comm%20w%20Appendix%20A.pdf>>

179 Dingemann, Kathrin and Kottmann, Matthias, *Legal opinion on the European system of harmonised standards*, Redeker, Sellner, Dahs, 2020, viewed 2nd November 2021, <https://www.bmw.de/Redaktion/DE/Downloads/P-R/rechtsgutachten-europaeisches-system-harmonisierter-normen.pdf?__blob=publicationFile&v=4>

developed by the China Association of Metros (CAMET) were incorporated into the state-recommended voluntary China Urban Rail Certification.¹⁸⁰

When regulations prescribe certain legally-binding thresholds, technical standards can serve as a method for implementation. Companies seeking market access need to comply with the regulation, but formally they do not need to comply with the referenced technical standard. They are free to provide evidence that they comply with the regulation by other means than those prescribed in the technical standard. However, in most cases, the cheapest option is to adopt the respective technical standard that is assumed to provide conformity with the regulation. Hence, technical standards remain voluntary on paper, but prescribe the easiest way for companies to ensure compliance with a legally-binding regulation. In particular, regulations of major markets—such as the European Single Market, the US or the PRC—can have extraterritorial effects because multinational companies often choose to comply with the strictest technical standard, since this allows market access and conformity with existing regulations in all relevant markets.

Political dimension

Technical standards create markets by means of interoperability. When technical standards are global in scope, they facilitate international trade and globalisation. However, standards can also be hurdles to trade and create distinct technological spheres because they generate interoperability only in the geographical area where they are applied. This implies that technical standards can create geographically bifurcated or fragmented technological corridors. Competing contradictory standards result in a lack of global interoperability, potentially creating ‘lock-in’ effects that can come with political costs reaching far beyond the field of technical standardisation.

For example, to date, technical standards in the railway sector remain largely national or regional. If country A adopts the national railway standards of country B—ranging from track gauges to traction technical parameters and voltage—the maintenance and further buildout of the railway cannot be carried out by suppliers other than those based in country B, as others would use deviant technical standards; their products would simply not be compatible. In this case, country A is locked into country B’s technology, and becomes fully reliant on country B’s suppliers.

Economists have been studying lock-in effects resulting from dominant technologies for decades, particularly if they enable complementary technologies (‘network effects/externalities’).¹⁸¹ Such studies have convincingly demonstrated that the hurdles to change such dominant technical standards are high, particularly since this comes with enormous adaptation costs.¹⁸² Particularly regarding the digital components of critical infrastructure, maintenance and expert knowledge become more and more essential, and lock countries into the products of specific suppliers. ‘Early mover advantage’ can result in a technologically inferior solution remaining dominant.¹⁸³

Politically, this remains largely unproblematic as long as the respective technology/product is not sensitive for the well-being of a society. Railways, however, are critical infrastructure, enabling the flow of goods

¹⁸⁰ Information according to author telephone interviews with European standardisation experts, July–September 2021.

¹⁸¹ Bonardi, Jean-Philippe and Durand, Rodolphe, 2003, *Managing Network Effects in High-tech Markets*, *The Academy of Management Journal*, vol. 17, no. 4, pp. 40–52.

¹⁸² Arthur, W. Brian, 1989, *Competing Technologies, Increasing Returns, and Lock-in By Historical Events*, *The Economic Journal*, vol. 99, no. 394, pp. 166–131; Farrell, Joseph and Saloner, Garth, 1985, *Standardization, Compatibility, and Innovation*, *Rand Journal of Economics*, vol. 16, no. 1, pp. 70–83.

¹⁸³ Schilling, Melissa A., 2002, *Technology Success and Failure in Winner-Take-All Markets: The Impact of Learning Orientation, Timing, and Network Externalities*, *The Academy of Management Journal*, vol. 45, no. 2, pp. 387–398.



and people, so a lock-in effect in such a critical sector would have political implications. Since all suppliers that are compliant with the respective technical standards are based in country B, country B could ask country A for political concessions in return for the maintenance and buildout of the critical infrastructure. Even if country B does not explicitly ask for such concessions, country A would think twice before adopting a confrontational stance on issues of core interest to country B out of fear for the continued operation of its critical infrastructure. These far-reaching political implications explain why in Mongolia the debate over whether to use Chinese or Russian rail tracks was subject to an election campaign. Questions were raised not only about dependencies and lock-in effects, but also whether China could more easily move its military into Mongolia if the track gauges complied with Chinese and not Russian standards.¹⁸⁴

Technical standards also have the potential to impinge on what is often regarded as the crown jewel of state power: security. Some observers argue that those who develop a technology are likely to have a deeper knowledge of how it works, including its vulnerabilities. Once internationally standardised, this technology spreads globally. When this concerns critical digital infrastructure, the developer of the technology in question possesses prime knowledge of its flaws that have the potential to be used to undermine an adversary's (cyber)security.^{185&186}

Many experts within the Chinese defence industry argue that the use of standards from overseas competitors in strategic sectors of communication creates critical vulnerabilities for the PRC. From this perspective, technical standardisation turns into a subject of civil and military network security.¹⁸⁷ Following a similar logic, observers from the US defence sector have been discussing implications of Chinese strengths in 5G standards for the low-frequency spectrum. This made them consider strengthening the millimetre spectrum (mmWave) to ensure that US military communication in operations abroad have reliable infrastructure with foundational technical standards shaped more by US companies than those for 5G low-frequency spectrum.¹⁸⁸

Even those observers that believe such cases are rather the exception—countering that standardisation is a process of maximum transparency in which it is not really possible to hide security-relevant flaws from engineers of potential adversaries—implicitly agree that standardisation has a security dimension. Therefore, a high degree of standardised technology increases the (cyber)security of products by providing international transparency.

Whichever perspective is more accurate, technical standardisation influences the degree of (cyber) security in critical digital technologies.¹⁸⁹ This explains why not only the content of adopted standard contributions matters, but also the definition of the components and how the contribution is to be implemented by means of certification.¹⁹⁰ This applies particularly in cases of dual-use goods when

184 Hillman, Jonathan E., *Influence and Infrastructure: The Strategic Stakes of Foreign Projects*, CSIS, Washington DC, 2019, pp. 11–12.

185 Eisenstark, Roma, *Why China and the US Are Fighting over 5G*, TechNode, 30th March 2018, viewed 11th April 2019, <<https://technode.com/2018/03/30/5g/>>; Medin, Milo and Louie, Gilman, *The 5G Ecosystem: Risks & Opportunities for DoD*, Defense Innovation Board, Washington DC, 2019.

186 One concrete example of such a threat are attempts by the US National Security Agency to manipulate international cryptography standards and use built-in vulnerabilities for surveillance purposes. Not least documents leaked by Edward Snowden provide evidence that this is not just a matter of the distant past. One challenge in this context is the complexity of technical standards, which can make it difficult for other participants to fully grasp the implications of a specific standard contribution. Often, large companies share an interest in complex standards with intelligence agencies, though for alternative purposes; large companies may strive to make market access for competitors more difficult while intelligence agencies may hope to cover security flaws. In the aforementioned cryptography standards case, the flaws were identified and made public, which shows that the transparency of standardisation can also help prevent the inclusion of such vulnerabilities in modern technology. Rogers, Michael and Eden, Grace, 2017, *The Snowden Disclosures, Technical Standards, and the Making of Surveillance Infrastructures*, *International Journal of Communication*, vol. 11, no. 1, pp. 802–823.

187 Seaman, John, *China and the New Geopolitics of Technical Standardization. Notes de l'Ifri*, Ifri, January 2020, viewed 2nd November 2021, p. 15, <https://www.ifri.org/sites/default/files/atoms/files/seaman_china_standardization_2020.pdf>

188 Medin, Milo and Louie, Gilman, *The 5G Ecosystem: Risks & Opportunities for DoD*, Defense Innovation Board, Washington DC, 2019.

189 Author interviews with European engineers involved in the development of 5G. February–November 2019.

190 Graz, Jean-Christophe, *The Power of Standards, Hybrid Authority and the Globalisation of Services*, Cambridge University Press, Cambridge, 2019, ch. 2.

technical standards are not only relevant for civilian but also military purposes.¹⁹¹

Ideational dimension

The design of technology is highly political because it inscribes ethical values. Technology does not exist in a vacuum divorced from the political. Technical standards are of importance in this regard since they formulate a ‘basic recipe’ setting the general rules by which different manufacturers develop specific products. As such, they shape the physical world around us and contribute to the constitution of our social lives. The necessity and omnipresence of standards makes us barely question them.¹⁹² Hence, technical standards shape what is perceived as ‘normal’ technology. This holds true not only for consumers; companies also ‘socialise’ into the technological world shaped by technical standards and develop new applications based on existing standards.¹⁹³ This has led several scholars to describe technical standards as social institutions in their own right.¹⁹⁴

For instance, while we are used to Wi-Fi as the dominant WLAN standard, this was by no means a given. Shortly after Wi-Fi was adopted as the international standard, China proposed wireless authentication and privacy infrastructure (WAPI) technology as a new standard. Although it promised better performance, WAPI provided worse privacy compared to Wi-Fi.¹⁹⁵ WAPI met considerable resistance and finally failed to become an international standard, largely due to procedural issues,¹⁹⁶ and because China did not release WAPI’s security algorithm.¹⁹⁷ Whether intentionally or not, by rejecting WAPI, international SDOs prioritised privacy over performance, shaping what consumers and manufacturers around the globe can expect from WLAN technology. Similarly, privacy has also been a concern in the drafting of the 5G standard.¹⁹⁸

This is not an isolated example. At a time when emerging technologies are increasingly penetrating all spheres of public and private life, ethical, political and security concerns are playing a growing role in technical standardisation. Algorithmic bias and data privacy are just two examples of ethical underpinnings in technical standardisation.¹⁹⁹ The EU recognises the importance of AI’s ethical implications and has drafted guidelines that found a wide international resonance, not least among Organisation for Economic Co-operation and Development (OECD) countries.²⁰⁰ However, such guidelines need to be standardised if they are to become effective. EU officials openly admit that this is where the EU risks failure due to its relatively low presence in international AI standardisation.²⁰¹

191 Sutter, Karen M. and Sutherland, Michael D., *China’s 14th Five-Year Plan: A First Look*, Congressional Research Service, updated January 5th, viewed 23rd March 2021, <<https://crsreports.congress.gov/product/pdf/IF/IF11684>>

192 Busch, Lawrence, *Standards: Recipes for Reality*, MIT Press, Cambridge, 2011.

193 Kollman, Kelly, 2008, *The Regulatory Power of Business Norms: A Call for a New Research Agenda*, *International Studies Review*, vol. 10, no. 3, pp. 397–419.

194 Krislov, Samuel, *How Nations Choose Product Standards and Standards Change Nations*, Pittsburg University Press, Pittsburgh, 1997; Tamm Hallström, Kristina, *Organizing International Standardisation: ISO and the IASC in Quest of Authority*, Edward Elgar, Cheltenham, 2004; Timmermanns, Stefan and Epstein, Steven, 2010, *A World of Standards but not a Standard World: Towards a Sociology of Standards and Standardization*, *Annual Review of Sociology*, vol. 36, no. 1, pp. 69–89.

195 Lee, Heejin and Oh, Sangjo, 2006, *A Standards War Waged by a Developing Country: Understanding International Standard Setting from the Actor-Network Perspective*, *Journal of Strategic Information Systems*, vol. 15, no. 3, pp. 177–195.

196 Suttmeier, Richard P. et al., *Standards of Power? Technology, Institutions, and Politics in the Development of China’s National Standards Strategy*, The National Bureau of Asian Research, Seattle 2006.

197 Lee, Heejin and Oh, Sangjo, 2006, *A Standards War Waged by a Developing Country: Understanding International Standard Setting from the Actor-Network Perspective*, *Journal of Strategic Information Systems*, vol. 15, no. 3, pp. 177–195.

198 *5G Standardization*, Ericsson, viewed 17th November 2021, <<https://www.ericsson.com/en/future-technologies/standardization/5g-standardization>>

199 Seaman, John, *China and the New Geopolitics of Technical Standardization. Notes de l’Ifri*, Ifri, January 2020, viewed 2nd November 2021, <https://www.ifri.org/sites/default/files/atoms/files/seaman_china_standardization_2020.pdf>

200 China’s attempts to shape international AI facial recognition standards have invoked ethical concerns in Europe; Xue, Yujie, *27 Companies Drafting China’s First National Facial Recognition Standard*, *Sixth Tone*, 27th November 2019, viewed 17th November 2021, <<http://www.sixthtone.com/news/1004893/27-companies-drafting-chinas-first-national-facial-recognition-standard>>

201 Information according to author telephone interviews with European standardisation experts, July–September 2021.



China is well aware of the ‘normalising’ effects of technical standards. For example, the PRC rejected the standardisation of Cantonese writing on western keyboards, which would have eased the use of the southern Chinese dialect. Any weakening of Mandarin Chinese would have only been marginal, but the Chinese leadership was concerned of the symbolic importance of such a standard.²⁰²

In addition, the ideational power of technical standardisation is not limited to underlying ethical values. If a country can shape international technical standardisation, it is likely to gain a reputation as a technologically-developed country. It is a sign of technological supremacy and societal progress beyond economic and military prowess.²⁰³

In summary, the ability to shape international standards comes with increasing influence in economic, legal, political and ideational terms that reach beyond the field of technical standardisation. The power of standardisation lies in the fact that standards are both discreet and transformative:²⁰⁴ discreet in that they appear to be technical while the political implications often remain implicit; and transformative because they are long-lasting due to the high adaptation costs and associated network externalities. This even applies to technical standards that are not optimal.²⁰⁵ As such, technical standards lend themselves to control over international order, and therefore standardisation has become a key battleground in the fight among states to increase their global influence.²⁰⁶

202 Pop, Valentina et al., *From Lightbulbs to 5G, China Battles West for Control of Vital Technology Standards*, *The Wall Street Journal*, 8th February 2021, viewed 17th February 2021, <<https://www.wsj.com/articles/from-lightbulbs-to-5g-china-battles-west-for-control-of-vital-technology-standards-11612722698>>

203 Seaman, John, *China and the New Geopolitics of Technical Standardization*. *Notes de l'Ifri*, Ifri, January 2020, viewed 2nd November 2021, p. 15, <https://www.ifri.org/sites/default/files/atoms/files/seaman_china_standardization_2020.pdf>

204 Bishop, Andrew D., *Standard Power. The New Geopolitical Battle*, *The National Interest*, 7th October 2015, viewed 17th November 2021, <<https://nationalinterest.org/feature/standard-power-the-new-geopolitical-battle-14017>>.

205 David, Paul A., 1985, *Clio and the Economics of QWERTY*, *American Economic Review*, vol. 75, no. 2, pp. 332–337.

206 Brunsson, Nils and Jacobsson, Bengt, *A World of Standards*, Oxford University Press, Oxford, 2002.

Annex 3: The state-centric nature of Chinese standards

Regardless of China's recent standardisation reform, its standard system and all five standard types remain state-centric.

1. National standards

National standards are developed in TCs, SCs and WGs consisting of state- and privately-owned enterprises, research institutions, state regulators, consumer organisations, testing and certifying entities, and industry associations. While this generally resembles European and international approaches, the development of national standards is not coordinated by private SDOs. Instead, national standard setting is carried out under the framework of the SAC. The SAC consists of two departments of the State Administration of Market Regulation (SAMR), which has ministry-level rank under the State Council. Hence, national standards are not developed in private institutions (like in Europe), but under the umbrella of a state ministry.

In the Chinese system, national standards cover the most fundamental specifications including health and security standards.²⁰⁷ Mandatory national standards are particularly relevant for European firms because compliance is necessary for market access.²⁰⁸ Mandatory national standards, explicitly referred to as 'standards' in Chinese terminology (*guóbìāo* or 'GB standards', in contrast to *guóbìāo tuījìàn* or 'GB/T standards', which are national voluntary standards), are legally binding and are similar in ways to regulations in Europe.

As of 26th July 2021, 39,777 national standards existed in China, of which 2,116 are mandatory,²⁰⁹ a considerable decline since before China's standardisation reform when more than 10,000 mandatory standards were in place.²¹⁰ In some sectors, the share of mandatory standards remains high. For example, almost a quarter of those in the medical device sector are mandatory.²¹¹

The reduction of mandatory standards generally signifies a loosening of political authorities' control; however, many voluntary national standards are still treated in China as if they were mandatory.²¹² This implies that the effects of the reform are less meaningful than it may have initially seemed. Accordingly, the official announcement to further streamline and simplify mandatory standards should be received positively but cautiously. Of more significance is the pledge that IP is to be avoided in mandatory standards, which should help improve IP protection in the PRC.²¹³

2. Sector standards

Similar to national standards, sector standards—also known as 'industry standards'—are developed

207 In the automotive sector, for example, mandatory national standards largely focus on safety, environment and emissions, energy consumption, and electronic magnetic compatibility. See: *List of Mandatory National Standards*, SAC, viewed 5th February 2021, <http://openstd.samr.gov.cn/bzgk/gb/std_list_type?p.p1=1&p.p90=circulation_date&p.p91=desc>; *List of Recommended National Standards*, SAC, viewed 5th February 2021, <http://openstd.samr.gov.cn/bzgk/gb/std_list_type?p.p1=2&p.p90=circulation_date&p.p91=desc>

208 *The EU and China: Addressing the Systemic Challenge: A Comprehensive EU Strategy to Rebalance the Relationship with China*, BusinessEurope, Brussels, 2020.

209 Official data obtained from SESEC.

210 *Legislation Review: China to Revamp Standardization System*, NPC Observer, 17th May 2017, viewed 2nd November 2021, <<https://npcobserver.com/2017/05/17/legislation-review-china-to-revamp-standardization-system/>>

211 Information according to author telephone interviews with European standardisation experts, July–September 2021.

212 Author interviews with European and Chinese standardisation experts (industry and researchers), November 2018–September 2021.

213 *MIIT Priorities for Standardization Work in 2021*, SESEC, Beijing, 2021, available for download at <<https://sesec.eu/wp-content/uploads/2021/04/Annex-1-MIIT-Priorities-for-Standardization-Work-in-2021.pdf>>



in TCs, SCs and expert groups that resemble the composition of TCs, SCs and WGs for national standardisation. Sector standards are also established under state ministries, but specific national ministries, such as the MIIT and the Ministry of Ecology and Environment, are leading sector standardisation instead of the SAC. Accordingly, sector standards are more specific than national standards. In many cases, research institutes that are an integral part of these national ministries hold the secretariats of TCs and SCs. Examples include the China Electronics Standardisation Institute (CESI) and the China Academy of Information and Communications Technology (CAICT). In-depth interviews with European and Chinese industry confirm that such ministerial research institutions and test laboratories have enormous influence in standardisation across a wide range of economic sectors.²¹⁴

As of 26th July 2021, 75,285 sector standards existed, of which almost all are voluntary.²¹⁵ Before China's standardisation reform, both mandatory and voluntary sector standards existed. While sector standards can be made mandatory, it requires the full consent of all of China's ministries represented in the State Council. The process was intentionally made lengthy and highly bureaucratic to drastically reduce the number of mandatory sector standards. However, similar to voluntary national standards, most voluntary sector standards are treated as if they are mandatory in practice.²¹⁶ While the number of mandatory sector standards is low, voluntary sector standardisation is in full play. This prompted the SAC to call for better coordination and avoid conflicts with other voluntary standards.²¹⁷

The near abolishment of mandatory sector standards indicates a gradual lifting of state control, however neither local Chinese nor FIEs operating in China consider national and sector standardisation an industry-driven initiative. In fact, the development and revision of national and sector standards is highly bureaucratic and time-consuming.²¹⁸ It is against this background that the MIIT announced in 2021 it aims to develop a fast track for the standardisation of new technologies.²¹⁹

Despite the lack of technical expertise among national ministry officials, the political agenda of the authorities continues to be influential. Although private firms and FIEs can influence sector standardisation, government institutions control the framework (i.e., the leadership, process and critical decisions over the development and revision of standards), and the actual technical development is influenced by enterprises alongside different government actors.

3. Local standards

The third and final type of technical standards in the state-tier, local standards, are developed under the framework of local governments, and only apply in their respective geographical area. Local standards should meet specific local requirements. However, local authorities utilise them to serve their own agenda, which leads to local protectionism.²²⁰ This phenomenon is well-known in the international arena, where technical standards are considered potential TBT in international trade law under the WTO.

As of the end of July 2021, 52,992 local standards existed in China, of which all are voluntary.²²¹ However,

214 Author interviews with European and Chinese standardisation experts (industry), November 2018–September.

215 Official data obtained from the SESEC.

216 Author interviews with European and Chinese standardisation experts (industry and researcher), November 2018–September 2021.

217 *Guidance on further strengthening the management of industry standards (SAC [2020] No. 18)*: SAC, 15th April 2020, viewed 6th February 2021, <http://www.sac.gov.cn/sxxgk/zcwj/202101/t20210122_347055.html>

218 Author interviews with Chinese standardisation experts (industry), October–November 2019.

219 *MIIT Priorities for Standardization Work in 2021*, SESEC, Beijing, 2021, available for download at <<https://sesec.eu/wp-content/uploads/2021/04/Annex-1-MIIT-Priorities-for-Standardization-Work-in-2021.pdf>>

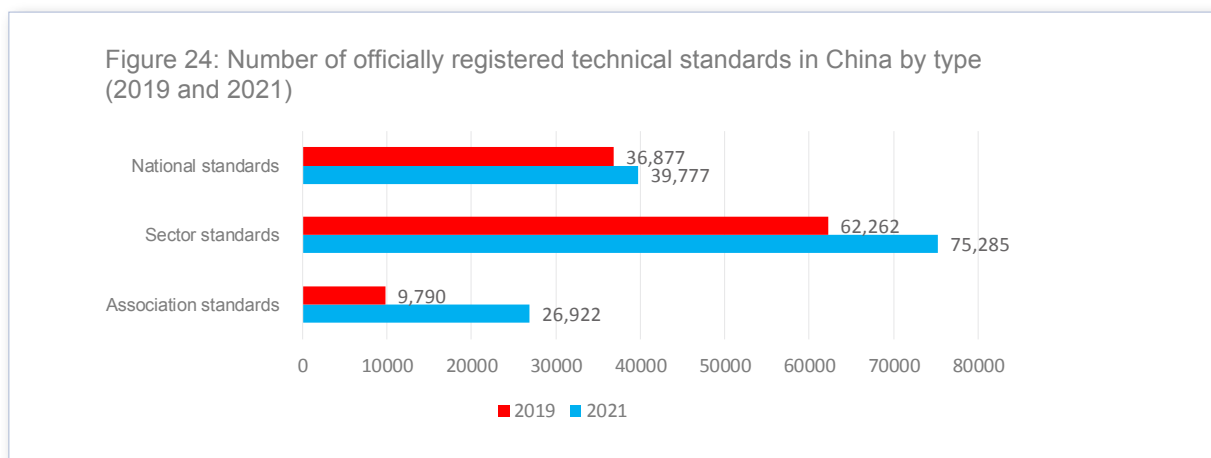
220 Author interviews with Chinese standardisation experts (industry and researchers), October–November 2019.

221 Official data obtained from the SESEC.

local public and private actors often treat local standards as mandatory.²²² This demonstrates that all three types of state-driven standards remain subject to considerable government influence.

4. Association standards

China's standardisation reform saw the establishment of market-tier standardisation alongside the previously existing state-tier. At the heart of the new market-tier are association standards, also referred to as 'social organisation standards'. Since their introduction, association standards have turned out to be the most dynamic standard type in China. After the government encouraged their development, the growth of association standards has outperformed that of the other standards considered relevant for European industry, namely national and sector standards (Figure 24).



Source: SAC, SESEC

As of July 2021, 26,922 association standards were registered in the national platform,²²³ of which 48.6 per cent cover industry, 24.5 per cent services, 16.1 per cent agriculture and 10.8 per cent social undertakings.²²⁴ Most participating associations were registered in Guangdong Province (14 per cent) followed by Zhejiang and Shandong.²²⁵ This illustrates that association standardisation thrives more in regions with a stronger private sector. In the first three years of the platform's existence, around 2,700 industry associations registered their standards. As of September 2021, the number has grown even further to 6,266.²²⁶

In contrast to state-tier standards, association standards are supposed to be fully autonomous from government influence. Associations do not require a licence for developing association standards. All private entities in China holding the status of a NGO, acquired from the Ministry of Civil Affairs under the Chinese State Council, are encouraged to develop technical association standards. On paper, this provides very little government control over the development of association standards. However, European and Chinese practitioners alike report in private conversations that steering from the political authorities exists in association standardisation as well.

222 Rühlig, Tim, *Technical Standardisation. China and the Future International Order: A European Perspective*, EU Office of the Heinrich Böll Foundation, Brussels, 2020.

223 Official data obtained from the SESEC. See also: *Standards List*, CNIS, viewed 17th September 2021, <<http://www.ttbz.org.cn/Home/Standard?page=456>>

224 *Report on the Development of Association Standards in China in Second Half of 2020*, China Standardization Press, Beijing, 2021, p. 4.

225 *SESEC IV. China Standardisation Newsletter*, SESEC, Beijing, 2021.

226 *Associations List*, CNIS, viewed 17th September 2021, <<http://www.ttbz.org.cn/Home/ActGroupList/?serType=1&serKey=&sheng=&page=264>>



As a latecomer, China laments that it has fewer association standards than the US. To date, Chinese authorities see the development of association standards as successful but acknowledge that the quality of these standards varies greatly.²²⁷ This could be due to the low average development time for association standards (12 months); for national standards, the average period is two years. Furthermore, state organs recognise that many association standards reflect individual members' interests.

There currently exists a multitude of overlapping, competing and contradictory technical standards, which can be difficult for European and Chinese businesses to deal with. China remains vague on whether and how it aims to resolve the resultant plurality of conflicting standards.²²⁸

Strikingly, the four criteria used by most Chinese and European companies to identify the most impactful association standards mirrors the government's indirect involvement in association standardisation:²²⁹

- 1) The first criterion for identifying the relevance of association standards is whether they are referenced in national regulations, mentioned in the communications of national ministries, or used for public procurement.²³⁰ In some cases, national ministries ask industry associations to develop technical standards. For example, in 2020, the MIIT selected 110 association standard projects as exemplary cases. The MIIT also endorsed association standards developed by the China Institute of Communication and Telecommunication Terminal Industry Forum, among others.²³¹ China has also adopted a mechanism to convert association standards into national sector or local standards.
- 2) A second criterion is whether an association had received the government's mandate to develop association standards in a pilot phase before the standardisation law opened the opportunity of developing association standards to all NGOs. This group includes 114 associations that to this day are widely regarded as impactful.
- 3) The third criterion often mentioned is the membership of industry associations. Technical standards are widely regarded as having more relevance if national champions, including but not only SOEs, take part in their development. Therefore, identifying relevant associations is much easier in economic sectors that are highly monopolised.
- 4) A fourth and final criterion is the geographical scope of a standard-setting association. Generally, national associations are more influential than those restricted to the local level.

Strikingly, the first three criteria lie in the hands of the government. This suggests that although association standards are supposedly market-driven, they are also subject to an element of state-steering.

More generally, China's economy remains essentially state-permeated. Chinese private industry is less independent from government influence than its European counterparts. National champions, even if not formally state-owned, often remain heavily influenced by the authorities.²³² Chinese industry associations have stronger ties to the government than their formal nature as business associations or chambers might

227 For example, see: *Report on the Development of Association Standards in China in Second Half of 2020*, China Standardization Press, Beijing, 2021.

228 Ibid., pp. 17–18, 27.

229 Author interviews with European and Chinese standardisation experts (industry and researchers), November 2018–September 2021.

230 For example, T/CADA 4-2016 specifications of roadside assistance services and operations have been used in government procurement. See: *Report on the Development of Association Standards in China in Second Half of 2020*, China Standardization Press, Beijing, 2021, p. 26.

231 Ibid.

232 Wu, Mark, 2016, *The "China, Inc." Challenge to Global Trade Governance*, *Harvard International Law Journal*, vol. 57, no. 2, pp. 261–324; ten Brink, Tobias, *China's Capitalism: A Paradoxical Route to Economic Prosperity*, University of Pennsylvania Press, Philadelphia, 2019.

suggest. According to some, many associations entitled to develop association standards are “designed to coordinate activities within an industry [...] and] are staffed by former government officials from defunct ministries and have the same organisational structures and functions as those ministries.”²³³

5. Enterprise standards

The fifth and final standard type is enterprise standards, which are specifications of individual companies. Unless achieving the informal status of a *de facto* standard, enterprise standards only apply within a given company. However, even enterprise standards are not completely free from political oversight and guidance. All enterprises are encouraged to declare their enterprise standards with the state authorities, thereby providing public agencies a better overview of product characteristics.

The history of enterprise standards is instructive to understand the dynamics behind state control. Back in the 1990s, all products in China were required by law to fulfil a standard in order to increase accountability. Whenever companies produced in a field where no technical standards existed, it was mandatory by law to establish an enterprise standard. The idea was to have a threshold against which state authorities could test and hold accountable all manufacturers.

Today, state guidance on enterprise standards is mostly exercised through a national competitive ‘top runner / front runner’ system invented in 2018, which awards prizes to standards considered the best by the government.²³⁴ Every year, the system has been further developed, and both national and regional systems coexist.²³⁵ It is challenging that the selection criteria for awards under the ‘top runner system’, and the review system, are not transparent. Reviews are supposed to be carried out by independent experts, but similarly lack transparency. Political ties seem to play a role in the award process as well.²³⁶ This tool provides government authorities to utilise industry-driven standardisation for its industrial policy and maintain a guiding function.

All this demonstrates that while China’s recent standardisation reform has strengthened industry and thereby opened opportunities to European firms, the political authorities continue to proactively steer standardisation, giving the authorities a much more prominent role in the process compared to the European approach of private, industry-driven self-regulation. At the same time, the government is no longer comprehensively controlling the process, but it is rather an alliance of public authorities and industry that is closely interwoven with the state that shapes China’s technical standardisation. This is not to say that all firms and associations in China have close ties with the authorities, but a significant share of them do.

European businesses active in China are fully aware of the political authorities’ continued influence. In the European Chamber / UI standardisation survey, state institutions, Chinese research institutions—which often are state-run or even an integral part of national ministries—and Chinese SOEs are named as having the greatest impact on technical standard setting in China. European FIEs and Chinese privately-owned enterprises are seen as having a similar degree of influence, outperforming non-European FIEs and Chinese consumer associations (Figure 25).

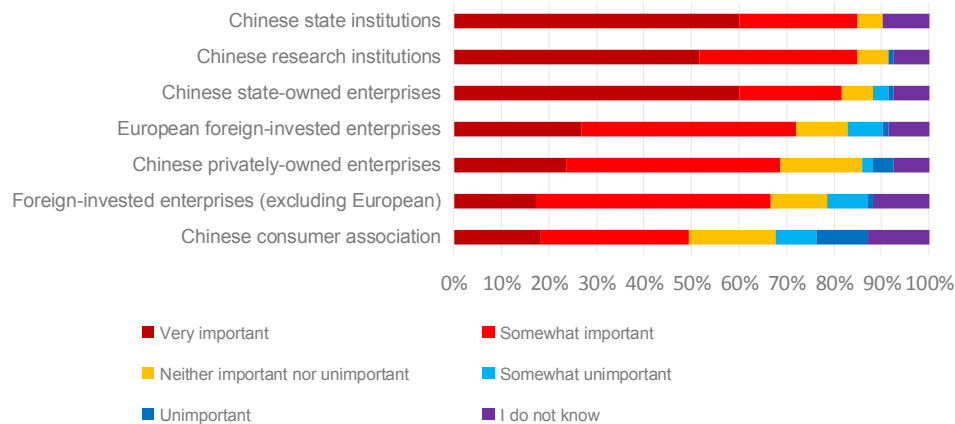
233 Milhaupt, Curtis J. and Zheng, Wentong, 2015, *Beyond Ownership: State Capitalism and the Chinese Firm*, *The Georgetown Law Journal*, vol. 103, no. 3, pp. 665–722.

234 *Opinions of Eight Departments Including the SAMR on Implementing the Enterprise Standards ‘Front-Runner’ System*, Peking University, viewed 5th February 2021, <http://www.pkulaw.cn/fulltext_form.aspx?Db=chl&Gid=319564>

235 SESEC IV: *China Standardisation Newsletter - June-July 2021*, SESEC, Beijing, 2021.

236 Author interviews with European and Chinese standardisation experts (industry and researchers), November 2018–September 2021.

Figure 25: How important are the following types of participants for the development of technical standards in the committees that your company participates in (in %)?



The steering role of the government comes with a fundamentally different understanding of technical standardisation in China. For the Chinese Government, technical standards are a means to implement industrial policy. To some extent, domestic standards can serve TBT and protectionist purposes, although this was more the case in the past. Today, technical standardisation has become a facilitator for the improvement of product quality and China's move up the global value chain.

Aimed at mitigating lower growth rates (the 'new normal') and avoiding the middle-income trap, China is undergoing an economic transformation.²³⁷ With hardly any urbanisation potential left, China is striving to move from competing on low labour costs to quality and innovation instead, which further increases the focus on standardisation.²³⁸ In line with this shift, Chinese Premier Li Keqiang announced in 2015 the Made in China 2025 initiative, identifying ten industry sectors in which China aims to turn into a world leader in the most innovative technology.²³⁹ Unsurprisingly, several of these industry sectors, including IT, railway equipment, power equipment and medical devices, have seen the most Chinese technical standardisation activities.²⁴⁰

China's domestic state-centric approach to standard setting has implications for its international behaviour. This is discussed in the next two sections of this annex.

China's state-centric approach to formal standardisation

China's international formal standardisation is not fundamentally different from western practices. However, the PRC has adapted well-known strategies in its state-centric approach, which can be seen by

²³⁷ Naughton, Barry, *The Challenges of Economic Growth and Reform, China in the Era of Xi Jinping; Domestic and Foreign Policy Challenges*, Bekkevold, Jo Inge and Ross, Robert S., eds., Georgetown University Press, Washington DC, 2016, pp. 66–91.

²³⁸ Xia, Ming, 2018, *China's Financial Crisis in the Making: Soft Budget Constraint, Overdraft and the Missing Credible Commitment*, *Journal of Chinese Political Science*, vol. 23, no. 1, pp. 9–32.

²³⁹ *Notice of the State Council on the Issuance of "Made in China 2025" (State Council [2015] no. 28)*, Central Government of China, 8th May 2015, viewed 31st March 2020, <http://www.gov.cn/zhengce/content/2015-05/19/content_9784.htm>

²⁴⁰ Author interviews with European and Chinese standardisation experts (public officials and researchers), November 2018–September 2021.

examining four factors among those considered impactful for formal standardisation.²⁴¹

1. Increasing technical expertise

The first factor is increasing technical expertise. The participants in standard negotiations are engineers. Even though economics and politics play a role, participants ultimately negotiate various technological solutions. Hence, technical expertise is a crucial prerequisite for influencing standard setting.

By and large, technological innovation in the west is the result of industrial and academic R&D, while public funding is vital for basic research. However, China has adopted a much more state-centric approach to R&D, using state resources to catch up with technological innovation in fields considered strategic. Industrial policies connected to Made in China 2025 have been accompanied by additional state funding, which allowed China to spend 2.2 per cent of its GDP on R&D in 2019.²⁴²

For example, Huawei, a national champion with close ties to the authorities (though not state owned), has rapidly expanded its technical expertise.²⁴³ The company is renowned for investing a high share of its revenue in R&D.²⁴⁴ Huawei is one of only three companies globally with high market shares to manufacture radio-access technology for 5G infrastructure. Strikingly, Huawei not only outspends the combined R&D investments of its two main 5G competitors, Ericsson and Nokia (USD 14.3 billion compared to USD 10.6 billion in 2017),²⁴⁵ but also benefits from political support. According to reports, over the past 25 years, Huawei has received up to USD 75 billion in tax breaks and cheap loans. It profited from USD 46 billion in cheap loans, credit lines and other support from state lenders alone. Between 2008 and 2018, the company saved USD 25 billion in taxes due to state incentives to promote the technology sector.²⁴⁶

While R&D investments alone do not result in innovativeness, and the sums invested by Huawei and other Chinese firms might exaggerate their respective company positions, significant R&D funding is a prerequisite for standardisation.

Not only has the Chinese Government provided remarkably good conditions for innovation through state-steering by means of state subsidies, economic rewards and investing in the necessary infrastructure, it has also taken protectionist measures, shielding indigenous innovation from international competition.²⁴⁷ This includes protectionist industrial policy, information control measures as a barrier to market access and trade, fiscal and SOE structures that work to Chinese companies' advantage, and the use of national security measures.²⁴⁸

241 For example, see: Büthe, Tim and Mattli, Walter, *The New Global Rulers: The Privatization of Regulation in the World Economy*, Princeton University Press, Princeton, 2011.

242 *Is China a Global Leader in Research and Development?*, CSIS, viewed 8th November 2021, <<https://chinapower.csis.org/china-research-and-development-rnd/>>

243 Author interviews with European mobile operators, January 2019.

244 Sharma, Parv, *5G Ecosystem: Huawei's Growing Role in 5G Technology Standardization*, Counterpoint Research, 20th August 2018, viewed 11th April 2019, <<https://www.counterpointresearch.com/huaweis-role-5g-standardization/>>

245 Nelson, Rick, *China's Huawei Seeks to Dominate 5G Standards Development*, *Evaluation Engineering*, 30th March 2018, viewed 11th April 2019, <<https://www.evaluationengineering.com/industries/communications/wireless-5g-wlan-bluetooth-etc/article/13017349/chinas-huawei-seeks-to-dominate-5g-standards-development>>

246 Yap, Chuin-wei, *State Support Helped Fuel Huawei's Global Rise*, *The Wall Street Journal*, 25th December 2019, viewed 9th February 2020, <<https://www.wsj.com/articles/state-support-helped-fuel-huaweis-global-rise-11577280736>>

247 Deron, Laure G., *Chinese Standards and the New Industrial Markets*, Institut Recherche Stratégique de l'École Militaire, Paris, 2020, p. 14

248 Ferracane, Martina F. and Lee-Makiyama, Hosuk, *China's Technology Protectionism and its Non-negotiable Rationales*, ECIPE, Brussels, 2017.



2. Exploiting early mover advantage

A second factor improving the ability to shape international technical standard setting is exploiting early mover advantage.²⁴⁹ While cutting-edge innovation is a precondition, early mover advantage—the early commercialisation of technology and proving its value of innovation in real-world conditions—is crucial for influencing standard setting because, once established, international standards are slow to change.

In China, early commercialisation is also a core dimension of standard setting, but it is not left to private industry. A central feature of the state's industrial policy is to establish regulatory and financial conditions to facilitate early commercialisation of key enabling technologies and encourage companies to turn innovation into technical standard contributions.²⁵⁰ For example, many municipalities offer stipends to Chinese firms if they develop technical standards. International standard contributions can receive funding of up to Chinese yuan (CNY) 1 million.²⁵¹

Another example is that China has sponsored the world's largest 5G trial area in the Yangtse River Delta.²⁵² It instructed the state-controlled mobile operators to roll out the most innovative version of 5G, known as standalone 5G, and provided spectrum free of charge. Western countries, by contrast, have tended to opt for updating 4G/LTE networks to non-standalone 5G, because private industry has identified that this path is more economical in the short and medium-term. In addition, European mobile operators had to purchase spectrum from European regulators.²⁵³ The Chinese Government has further announced plans to invest USD 411 billion in the roll-out of 5G between 2020 and 2030.²⁵⁴ In short, China's state-centric approach supports standardisation by socialising financial liabilities of early commercialisation.

3. Encouraging active participation in standardisation bodies

A third factor is encouragement for active participation in standardisation bodies. Having voting rights in several formal SDOs requires active and regular contributions to standard development. Western firms with stakes in standardisation need to meet this requirement with little if any state support (for example, partial coverage of travel expenses). The most influential European SDO, the German DIN, receives around 10 per cent of its budget from public authorities. The sale of standards and membership fees are the DIN's main funding sources.

By contrast, China adopts a state-centric approach to increase engagement in formal international standardisation by means of state-defined benchmarks that help contributing firms gain preferential access to financial resources provided by state-owned banks.

Until recently, China also provided significant financial support for travel, participation and the operations

249 Arthur, W. Brian, 1989, *Competing Technologies, Increasing Returns, and Lock-in By Historical Events*, *The Economic Journal*, vol. 99, no. 394, pp. 116–131.

250 Medin, Milo and Louie, Gilman, *The 5G Ecosystem: Risks & Opportunities for DoD*, Defense Innovation Board, Washington DC, 2019.

251 *Changzhou awards 36 technical standard projects up to CNY 250,000*, JSTV, 30th May 2015, viewed 9th April 2021, <<http://news.jstv.com/a/20160530/1464592527175.shtml>>; *Maximum reward of CNY 200,000! Anhui Province Standard Innovation Contribution Award*, Sina, 5th June 2020, viewed 9th April 2021, <http://ah.sina.com.cn/news/2020-06-05/detail-iirczymk5326832.shtml?from=ah_ydph>; *Individual category prizes of CNY 300,000! Come and apply for the Shenzhen Science and Technology Award, Guangzhou Converged Media Centre*, 21st May 2020, viewed 9th April 2021, <<https://huacheng.gz-cmc.com/pages/2020/05/21/c9234e610ef441b084884c5f0b0bd5c1.html>>; *2019 Shenzhen Science and Technology Award (Standard Award) Application Guide*; Shenzhen Municipal Government, viewed 9th April 2021, <<http://amr.sz.gov.cn/attachment/0/43/43748/1968717.pdf>>; *Group standards included in the scope of local financial subsidies*, CBLFTA, viewed 9th April 2021, <http://www.cbifta.org.cn/cbiftaorg/wap_doc/15603295.html>

252 Shi-Kupfer, Kristin and Ohlberg, Maraike, *China's Digital Rise: Challenges for Europe*, MERICS, Berlin, 2019, p. 26.

253 Eisenstark, Roma, *Why China and the US Are Fighting over 5G*, TechNode, 30th March 2018, viewed 11th April 2019, <<https://technode.com/2018/03/30/5g/>>; Rühlig, Tim and Björk, Maja, *What to Make of the Huawei Debate? 5G Network Security and Technology Dependency in Europe*, *UI Paper 1/2020*, The Swedish Institute of International Affairs, Stockholm, 2020.

254 Shi-Kupfer, Kristin and Ohlberg, Maraike, *China's Digital Rise: Challenges for Europe*, MERICS, Berlin, 2019, p. 18.

of secretariats by Chinese actors. Academic research has repeatedly emphasised the crucial importance of financial resources in this context.²⁵⁵

4. Optimising policy coordination

A fourth and final factor is optimising policy coordination in order for a country or bloc's industry to speak with one voice in SDOs. Practitioners from all countries confirm that conflicts of interest among industry representatives from one country are the rule rather than the exception. At the same time, coordination to ensure participants speak with one voice helps to establish support around a given standard proposal.

In the EU and the US, such coordination is left to industry or to committees within private SDOs. While China's unity is often overestimated, in fields of national priority, the government indeed actively facilitates coordination. In 2013, for example, China founded the IMT 2020 (5G) Promotion Group, which comprises Chinese public agencies (the MIIT, the Ministry of Science and Technology and the NDRC), research institutes (Beijing University of Posts and Telecommunications) and numerous Chinese technology companies.²⁵⁶

Government institutions do not define standards or prioritise one contribution over another. However, public authorities facilitate coordination within the country prior to engaging in international standardisation. At times, this involves pressure. Famously, when Chinese IT firm Lenovo voted in favour of a standard contribution proposed by Qualcomm instead of one put forward by Huawei in 3GPP, Lenovo faced a severe backlash in China.²⁵⁷ Similarly, China made coordinated efforts at a 2016 international 3GPP meeting to push Huawei's proposal for the control panel of non-standalone 5G against a contribution from Qualcomm that seemed to have already gained wide consensus among international standardisers.²⁵⁸ There are also reports that China even demands smartphone pictures from its delegates as proof that they have voted in favour of Chinese candidates when leadership positions in SDOs are being elected.²⁵⁹

In sum, China has not only gained influence in formal 5G standard setting and international SDOs, but it has also pursued a state-centric variant of standardisation. In formal international standardisation, this state-centric approach now coexists alongside the traditional privately-driven approaches of the EU and the US.

China's state-centric approach to de facto standardisation

China's growing ability to shape international *de facto* standardisation is also not the result of practices that are fundamentally different to western approaches, but rather a state-centric variant. This can be illustrated with reference to three influential factors.

255 Tamm Hallström, Kristina and Boström, Magnus, *Transnational Multi-Stakeholder Standardization: Organizing Fragile Non-State Authority*, Edward Elgar, Cheltenham, 2010, pp. 28–29.

256 Chen, Shan-zhi and Kang, Shao-li, 2018, *A Tutorial on 5G and the Progress in China*, *Frontiers of Information Technology & Electronic Engineering*, vol. 19, no. 3, p. 309–321; *5G Progress and Cooperation in China*, CAICT, Beijing, 2016; Triolo, Paul et al., *Eurasia Group White Paper: The Geopolitics of 5G*, Eurasia Group, Washington DC, 2018.

257 Lewis, James A., *How 5G Will Shape Innovation and Security: A Primer*, CSIS, Washington DC, 2018; Hersey, Frank, *Lenovo Founder in Public Backlash for 'Unpatriotic 5G Standards Vote'*, *Technode*, 16th May 2018, viewed 30th September 2018, <<https://technode.com/2018/05/16/lenovo-huawei-5g/>>

258 Pop, Valentina et al., *From Lightbulbs to 5G, China Battles West for Control of Vital Technology Standards*, *The Wall Street Journal*, 8th February 2021, viewed 17th February 2021, <<https://www.wsj.com/articles/from-lightbulbs-to-5g-china-battles-west-for-control-of-vital-technology-standards-1161722698>>.

259 Ibid.



1. Leveraging company size and market share

Establishing large companies with a significant market share is a prerequisite for a state to set *de facto* standards. It is also helpful if the state's own market is big, because this provides more market power when engaging in international standardisation.

While size has helped Chinese firms, too, government support goes far beyond western practices. China proactively facilitates the creation of national champions, and in recent years the average size of its SOEs has grown considerably.²⁶⁰

One example is the railway sector, which remains state-controlled. In 2013, the Ministry of Railways was dismantled and divided into the National Railway Administration and the China Railways Corporation (CRC) under the Ministry of Transportation and the NDRC. However, alongside its activities as a company, the CRC also is responsible for railway development, pricing and infrastructure building.²⁶¹ Hence, it is not only a supplier but simultaneously performs a coordinating function in China's railway industry. This has implications for strategic R&D investment and standardisation targets. China has not only established state control over manufacturing and the operation of the railway sector, but also directs the technological innovation and R&D required for standards development. At least 25 research universities, 11 research institutes and 51 national engineering and research centres with more than 10,000 researchers receive direct instructions from the government to fulfil national goals. The CRC also has its own engineering and research branches, namely the China Railway Design Corporation and the China Academy of Railway Sciences.²⁶²

In other words, state control over the railway industry and R&D is linked with China's approach to railway standardisation.

2. Boosting international presence and 'package deals'

Domestic market dominance is not sufficient for setting *de facto* standards. The globalised world forces both western and Chinese companies to compete with technological solutions from abroad. While export subsidies are a global phenomenon, China has adopted a distinctly state-centric approach to achieving international market presence. Again, the railway industry is a case in point.

Although Chinese railway companies mostly produce for the domestic market, China is promoting exporting its railway industry as part of the Made in China 2025 initiative. China has promised to spend USD 1 trillion building new roads, railways and other infrastructure beyond its borders in the BRI.²⁶³ By 2020, the export quota had increased to 25 per cent of the CRC's business. The concept of a 'Railway Economic Belt' (REB) was established to boost both the buildout of railway infrastructure and the promotion of trade via the railways.²⁶⁴

China's 'going out' strategy is heavily subsidised by state-owned banks. Experts have estimated subsidies

260 Lardy, Nicholas R., *The State Strikes Back: The End of Economic Reform in China?*, Columbia University Press, New York, 2019.

261 Yan, Shu Liang (Karl), *Can China Link the Belt and Road Initiative by Rail?*, *New Perspectives on China's Relations with the World: National Transnational and International*, Johanson, Daniel et al., eds., E-International Relations Publishing, Bristol, 2019, pp. 87–103.

262 Ibid.

263 Hillman, Jonathan, *The Emperor's New Road*, Yale University Press, New Haven, 2020, p. 4.

264 Yan, Shu Liang (Karl), *Can China Link the Belt and Road Initiative by Rail?*, *New Perspectives on China's Relations with the World: National Transnational and International*, Johanson, Daniel et al., eds., E-International Relations Publishing, Bristol, 2019, pp. 87–103.

(including from local governments) for the REB connecting China with Europe to be as high as USD 300 billion.²⁶⁵ While the Postal Savings Bank of China announced in May 2017 that it would provide loans worth CNY 200 billion for REB projects, similar disclosures from other Chinese banks have not been forthcoming.

Such export subsidies as part of larger package deals are crucial for the internationalisation of domestic Chinese railway standards because they are very often an integral part of specific infrastructure development projects, as briefly summarised in the main text of this study.

China not only provides loans to BRI countries on the condition that Chinese firms are awarded the construction contracts, but also aims to spread its technical standards as part of 'package deals'.²⁶⁶ This demonstrates that Chinese railway firms receive significant and strategic support to increase their market share while setting *de facto* railway standards in BRI countries.

3. Creating long-term liabilities

De facto standards are particularly potent, as in many cases they lock customers into specific products from one specific supplier. The maintenance of products or their use in related products relies, in many cases, on established technical standards. Western firms' practices show that this asset is being strategically used by companies, and China's approach is no different. See Annex 2 on page 53 for more details.

²⁶⁵ Jakóbowski, Jakub et al., *The Silk Railroad, The EU-China Rail Connections: Background, Actors, Interests, OSW Studies 72*, Centre for Eastern Studies, Warsaw, 2018.

²⁶⁶ Hillman, Jonathan E., *Influence and Infrastructure: The Strategic Stakes of Foreign Projects*, CSIS, Washington DC, 2019.



Annex 4: Challenges for the EU arising from China's standardisation approach

China's growing footprint in technical standard setting has raised concern among observers and policymakers on both sides of the Atlantic,²⁶⁷ but what are the challenges arising from this development specifically for the EU? This section identifies three sets of partly overlapping consequences, namely the politicisation of standard setting; a potential bifurcation, fragmentation or decoupling of international technical standards; and the EU's loss of influence in international standard setting.

Politicisation of technical standards

Although technical standards were used by states as a tool to exert power in the late 19th and early 20th centuries, their potential to influence has long been neglected.²⁶⁸ This seems to have undergone something of a resurgence, however, with the Chinese Government's strategic approach to international technical standard setting coupled with emerging competition over high technology. This is leading towards standardisation being politicised, not least with China's growing footprint potentially compelling other, primarily developing, countries to consider adopting a state-steered approach.

For good reason, Europe has long been a strong advocate of a rather non-political approach to technical standards, shielded from state influence: the focus on technological solutions helped to steer the way for globalisation and economic cooperation. Standardisation has also served as a technological baseline stimulating economic competition internationally. This is about to change, since China is represented in the ISO and the IEC not by a private SDO but a state ministry (SAC) and leverages its state-steered domestic system in international standardisation activities. It is no coincidence that China aims to move more standardisation activities from private institutions into the ITU (for example, its 'New IP' proposal), which is an intergovernmental organisation, though a special kind since it includes private actors as well. This politicisation could cause damage to technical standard setting and harm all actors involved, including the EU.²⁶⁹

Politicisation could substantially change the nature and process of standard setting. The actors involved may end up paying more attention to ethical, societal and political underpinnings of different technological solutions. While this is not necessarily negative, the EU needs to be prepared that technical standardisation could become an arena where states compete over differing values.

Bifurcation of international standardisation

As a result of politicisation, standardisation could suffer from a division into two or more camps. China could aim to develop a rival system of international standard setting, with the BRI serving as its stepping-stone, in order to outcompete European standardisation powers. The international standard setting system is already experiencing fragmentation, and the risk of a decoupling of technical standards is growing. As

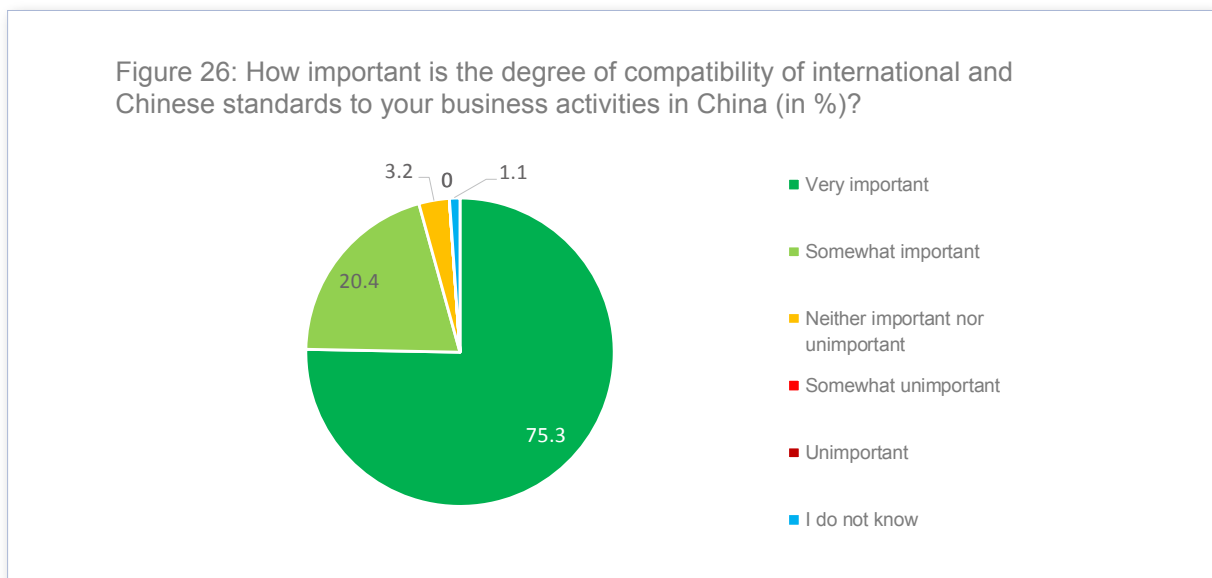
267 Arcesati, Rebecca, *Competing with China in the Digital Age, Towards a "Principles First Approach" in Europe's China Policy: Drawing Lessons from the Covid-19 Crisis*, Huotari, Mikko et al., eds., MERICS, Berlin, 2020, pp. 47–56; Delhaes, Daniel et al., *Economic War of the 21st century: How China is replacing DIN standards*, *Handelsblatt*, 15th March 2021, viewed 29th March 2021, <<https://www.handelsblatt.com/politik/deutschland/technologie-wirtschaftskrieg-des-21-jahrhunderts-wie-china-den-deutschen-standard-verdraengt-/26986456.html?ticket=ST-2008279-LPbWaLA6LWSm5JpvHOc-ap3>>; Rühlig, Tim, *Technical Standardisation, China and the Future International Order: A European Perspective*, EU Office of the Heinrich Böll Foundation, Brussels, 2020; de La Bruyère, Emily and Picarsic, Nathan, *China Standards 2035: Beijing's Platform Geopolitics and "Standardization Work in 2020"*, Horizon Advisory, New York, 2020.

268 Doshi, Rush and McGuinness, Kevin, *Huawei Meets History: Great Powers and Telecommunications Risk, 1840–2021*, Brookings Institution, March 2021, viewed 11th April 2021, <<https://www.brookings.edu/wp-content/uploads/2021/03/Huawei-meets-history-v4.pdf>>

269 SFRC Democratic Staff, *The New Big Brother: China and Digital Authoritarianism*, US Senate, Washington DC, 2020, p. 44.

China is a latecomer to the existing global institutional system, established standardisation powers are striving to preserve the system, while simultaneously integrating China without losing influence.

As a novice in the game, China could aim to stretch the boundaries of the rules or establish rivaling institutions that undermine the existing framework. Although the ISO and the IEC are currently the key platforms, accounting for around 85 per cent of all international product standards,²⁷⁰ a multitude of SDOs are already competing for international influence. The risk of such a decoupling of standards is significant and would be highly detrimental to European businesses. This is borne out by the fact that an overwhelming majority of the European firms operating in China find compatibility of Chinese standards with international standards to be very important to their business activities (Figure 26).



Source: European Chamber and UI Standardisation Survey 2021

The enormous importance attributed to compatibility with international standards is particularly crucial given that potential decoupling of technical standards is a consideration for a majority of European companies when assessing their level of involvement in the China market (Figure 27).

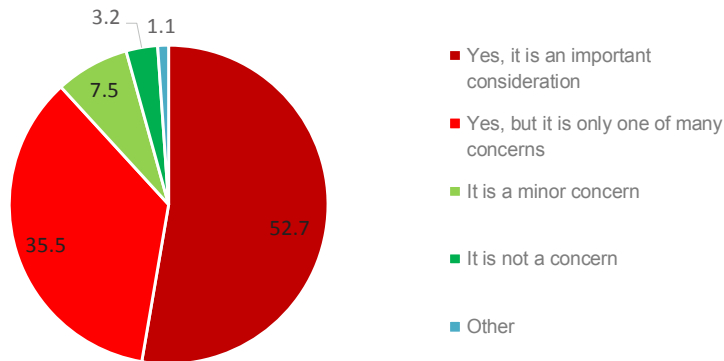
Interviews with European industry conducted for this study provide further nuance to these findings, in that concerns vary greatly across different sectors of the economy. Worries are growing in the ICT and automotive sectors in particular, while other, less politically-strategic sectors—such as food or household appliances—are less concerned.

Even within sectors, China does not necessarily adopt a unitary policy. By trend, China is more willing to commit to international standards in areas where it is technologically advanced and strives to influence global standard setting. In fields beyond Chinese technology strongholds, China tends to fuel decoupling from international standards.

²⁷⁰ Bütthe, Tim and Mattii, Walter, *The New Global Rulers: The Privatization of Regulation in the World Economy*, Princeton University Press, Princeton, 2011, p. 6.



Figure 27: Do you consider challenges related to potential decoupling and implications this may have on the incompatibility of technical standards when planning your level of involvement in China (in %)?



Source: European Chamber and UI Standardisation Survey 2021

In some cases, such as elevators and postal services, alliances of European actors with export-orientated Chinese businesses have helped to generate support for the adoption of ENs, or have led to collaboration on developing an international standard based on ENs that was then adopted identically within China.²⁷¹

Almost the entire European industry is united in its advocacy for the adoption of international standards in China,²⁷² and academic analysis confirms the benefits of international standards for EU-China trade.²⁷³ By providing interoperability, they facilitate international trade and harmonise technical necessities for market access. The potential to sell products on global markets is a driver for technological innovation. If technical standardisation were to be divided into two distinct spheres, there would be direct economic risks for all actors. If companies were forced to design products in a distinct manner for different geographical areas, they would suffer from a loss of efficiency, and the increase in costs would hamper innovation.²⁷⁴

Loss of influence

The EU and European firms rightly fear a loss of influence resulting from China's growing footprint in international technical standardisation. Current concerns in Europe largely focus on new and key enabling technology standardisation such as AI and lithium batteries.^{275&276} More fundamentally, however, the force of standards themselves could dwindle if they are not considered impartial.

Economically, a redistribution of resources dominates concerns over a power shift. Actors that used to

271 Information according to telephone interviews with European standardisation experts, July–September 2021.

272 Information according to telephone interviews with European standardisation experts, July–September 2021.

273 Mangelsdorf, Axel, 2011, *The Role of Technical Standards for Trade Between China and the European Union*, *Technology Analysis & Strategic Management*, vol. 23, no. 7, pp. 725–743.

274 *Decoupling: Severed Ties and Patchwork Globalisation*, European Union Chamber of Commerce in China, 14th January 2021, viewed 2nd November 2021, <<https://www.eurochamber.com.cn/en/publications-decoupling>>

275 Delhaes, Daniel et al., *Economic War of the 21st century: How China is replacing DIN standards*, *Handelsblatt*, 15th March 2021, viewed 29th March 2021, <<https://www.handelsblatt.com/politik/deutschland/technologie-wirtschaftskrieg-des-21-jahrhunderts-wie-china-den-deutschen-din-standard-verdraengt-/26986456.html?ticket=ST-2008279-LPbWaLA6LWSm5jJpvHOC-ap3>>

276 Pop, Valentina et al., *From Lightbulbs to 5G, China Battles West for Control of Vital Technology Standards*, *The Wall Street Journal*, 8th February 2021, viewed 17th February 2021, <<https://www.wsj.com/articles/from-lightbulbs-to-5g-china-battles-west-for-control-of-vital-technology-standards-11612722698>>

gain large shares of royalties from SEPs, not least those based in the EU, could face a situation in which they not only need to pay licensing fees to Chinese competitors, but also bear switching costs when redesigning their technology. To the extent that technical standards are considered part of international trade law, the EU's capacity to shape international law would also diminish.

Another concern is that Europe could face strategic dependency on Chinese certifiers. China purchases European certification agencies, including Notified Bodies (NBs), that certify conformity with hENs.²⁷⁷ At this stage, the related challenges are vague and abstract, as it remains unclear whether NBs are covered by the EU's FDI screening mechanism.²⁷⁸ At worst, however, the EU could end up in a situation in which it relies on Chinese SOEs to certify conformity with standards supporting EU regulation in some sectors and countries.

277 Zhong, Nan, *Certification Firm Gets Nod as Central SOE*, *China Daily*, 12th June 2020, viewed 6th May 2021, <<https://govt.chinadaily.com.cn/s/202006/12/WS5ee2ebcc498ed1e2f340711d/certification-firm-gets-nod-as-central-soe.html>>

278 Berendsen, Tom, *Risks Arising from Foreign takeovers of Notified Bodies*, European Parliament, viewed 6th May 2021, <https://www.europarl.europa.eu/doceo/document/E-9-2021-001186_EN.html>



Annex 5: Abbreviations

3GPP	Third Generation Partnership Project
4G/LTE	Fourth-generation / Long-term Evolution
5G	Fifth-generation Mobile Technology
AFNOR	Association Française de Normalisation
AI	Artificial Intelligence
BRI	Belt and Road Initiative
BRICS	Brazil, Russia, India, China and South Africa
CAI	Comprehensive Agreement on Investment
CAICT	China Academy of Information and Communications Technology
CAMET	China Association of Metros
CC	Central Committee
CCP	Chinese Communist Party
CEN	European Committee for Standardisation
CENELEC	European Committee for Electrotechnical Standardisation
CNIS	China National Institute of Standardisation
CNY	Chinese Yuan
CRC	China Railways Corporation
CS2035	China Standards 2035
CTCS	Chinese Train Control System
DC	Direct Current
DIN	German Institute for Standardisation
ESO	European Standardisation Organisation
ETSI	European Telecommunication Standards Institute
EU	European Union
EUR	Euro
FDI	Foreign Direct Investment
FIE	Foreign-invested Enterprise
FIL	Foreign Investment Law
FRAND	Fair, Reasonable and Non-discriminatory
FYP	Five-year Plan
GATS	General Agreement on Trade in Services
GB	Guóbiāo
GDP	Gross Domestic Product
hENs	Harmonised European Norms
ICT	Information and Communication Technology
IEC	International Electrotechnical Committee
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IoT	Internet of Things
IP	Intellectual Property
IRTF	Internet Research Task Force
ISO	International Organization for Standardization
IT	Information Technology
ITU	International Telecommunication Union

JTC	Joint Technical Committee
JV	Joint Venture
MERICCS	Mercator Institute for China Studies
MIIT	Ministry of Industry and Information Technology
mmWave	Millimetre Spectrum
MoU	Memorandum of Understanding
NB	Notified Bodies
NDRC	National Development and Reform Commission
NSB	National Standard Body
OECD	Organisation for Economic Co-operation and Development
OS	Operating System
PPP	Public-private Partnership
PRC	People's Republic of China
R&D	Research and Development
RCEP	Regional Comprehensive Economic Partnership
REB	Railway Economic Belt
SAC	Standardisation Administration of China
SAMR	State Administration for Market Regulation
SDO	Standard Developing Organisation
SEP	Standard Essential Patent
SESEC	Seconded Standardisation Expert in China
SIS	Swedish Standards Institute
SME	Small and Medium-sized Enterprise
SOE	State-owned Enterprise
TBT	Technical Barriers to Trade
TC	Technical Committee
TSAG	Telecommunication Standardisation Advisory Group
TTC	Trade and Technology Council
UK	United Kingdom
UN	United Nations
US	United States
USB	Universal Serial Bus
USD	United States Dollar
USCC	United States-China Economic and Security Review Commission
W3C	World Wide Web Consortium
WAPI	Wireless Authentication and Privacy Infrastructure
WLAN	Wireless Local Area Networking
WTO	World Trade Organization



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