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The increasing dispute between USA and China over international standardization

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Abstract

This paper argues that there is an increasing dispute between China and United States on international technical standards, with national security as a central element and involving emerging and critical technologies. Based on Krasner's structural perspective on international regimes, it shows that historically, states' powers and interests have influenced the construction of the standards principles and rules in international institutions. The current USA-China dispute is revealed by their growing international participation and influence combined with national strategies to internationalize national standards. The paper is widely supported by specialized bibliography and documents from governments and institutions that are relevant on the issue.

Keywords: Standards; China; Technical Barriers to Trade; USA; Emerging Technologies.

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Introduction

Despite its importance for high-technology competition and economic gains, in addition to its potential connection to security issues, standards issues have received little attention from International Relations academics, especially in Brazil.

By standards, this article refers primarily to what is also known as "technical standard" and may involve the three main types of documents provided by the World Trade Organization (WTO) Agreement on Technical Barriers to Trade (TBT): standards, technical regulations and conformity assessment procedures. The main difference between standards and technical regulations is that the latter are issued by government regulatory authorities and compliance is mandatory, whereas the formers are voluntary and the issuing entities are not always governmental. Conformity

assessment procedures are ways of demonstrating compliance with technical standards and regulations (WTO 2018a).

The international dispute in standards in international forums used to be more restricted to United States (USA) and Europe, but more recently Asians have become relevant actors. Among them, China has emerged with an extremely vigorous and bold strategy. This paper argues that USA and China are involved in an increasing dispute in the field of standards, grounded by the growing participation of China in standardization forums and in the dispute to internationalize their standards. This competition involves critical and emerging technologies (CETs) - such as 5G, Artificial Intelligence (AI) and semiconductors - which are important for national economic development and companies' gains, but above all for international influence and national security, the core reason declared by these states. Such rivalry is attracting growing attention from communities of standards and policy makers, but, according to Kim, Lee and Kwak (2020, 1), "While China's challenges with various standard initiatives to the global standards regime peaked in the 5G dispute have attracted public interests, scholarly approach to the dispute is still limited".

This paper brings a theoretical contribution to the scarce literature about technical standards and USA-China rivalry, which is usually approached by a state-centric techno-nationalist perspective, focused on S&T systems and policymaking, present in Suttmeier and Xiangkui (2004), Kim, Lee and Kwak (2020) and Lee (2021). Here is added a structural realist perspective parting from Stephen Krasner's (1982; 1985) conceptions of international regimes and structural conflict, in which an anarchic system and its distribution of power influence the states dispute and strategies in the quest for more than wealth, but national security, power and control over vulnerabilities, which in turn involves their search for influence over regimes and technological leadership. As will be seen, China and USA put the national security as the top reason to act on technical standards. This perspective does not address international standardization activity as neutral, and that it would result from a joint international effort to promote better standards that can benefit all countries (Loya and Boli 1999; Mattli and Büthe 2003). Another contribution of the article is putting together historical building of standards rules and institutions and the actual disputes from a structural perspective.

Section one deepens the theoretical support of the article. The second section presents the various standardization international forums, some indicators of US influence and the increasing participation of China in the 21st century. The following sections provide a comparison of key factors in understanding and assessing the USA-China rivalry. Section three shows the national frameworks and states' strategies for standardization activity. Section four deals with each state's initiatives to internationalize their own standards. The final section brings some final remarks on USA-China dispute and possible standards changes. The paper is supported by specialized bibliography and documents from governments and institutions that are relevant for technical standards. A combination of qualitative and quantitative analysis is used to support the paper's main argument.

A structural realist perspective

Standards are the new frontier of trade negotiations and technological disputes. A recent study conducted by the US Department of Commerce estimates that up to 93% of trade can be affected by standards (WTO 2019). Moreover, studies in Europe about the impact of standards on national economies' GDP showed that it can reach 0.8% in France and 0.9% in Germany (European Commission 2018). Many important mechanisms that link standards to economic gains and national security will be mentioned along the paper. For example, financial economic gains can be fundamentally linked to the standards arising from the inclusion of technologies with intellectual property rights (IPR) in the standards. An example regarding the impacts on national security, the development of standards can have dual use, civil and military, and even impulse the leadership in technologies which are critical to security. Also, it can avoid technology dependence linked to standards that can lead to economic and security vulnerabilities. Policies adopted by the USA and China, as well as disputes in international standardization forums, show this relevance very clearly.

Kim, Lee and Kwak (2020, 2) bring a techno-nationalist view over China's strategy, US responses, and the resulting rivalry on standards. As the authors point out, "Techno-nationalism usually refers to a tendency of national technology and innovation policy in favor of avoiding or minimizing the dependence on foreign technologies". Usually perceived as a state action to strengthen national security through S&T policies, techno-nationalism is a state-centered approach more focused on innovation systems and economic gains, although security reasons can be claimed by states. It sees that China's approaches to standardization strategies as the fundamental stance in its science and technology policy in general and international standardization in specific.

Going beyond this approach, this paper inserts a structural realist perspective of International Political Economy. For Krasner (1982, 186), international regimes are "sets of implicit or explicit principles, norms, rules and decision-making procedures around which actors' expectations converge in a given area of international relations." Regimes are built and influenced by states interests and power relations, the basic causal variables, under an anarchic system marked by its distribution of power (Krasner 1982; Krasner 1985).

Krasner (1982) points out that although regimes can have some stability and lags in relation to distribution of power changing – therefore achieving some autonomous dynamics, bureaucracy and agenda setting temporarily -, they can't have a "life of their own", based on a neutral aim for justice, cooperation or efficiency, or even turning into an independent variable as proposed by Keohane (1984). For Krasner, regimes are intervenient variables that impact actors' behaviors and outcomes, the dependent variables (Figure 1). But still, states' power and interests keep on seeking and in fact influencing regimes and outcomes. Krasner also points to the possibility that established regimes (through outcomes) impact the capacities and interests of the states, the initial causal variables.

Figure 1. Regimes as intervening variables

Source: Krasner (1982).

In Krasner's (1985) view, distribution of power causes a structural conflict, in which the position (capacities) of the states in the distribution of power and wealth influences their interests regarding more liberal or more interventionist regimes, aiming to achieve more advantages and/or power and control over vulnerabilities. Structural conflicts help us to remark the importance of states' strategies and rivalries seeking the internationalization of national standards and influence on international institutions and rules. States are seeking economic autonomy, but also international power and influence for their core purpose of national security.

Here, it is worth mentioning Fiori's (2004) vision that power competition, or specifically the quest for dominance and security, also leads to dispute and conflict between Great Powers. They (including the hegemonic state) do not necessarily promote liberal regimes or act as stabilizers of the international system, and can even disrespect rules and institutions that they created, and may seek to create different ones. That happens because Great Powers are always guided by a compulsive expansion aiming at national security, which means achieving a favorable (advantageous) distribution of power in an anarchic and competitive system.

In such perspective, as seen in Figure 1, China and USA are seeking influence on international standards regimes, and the increasing or decreasing of American or Chinese influence in setting them may have relevant technological, economic and national security repercussions for their power dispute. In a national perspective, the standards involve the technology mastery in critical emerging technologies and markets control with the potential for huge trade and financial gains. It can also be relevant for national security issues, as military leadership is dependent on high-level technologies and economic capacity. This structural view will support the historical and dynamic analysis in the next section, showing states' influence over the process of rules and institutions building in the standards area, as well as the changes revealed by China's rising presence.

The international standardization process and the trade rules for the area

After introducing the structural realist approach on regimes, it is worth analyzing the historical process of building international standards under the lens of states' power, interests and disputes.

The process of developing a standard can take place at the national, regional, international or even at the level of an NGO, a company or a group of companies. However, the standards that are

usually considered internationally relevant are those developed within international organizations, such as the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), the International Telecommunication Union (ITU) and Codex Alimentarius. In addition, there are those developed in self-called international standardization bodies, but whose participation by companies based where these organizations are established ends up prevailing, such as the American Society for Testing and Materials (ASTM International) or the Institute of Electrical and Electronics Engineers (IEEE). At the national level, most countries have only one standardization organization that brings together all the activity done for the various sectors (Pizetta 2018).

In order to understand the importance that standards have gained in international trade, it is essential to know the rules created under the GATT / WTO. First discussions to regulate the field started in the 1960s, when it began being called “technical barriers to trade”. Experts from eight countries or regional organizations were called by a Working Group who had been set up for working on “solutions” for the issue: Australia, Canada, Denmark, Japan, Sweden, United Kingdom, USA and European Community. Based on an inventory of notifications sent by GATT Members, these experts developed the rationale that guided all the field’s negotiations ever since (WTO 2018b). Suggestions were structured and translated into the so-called Standards Code of the Tokyo Round, of a voluntary nature, which was later transformed without major changes into the Agreement on Technical Barriers to Trade (TBT) of the Uruguay Round, this time of compulsory compliance by all WTO Members. Following Krasner’s (1982) structural view (Figure 1), here it is possible to find the influence of states’ (Great Powers) power and interests shaping from the start the standards regimes through the TBT Agreement, and later impacting related behaviors and outcomes. But it also reveals the possibility of cooperation and dispute between Great Powers, as foreseen by Fiori (2004).

The TBT Agreement has some main principles. The first of them is “non-discrimination” between national and foreign products (from GATT’s principle of national treatment) in terms of standards, technical regulations, and conformity assessment procedures. The second is the prevention of unnecessary barriers to trade, with important emphasis on the concept of “necessity” developed by the WTO Dispute Settlement Body later on. The third is the use of relevant international standards as the basis for national technical standards and regulations. The fourth fundamental principle of the Agreement is transparency. This involves member countries’ commitment on issues such as notifying their regulations to WTO, providing time for comments and enforcement, and establishing so-called Inquiry Points to provide information on domestic regulation to foreign stakeholders.

Studying the case of ISO, Witte (2003) presented the factors that can be considered fundamental for an actor to influence the standardization process: 1. Economic resources: the standard development can take years and participation in meetings throughout the process requires high financial sums; 2. Technical expertise: lack of access to knowledge and technology being debated, as well as technicians and scientists capable of defending the actor’s positions and

interests, makes influence impossible; 3. Capacity to coordinate the Technical Committee or Working Group, which materializes in the capacity and structure to organize the work carried out there, which also facilitates the participation of national companies; 4. Access to information as quickly and accurately as possible. If the country wishes to exert influence over the standard being developed, it should be engaged in its development from the outset and the definition of its scope, since all subsequent work will be done on the basis of that beginning; 5. Effective representation by the national representative at ISO. Ability of national stakeholders to organize and coordinate their positions. Framing in Krasner's conception of international regimes, the factors identified by Witte can be grouped and translated as the states' power needed to influence standards institutions, principles and rules.

Comparisons of 2001-2020 data on the number of Secretariats of Technical Committees (Table 1) and the amount of Coordination of Working Groups (Table 2) can support the analysis over the evolution of ISO, the largest and most important international organization for standardization. These data highlight: the dominance of developed countries over the standardization process; the decline of US participation, which ranked as number one in 2001 but was overcome by Germany; and the huge growth of countries such as China and South Korea in the 21st century. As these states have seen standards as a tool for high technology-based economic development and national security, and as they are achieving greater international power and economic relevance, they are searching for more influence on international standards institutions and rules through ISO participation.

Table 1. ISO - Number of active secretariats at TC and SC level

Country	2001	2020	Growth %
Germany	124	135	9%
USA	136	103	-24%
Japan	36	78	117%
France	85	81	-5%
UK	106	77	-27%
China	6	66	1000%
Sweden	28	26	-7%
Italy	17	21	24%
Australia	15	23	53%
Korea	5	18	260%

Source: ISO. www.iso.org

Table 2. ISO – Number of convenorships at WG level

Country	2001	2020	%
USA	471	427	-9%
Germany	360	384	7%
Japan	110	227	106%
France	188	209	11%
UK	328	226	-31%
China	13	215	1554%
Sweden	100	52	-48%
Italy	35	59	69%
Australia	48	57	19%
Korea	4	113	2725%

Source: ISO. www.iso.org

The issues related to the WTO TBT Agreement and ISO provide a good picture of the dominance and influence of states' powers and interests in the various international standardization forums. This frame contributes to the paper's main argument that China and USA are involved in an increasing dispute on standards, which encompasses the relevance of CETs. The next section will approach the national systems and the forms of state and private initiative participation in China and USA, and the fourth section will present initiatives taken by both countries to internationalize their standards, which strengthens such argument.

National standardization systems

USA and China have two national systems of standardization that are quite peculiar, one more of a bottom-up type, the other top-down. However, both have similar characteristics, reinforcing the role of the state in the internationalization of their systems.

The US structure is the best known example of a bottom-up format, with a decentralized system of standardization and the private sector's initiative playing a central role, unlike most countries, where the state led the construction of the national standardization system. Technical, scientific and commercial societies began to create independent entities to accomplish the task of standardization, such as the American Society of Civil Engineers (ASCE) in 1852. It is important to highlight the fact that from the outset there was no legal impediment for these societies to develop their own standards (Ernst 2012; Noble 1977; Pizetta 2018).

Advocates of the American system argue that the large number of standards and standardization organizations foster a competitive environment among them, generating greater incentives for innovation in which the best standard wins. Some of these organizations have greater relevance and end up developing standards that are more recognized, being adopted by the government and with a greater degree of internationalization, such as ASTM and IEEE, for example. Although

participation in the standardization process of these entities is open, the dominance of American industry is undoubted and reveals the importance of its technology and trade interests within these standards.

The American National Standards Institute (ANSI) was created to coordinate American participation in international standardization organizations which require each country to have only one representative entity, such as the ISO. Additionally, ANSI has also developed a number of rules that affiliated standardization organizations must follow in order to standardize some general principles and procedures, thereby facilitating the chances of internationalization of US standards.

In turn, the Chinese system was created in totally different conditions, being a typical example of a top-down system. Since 1949, with the establishment of the communist government, the task of standardization has belonged to the state, and companies were prohibited from developing such rules. The standards' main purpose was to organize large-scale production for the planned economy, and compliance to them was compulsory (Ping, Yiyi, and Hill 2010). However, the development of standards does not occur in a single state entity, as is the case in several other countries, but simultaneously in the Standardization Administration of China (SAC) and in Ministries and local governments.

The Chinese system was undergoing changes as the country became more integrated with international trade and its technology advanced. This entire evolutionary process took place under the coordination and guidance of the national industrial, technological and military development plans. Examples of some changes that have occurred over time include: voluntary standards alongside compulsory standards; technical committees for the development of standards were set up in accordance with international practice; and companies started being able to develop their independent standards.

A major change occurred in the 1990s with China's accession to the WTO. The national standardization strategy had to be adapted mainly to comply with the provisions of the TBT Agreement. The Chinese government also incorporated to its strategy the purpose of using international standards to transfer advanced foreign technology to Chinese producers and to adapt their production to international markets.

Recently, in November 2017, China's *Law of Standardization and Technical Regulation* made new changes to its standardization framework. In this new structure, the various governmental instances of standardization continue to coexist, but greater coordination between them has been encouraged. Also, the figure of "social organizations" was created, in which private actors can develop standards. There are national standards that are compulsory, and others voluntary (recommended). Alongside, there are sectoral standards developed by Ministries and local standards issued by the local governments to regulate specific local issues. It is the responsibility of the Council of State to establish mechanisms of coordination between the various existing standards. Sectoral and local standards can only be issued if there is no national standard or if they are more stringent than the national one (China 2018).

It is up to the state to promote the participation of companies, associations, chambers of commerce, federations and research institutes in the process of standardization. In the private sphere, the state should encourage standardization in areas linked to so-called self-innovative technologies in relevant sectors and emerging strategic sectors. In addition, the law requires the state to promote participation in the international standardization activity, integration of the rules of military and civilian use, and award cases of success (China 2018).

In any case, the process of standardization in China remains largely managed by the government. The SAC is responsible for coordinating the development of national standards. Sectoral Codes of Standards elaboration is under the coordination of the Ministry of Industry and Information Technology (MITI) and other agencies. Governmental technical and research institutes act as the so-called “technical focal points”, holding the responsibility of providing the Secretariat for the Technical Committees and serving as a kind of think tank, ending up organizing the standardization activities (Wang and Liang 2016).

It is early to assess whether the creation of more room for companies to develop their own standards under the “social organizations” might represent an important shift for the future of Chinese standardization system towards something more similar to the American system. However, the growing competition on CETs that involves national security and economic gains tends to keep the Chinese State’s leading role. On the other side, such dispute is leading to more presence of the US’s state in the standards process, as will be shown.

Looking at the states’ participation in standardization systems related to CETs and national security, frictions involving technology transfer, IPR and national security are put into light, evidencing a structural conflict.

Two aspects that seem to be quite relevant with regard to Chinese State participation are technology transfer and national security. In the Chinese system, the major national development plans, especially technological ones, were the guides in the structuring and development of the standardization system. The relationship between standards, technology and IPR was perceived early on as crucial by the government and companies. Some exemplary cases, such as DVD players or computers, when most Chinese producers’ earnings had to be passed on to US, European or Japanese IPR holders in the corresponding standards (Ernst 2011). Although China did not get the necessary support and failed, it tried to change international rules in the TBT Agreement’s Triennial Reviews discussions, warning that IPRs in international standards made it too difficult for developing countries to use them.

At the same time, throughout its process of technology evolution, the Chinese government has promoted policies to disseminate the content of international standards to national companies. It aims to transfer advanced foreign technology present in the standards, as well as adapting its production to the requirements set to access American and European markets (Ping, Yiyi, and Hill 2010). The very participation of foreign companies in the standardization activity in China has been, in many cases, conditional on technology transfer to Chinese companies (Suttmeier and Xiangkui 2004; Suttmeier, Yao, and Tan 2006; Ping, Yiyi, and Hill 2010).

This has been one of the main points of friction between China and USA. Under the Donald Trump administration, the US Trade Representative (USTR) report on Chinese practices related to technology transfer, IP and innovation, has served to justify imposing tariff increases on Chinese imports, as it stated that:

According to stakeholder submissions, China's recently enacted Amendments to the Standardization Law of the People's Republic of China (Standardization Law Amendments) raise concerns related to whether U.S. companies will be required to transfer valuable IP or license it on non-market terms as a condition of participation in standards setting bodies. 1131 Stakeholders assert that the amendments impose unique and potentially damaging requirements on enterprises to publicly disclose functional indicators and performance indicators of their products or services, which may result in unnecessary costs and risks.¹¹³² Furthermore, the Amendments reportedly endorse a preference for indigenous innovation in Chinese standards, to the detriment of U.S. and other non-Chinese companies (USA 2018).

Another relevant aspect of the Chinese system is the importance of public R&D institutes and think tanks in the development of technology that is transferred to Chinese standards and companies. A similar role to what happens in the USA, where governmental R&D institutes participate in the standardization activities carried out within the country's various standardization organizations, making them essential forums for technology transfer. National policies and laws tell the US government to participate in the standardization activity carried out by these private entities. As expressly set forth in the National Technology Transfer and Advancement Act of 1995 and in the Office of Management and Budget Circular A-119 of 1998, federal departments and agencies should use voluntary standards as the basis for their regulatory and procurement activities. This should therefore be the rule, and the exception should only occur when these standards are inconsistent with the law or otherwise impracticable. Circular A-119 makes it clear that "The policies in this Circular are intended to reduce to a minimum the reliance by agencies on government standards." (USA 1995; USA 1998).

In this way, research carried out in the public domain following White House guidelines and priorities, such as military superiority, security, energy and health, is eventually transferred to standards, many of which are subsequently referenced and made mandatory by technical regulations issued by American regulatory agencies (USA 2005; USA 2017a; USA 2017b; USA 2017c). This strategy serves both the purpose of technology transfer and the strengthening of standards developed in US-based standardization organizations, but also for the national security assurance that the standards used rely on American technology.

China's effort to ensure that national security standards meet Chinese technology has been another matter of intense conflict between the two powers. First, in the case of the WLAN Authentication and Privacy Infrastructure (WAPI) standard is well known, where China sought to enforce the use of this standard for the commercialization of products with wireless

communication technology in the country. The standard was developed with Chinese public and private technology and its commercialization required the payment of royalties to Chinese companies. Finally, after the USA's opposition and major diplomatic battles in the WTO and ISO, China was eventually defeated and the requirement was lifted (Kim et al. 2014; Suttmeier, Yao, and Tan 2006). The same intent is repeated in a number of cases, such as the standards related to 4G cellular communication networks and, more recently, 5G, where China seeks the use of sensitive technologies and Chinese IP.

The same is true of several more general laws being enacted, such as the Multi-Level Protection Scheme (MLPS), which was first released in 2007, the National Security Law and Counterterrorism Law in 2015, the Cybersecurity Law in 2016, the Cryptography Law in 2017 and the Cybersecurity Classified Protection Regulations in 2018. These initiatives have similar objectives to the National Medium to Long-Term Science and Technology Development Plan (2006-2020) and the five-year standardization development plans, namely, to ensure that the technologies used in China are "secure and controllable", especially in the sectors that may relate to national security. The range of these sectors, however, is quite broad and may include the entire government, financial, telecommunications, energy, education and health sectors (USA 2019; Ernst 2011).

The "Made in China 2025" (MIC) was announced in May 2015 as a state initiative aiming to transform China into a world leader in high technology and industry production - with goals to be achieved by 2025, and then on to 2035 and 2049. In part, it reflects China's change of focus from low to high technology manufacturing, but it is also a reaction to the Chinese worry about external vulnerabilities fostered by other countries' leaderships (including the USA), especially in CETs, which are sensitive to national security, as semi-conductors or Next Generation IT, for example.

The word "standards" (or related words) appears 37 times in the MIC, also figuring strongly as a key point in the ten priority sectors and nine strategic tasks to national manufacturing innovation capability. The document is highly concerned about national standardization as well as the internationalization of Chinese standards (addressed in the next section), connected to its general aim of reaching high technology innovation and national autonomy, as well as expanding its dominance over global markets. The documents also reveal how relevant are the concerns about national security and the use of dual technology. Finally, it encourages the aforementioned changes of enabling an important role for enterprises in the process of standard setting, including the collaborative process of research (with research institutions and industry associations), standards settings, and participation in the making of international standards, as well as the work to accelerate the internationalization of Chinese standards (China 2015). Many of those aims were set forth by the new framework for standardization set up by the Chinese government reform implemented in November 2017 (People's Republic of China 2018).

Kim, Lee and Kwak (2020, 1) remark that "China's 5G standardization is grounded on intellectual property rights-based standardization (...). China accounts for about one-third of

the total 5G-related SEPs [Standards Essential Patents], led by Huawei who possesses the largest portfolio of SEPs for 5G Technologies”, overtaking the USA and therefore triggering the rivalry. China’s ambitions over 5G and the projection of Huawei clearly turned into a point of rivalry between China and USA, as such technology is a civil and military CET. It means that standards and standards-setting are increasingly relevant in the ICT sector, therefore increasing their importance in national economic and security strategies, and in the growing economic and geopolitical competition between China and USA, thus reflecting in US responses.

Under the Trump administration, Huawei was identified as a threat to US national interests and security. The 2019 Executive Order 13873 banned Huawei from selling equipment to US telecommunication companies. Lee (2021) mention that several recent USA reports and strategic documents emphasize the government’s role in both domestic and international standardization concerning China’s rise. Biden’s administration strengthened actions in this direction, as will be seen in the next section. The increasing rivalry between USA and China involving security and CETs sectors, as well as US responses and the greater state participation in its decentralized standard system will be reinforced in the next section about standards internationalization strategies.

Following China and USA documents, and as stated by the structural realist perspective, national security is a central matter in the standards. This involves frictions and rivalries over IP and CETs that impact economic gains, but mainly national security and global power competition. States’ strategies on standards internationalization will make it even clearer.

Standards internationalization strategies

The standards internalization strategies expose the conflicts between USA and China in the pursuit of a major international influence on standards, strengthening the article’s main argument and confirming Krasner’s view on international regimes.

The US’s standards internationalization strategy has two fundamental aims: ensuring the status of relevant international standards to those developed within US-based organizations; and the “export” of US standards and models of standardization and regulation. As seen in the second section, the Standards Code Agreement, and later the WTO TBT Agreement provide that member countries shall use the relevant international standards as the basis for their national standards. Thus, a key issue for the field has become the definition of which standards can be considered the “relevant international” ones.

The two main opponents in this dispute used to be USA and Europe. Europeans advocating the designation of some international standardization organizations whose standards would be considered relevant: ISO itself, IEC, ITU and Codex Alimentarius. The USA, for their part, argues that US-based standardization organizations such as ASTM, ASME, UL, etc., should also be considered “relevant international” organizations because of their importance and the high international use of standards issued by them.

In organizations such as ISO, IEC, ITU and Codex, the decision-making system is “1 country = 1 vote” and Americans accuse Europeans (such as EU members) of exerting excessive influence on decisions through strategies such as voting separately but in a coordinated manner. Another strategy that favors European interests is done by the Vienna, Dresden and Frankfurt agreements signed between European regional standardization organizations: CEN, CENELEC, ETSI with ISO, IEC, ITU. These agreements allow the transformation of European into international standards more easily (Witte 2003; ANSI 2000).

The solution agreed between them came in the Second Triennial Review of the TBT Agreement, which also established a set of principles that must be followed by a standardization organization to be considered relevant (WTO 2018a). On the one hand, the reached understanding restricts the number of organizations whose standards can be considered relevant internationally. On the other hand, it accepts the main US-based organizations in that condition. The fact is that the USA or other countries that have used standards from major US-based international standardization organizations as the basis for their technical regulations have not been questioned in the WTO. This dispute can be illustrated following Krasner’s scheme (Figure 1), in which US and European states’ power and interests influenced the principles, norms, rules and decision-making procedures on relevant international standards and institutions.

The USA also makes a permanent effort to “export” these standards as well as their standardization and regulation models. Executive Order 13609 of May 2012 indicates that regulatory approaches from other countries, due to their differences with the US model, may be detrimental to US companies’ exporting interests, and mandates the promotion of regulatory cooperation, among other objectives, to promote US regulatory approaches (USA 2012). These efforts occur both through agreements between standardization organizations such as ANSI and organizations from other countries, as well as by initiatives such as the Standards Alliance, which is supported by the USAID Cooperation Agency and provides international technical assistance in the area of standardization, regulation and conformity assessment. This objective also appears in 2015, ANSI’s coordinated American Standardization Strategy, in its item number 7: Strengthening international outreach programs to promote understanding of how voluntary, consensus-based, market-driven sectoral standards can benefit businesses, consumers, and society as a whole. This effort should be undertaken by the private sector and the government and encompass initiatives aimed at individual countries as well as international fora:

U.S. stakeholders need to do more to help foreign stakeholders understand the benefits of the approach embodied in the U.S. standards system. (...) Outreach efforts should be focused on countries that are still developing or restructuring their standardization systems and offer important commercial market opportunities. (...) ANSI should play a leadership role in promoting dialogue with foreign standards organizations and in reinforcing outreach efforts of industry, standards developers, the U.S. government, and other stakeholders (ANSI 2015, 14).

These efforts are complemented by negotiations of bilateral and regional trade agreements, as well as negotiations within the WTO TBT Committee meetings, triennial reviews and, of course, the Organization's negotiation rounds (although none have been concluded after the Uruguay one).

For its part and going against US interests, China has been constantly trying to broaden its influence in the major international standardization organizations and to internationalize its standards. Tables 1 and 2 (section 2) make clear the unparalleled advance of Chinese participation in the Technical Committees of these organizations. Alongside the technical level, China has also greatly increased its influence at the political level. China became a permanent member of the ISO Council in 2008 (alongside USA, Japan, Germany, UK and France), of the IEC Council in 2011, and, in 2013, of the ISO Technical Management Board - responsible for managing the organization's Technical Committees, approving the creation, closing and definition of guidelines for the work of the Committees. In the same year, a Chinese representative was elected as the organization's Chair and another to the IEC Vice Presidency. In 2014, a Chinese was elected ITU Secretary General (SAC 2018a).

The 13th Five-Year Plan (2016–2020) affirms that China aims to become a leader in the international standards community and specifically one of the leaders in 5G international standards, technology and industry by the end of 2025 (China 2015b). Also, MIC did not express doubts about Chinese aims to lead technology development in strategic areas and to internationalize its standards (2015a).

Another front in China's strategy has been to embed the theme of standards into the major international projection initiatives it has led, such as the China-Asia Standardization Research Center and the New Silk Road Standardization Alliance. According to the SAC Director, efforts are being directed at expanding cooperation between Belt and Road Initiative (BRI) member countries to facilitate compatibility between their standards and their standardization systems, jointly develop new international standards and share and promote the advancement of Chinese standards (SAC 2018b). According to Lee (2021), in September 2019, China signed fifty-two standards cooperation agreements with countries or regions through the BRI, revealing how it can be used as a geostrategic tool in the global power dispute.

In negotiating trade agreements, China used to be more defensive in TBT-related negotiations. As previously mentioned, during the triennial reviews of the WTO, China unsuccessfully sought to incorporate the discussion of IPR in the standards.

Investigating China's attempts to internationalize ICT-related standards during the last two decades, Kim, Lee and Kwak (2020) identify three prominent cases in which USA and China get into a struggle concerning standards and high technologies: WAPI, TD-SCDMA (Time Division-Synchronous Code Division Multiple Access for international 3G mobile communication standard) and 5G. A common feature among them is that security concerns were declared by the Chinese State as its central motivation for actions. Partners, mainly the USA, then use commitments from international trade agreements, especially the TBT Agreement, to pressure China, as seen,

for example, in the case of the WAPI standard and the TD-SCDMA. In both cases, China failed to internationalize its standards. What is new in the 5G standard initiative's aspiration is that China is first moving and 5G is an IPR-based standard, following the changes proposed by MIC technological development strategy.

China's State Council 2021 document *Outline for National Standardization Development* establishes the goal of leading international standardization in CETs such as 5G, AI, quantum information and biotechnology. Kim, Lee and Kwak (2020, 4) point out the Chinese State's coordinated efforts to influence 3GPP: "Chinese institutions and companies led by the China Communications Standards Association (CCSA) under MIIT have taken an active part in 3GPP, the international body that formulates standards for mobile communication systems".

On the other side of this dispute, USA has been strengthening its responses. As noted, in Trump's government, Huawei was identified as a national security threat and banned from selling equipment to USA. In the 2020 document *United States Strategic Approach to the People's Republic of China*, besides mentioning the word "standards" ten times, US concerns about China's BRI and other actions aiming to reshape international standards and advance Chinese global interests were exposed. The document established a policy target to "promote a set of common standards for secure, resilient, and trusted communications platforms" (USA 2020, 7) with the ultimate goal of preserving the US lead in innovation and setting standards for CET industries, while attacking what it called China's "discriminatory" standards, evidencing a structural conflict.

By its discourses, measures and actions, Biden's administration widened the US's warning and actions against China's rise in international standardization, mainly in regard to leading in CETs. It points out the significance of "establishing strong domestic standards or advocating for the establishment of global standards" (USA 2021, 14) to support the private sector, but also remarks it inside a wider purpose of promoting national security linked with technological leadership facing the China challenge. The Executive Order signed in June 2020 (USA 2020) asserted that the way China is seeking to leverage itself in digital technologies and Americans' data threatens US national security.

Kim, Lee and Kwak's (2020, 4) techno-nationalism sees the USA and China involved in a 'technology war' or 'standard war' for the leadership in ICTs, especially 5G, in which a higher influence allows to take advantage in the standards-setting process and its economic gains; while the Chinese government takes advantage of security concerns. For the authors, "China began to challenge the regime of international standards which has been dominated by the U.S. and partially by EU and Japan". However, national security worries are central when it involves communication CETs, connecting geopolitics and national productive and technological development in military and civil areas, and confirming the structural realist perspective. Arguing that dependence on foreign CETs is harmful to economic development and security, China moved towards a more offensive stance and seeks to internationalize its standards against US interests in a global power dispute.

Conclusion

The case of technical standards shows that many dimensions are involved in a dispute between great powers in an anarchic, competitive and hierarchic interstate system. The interrelation between trade, technology and national security interests and gains was made clear in such dispute, as shown in USA's and China's strategies to advance and internationalize their respective standards.

The paper shows how powerful and developed states have had a great influence on international standards institutions, principles and rules since its origins, such as the TBT Agreement and the establishment of relevant international standards as basis for national standards and regulations. In other words, based on Krasner's structural perspective, it reveals that states' power, conflicts and interests often impact international regimes in the standards sector.

When observing the current situation, as well as the cases of the USA and China, it is fair to say that the state and private companies are partners in trying to reach more influence on this international standard setting process, as well as on exporting national technology and standards in order to obtain these enormous benefits and competitive gains that standards can provide, mainly in high technologies, such as 5G, AI and semi-conductors. The US-China competition on standards for such technologies is getting fiercer, involving civil and military leadership. It is worth remarking that these states' rhetoric and documents put security motivations in the center of their actions.

From a structural realist perspective, as shown historically, states' power, disputes and interests have influenced the international standards and characterize the USA's and China's strive for it. USA-Europeans disputes shaped the international standards from the start, but China's rise and its change from a defensive to a more offensive posture (in 5G, for example) began to threaten the already established regimes related to standards, and led to US responses. Chinese and American documents, instruments and actions, confirm that they are involved in a dispute on standards which impacts leading technologies for national security and development (CETs), and its outcomes in a global power dispute.

China has constantly sought to broaden its influence in the major international standardization organizations and to internationalize its standards, running against US interests. In turn, USA is trying to keep or widen its standards and standardization system as an international reference. It characterizes a structural and global power conflict on setting the international standard rules in order to gain more relative economic power and national security.

In many aspects, both strategies are similar. First, the use of standards and standardization forums to transfer technology to companies. Second, using the state trade and diplomatic structures to support the dispute between domestic and foreign interests about standards. Third, on trying to "export" not only standards but models and structures of standardization and regulation, which obviously also helps domestic producers. Forth, on paying close attention to standards that can affect national security, a concept that can be broadened in order to advance domestic economic interest, but can also be hidden behind standards to become international.

Looking at the impacts of USA-China rivalry, Lee (2021) raises concerns about the politicization of the competition leading to a decoupling of the global standardization system, alongside the often-mentioned fragmentation in global supply chains. Such scenario would create several difficulties for companies that would try to operate and adapt in the different respective systems of standards.

As the states' competition is getting fiercer and demands more critical responses, the US State should probably strengthen its participation in its national standard system, instead of the Chinese becoming more bottom-up (like the American). China's offensive posture on international standards and the role of IPR-based standardization led by 5G fostered US responses and the bilateral rivalry, as civil and military CETs are involved with possible huge impacts on economic gains and national security. Despite US political pressures, its allies around the world have allowed the use of Chinese companies' equipment in setting up infrastructure. Also, the Chinese BRI has been used to spread its standards and advance geopolitical aims, showing that the geopolitical competition launched involving standards will get even fiercer.

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