Polish Journal of Political Science

Volume 5 Issue 2 (2019)

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Polish Journal of Political Science

Volume 5 Issue 2

Wydanie bieżącego numeru PJPS – zadanie realizowane w ramach umowy 874/P-DUN/2019 ze środków Ministra Nauki i Szkolnictwa Wyższego przeznaczonych na działalność upowszechniającą naukę.

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eISSN 2391-3991
Original version: e-book
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China's technological transformation and the future of Sino-American competition

Abstract

This article aims to explore the significance of China's technological transformation for the future of the Sino-American superpower competition. It examines determinants, motivations, strategies, and policies introduced by the Chinese authorities with an aim to close the technological distance to the most advanced economies. The author also attempts to assess policy initiatives and efforts made by China in relation to its main economic rivals, particularly the United States. The paper concludes that technological transformation remains at the forefront of China's development strategy, and its successful implementation will be the key to achieving the superpower status and effectively address domestic and international challenges. The article concludes that China has made a significant progress in some specific areas such as R&D expenditure, Global Innovation Index, ICT industry or patents. However, contrary to the Party's bold rhetoric, reliance on foreign technology, especially on imported advanced machinery and semiconductors, has remained.

Keywords: China, United States, technology, patents, R&D

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Introduction

This article aims to explore the significance of China's technological transformation for the future of the Sino-American superpower competition. It examines determinants, motivations, strategies, and policies introduced by the Chinese authorities with an aim to close the technological distance to the most advanced economies. The author also attempts to assess policy initiatives and efforts made by China in relation to its main economic rivals, particularly the United States. The paper concludes that technological transformation remains at the forefront of China's development strategy, and its successful implementation will be the key to achieving the superpower status and effectively address domestic and international challenges. From Washington's perspective, China has the potential to undermine the American position not only in terms of industrial output but also with respect to high-value-added goods and most advanced technologies. For that reason, impeding China's technological and economic expansion has been set as a priority by the administration of Donald Trump, and this assessment is likely to be maintained by future presidential cabinets. The author further finds that in numerous fields such as R&D expenditure, Artificial Intelligence, 5G networks China has made a remarkable progress, catching up or even surpassing the US. Yet, in general terms, the US upholds the advantage especially as regards human capital, productivity, and efficiency, crucial software, military technology, and semiconductors. Given the economic weight of China and the US, their military and nuclear capabilities, any open military confrontation would bring devastating costs to both sides and the international system. Due to these concerns, technological and economic dimensions

are becoming an increasingly important area of US-China strategic rivalry as they enable both nations to compete for power without major turbulences. For these reasons, China's pursuit of 'innovation-led' growth will be of pivotal importance both as regards its pursuit of superpower status and Washington's efforts to preserve the unparalleled position of the United States.

Recent literature attempting to grasp the essence of the Sino-American competition tends to favour the explanatory value of factors other than technology, such as systemic structural pressures generated by the rise of anew potential superpower,[1] nationalism and perceptual factors,[2] the significance of an alternative vision of international principles and order[3] or the importance of enduring American military alliances.[4] There is also a growing body of literature oriented toward demystifying claims that the US is declining and China's rise to the hegemonic status is by any means inevitable.[5] In most of the above-mentioned works, the issue of China's technological advances is usually briefly dealt with and it serves a secondary or tertiary role. This paper aims to complement these deficiencies by focusing almost exclusively on China's technological transformation.

The paper proceeds as follows: 1) in the first section, it reflects upon the limitations of military component and the increasingly significant role of economics for a peaceful resolution of the US-China strategic competition; 2) secondly,

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1 Mearsheimer (2014); Allison (2017); Ross (2006); Shifrinson (2018) Zhao (2015).

2 Schweller (2018).

3 Ikenberry (2008).

4 Christensen (2015); Friedberg (2011).

5 Nye (2015); Beckley (2012); Wohforth and Brooks (2015).

the author analyses which factors played a decisive role in China's development in the post-1978 era and whether they can exert similar influence in the first half of the 21st century; 3) the third section traces how the issue of technological transformation is depicted in China's strategic documents; 4) the final section assesses the impact of selected policies on China's technological sophistication.

Old logic of conflict, new grammar of commerce

In the early 1990s, Edward Luttwak argued that the post-Cold War international relations will turn from geopolitics to geoeconomics, especially as regards relations among most powerful states.[6] Luttwak concluded that the growing economic interdependence driven by globalization increases the costs of conventional warfare and limits the usefulness of the military in foreign policy. In his view, the settlement of conflicting interests between the rivalling powers will therefore largely shift from the military realm to trade relations, technologies and economic competition. For Luttwak, the Clausewitzian logic of conflict (zero-sum game) among states remains topical, and what has changed is the set of tools and methods they employ. Similar conclusions were drawn by Robert Blackwill and Jennifer Harris, who critically concluded that the United States 'too often reaches for the gun instead of the purse'. Blackwill and Harris[7] advocated adopting a more 'geoeconomic' approach toward rising China, which could help achieve strategic goals without devastating consequences of an open or even a local conflict.

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6 Luttwak (1990).

7 Blackwill and Harris (2016): 1.

In fact, they preceded the actions of Donald Trump administration which initiated trade war with China and imposed a series of sanctions upon Chinese 'national Champions' such as Huawei and ZTE.

While the sense of using the prefix 'geo-' and the theoretical foundations of 'geoeconomics' remain questionable,[8] the aforementioned authors underline the significant dynamics of contemporary international relations. On the eve of the third decade of the 21st century, observations made by Luttwak are even more topical then they were in the 1990s. The military component remains essential for providing security of every state and can serve as an indispensable tool for securing the interests abroad (USA), even despite economic weaknesses (Russia). It can also play a vital role in deterring intervention of a foreign power (North Korea, Iran). Nevertheless, it is the position in the global value chains and technological sophistication that largely defines a state's power and its ability to advance in the international hierarchy. William Wohlforth and Stephen Brooks argue that the material power of each state is essentially an outcome of three interrelated factors: technology, economics and the military.[9] A strong economic foundation is necessary to ensure military expenditure and the flow of innovative technologies from the civilian to the military sector. Effective application of civilian technologies in the military field, in turn, allows a state to gain advantage over other actors. What is even more significant, if one confines a conflict to economy and technology, a power shift occurs in a relatively peaceful manner free

8 Skarżyński (2017).

9 Wohforth and Brooks (2015).

from territorial expansion, thousands of human casualties and destruction of property.

Since 1978 and the introduction of reforms by Deng Xiaoping, China has experienced rapid economic development which enabled its re-emergence as one of the world's leading powers. The material progress has not been accompanied by democratization expected to follow with greater globalization of the Chinese economy.[10] Since the 2000s, the perception of China gradually shifted, as the American elites realized that China will not integrate with the West, the way Japan, South Korea or Taiwan had done. At that time, it was also accepted that China had the potential to undermine the US position as the world's sole superpower and therefore had to be approached more assertively.[11] American engagement in the Middle-East delayed reorientation toward Asia, but in the 2010s China clearly emerged as the defining theme in the US foreign policy. The problem faced by American decision-makers was associated with the a high level of interdependence between the Chinese and American economies and China's vital role in the international division of labour. Given the complexity of economic relations in the second decade of the 21st century, isolating China would be extremely costly for all parties to the dispute and would require a broad and determined international coalition. Economic containment of the USSR during the Cold War was possible due to the relative autonomy of two blocks, but even then it required a cohesive and determined coalition of American allies.[12] In the 21st century, a similar strategy toward China would be almost impossible since China has become deeply

10 Hveem and Pempel (2016): 196-232.
11 Paszak (2019).
12 Art (2010).

integrated with the world economy. American allies may limit China's advances in some areas such as 5G access or investments, but would not be ready to accept China's full economic isolation as it would turn against their interests. The only acceptable option for Washington was, therefore, a policy of limited economic containment which focuses on preventing China's advances in core sectors of technology and services without decisive break-up. This rational policy aims to exploit China's structural economic weaknesses and keep its development on a moderate level, so it would not endanger the US position. Trade war, sanctions against China's national champions and a broad campaign against the participation of Huawei in building the European 5G network have to be regarded as concrete measures to implement this strategy. This course of action is likely to be continued in the coming years with the Chinese authorities trying to mitigate the negative impact of deteriorating international situation.

China's imperative of transformation

Since the 1978-2007 period, China's economy has been growing continuously at almost 10% per year which led it to become the second-largest economy in terms of nominal GDP in 2010, and the largest economy in terms of GDP measured as PPP in 2014. China's economy has grown from modest $149.5 billion in 1978 to $13.68 trillion in 2018.[13] But these spectacular material successes were possible due to the combination of a high rate of household savings and large inflows

[13] World Bank (2019).

of foreign direct investments (FDI) .[14] Another crucial component of transformation was the reallocation of a vast workforce from the agricultural sector and rural areas to cities, where it could be used for the development of industry and later services.[15] These processes helped with creating a cheap labour market, highly attractive to Foreign International Enterprises (FIE's) aiming to optimize their production costs. In short, China's economic growth was predominantly based on massive mobilization of resources such as labour and capital. As a result, China has become 'world workshop', largest trading nation, and quickly moved from producing low value-added goods to more sophisticated commodities such as machinery and electronics. Despite great advances, China still significantly lags behind most developed countries when it comes to GDP per capita, Human Development Index, productivity, efficiency, and indigenous innovation. Almost two-thirds of value-added of high-tech exports are in fact completed by FIEs[16] and, in contrast to South Korean or Japanese industries, the bulk of China's high-tech exports comes from assembling imported components. Chinas energy efficiency in manufacturing amount roughly to one-quarter of the United States and around one-tenth of its labour productivity.[17] Stephen Brooks and William Wohlforth further argue that it is relatively easy to move from an underdeveloped to middle- or upper-middle-income economy, and what constitutes a real challenge is to achieve a developed-economy status.[18] Given the aforementioned indicators, China faces the great-

14 Khalid (2012): 48.
15 Regis (2019).
16 Gao (2012): 198.
17 Gao (2012): 199.
18 Wohlforth and Brooks (2014): 26; Kharas and Kohli (2011).

est developmental challenge since 1976. To maintain high growth rates without endangering its sustainability, China's authorities cannot rely anymore on cheap labour, massive investments and assembling products for transnational corporations. The future goal is to build domestic technological capacity, innovative and efficient industries, increase domestic consumption and the role of services.

The world financial crisis has demonstrated that overreliance on exports is a double-edged sword that alongside multiple benefits can also cause substantial damage to the industry and workplaces.[19] To reduce negative implications of the drop in demand and falling exports, the Chinese authorities were forced to launch an economic stimulus program worth $586 billion, but total net new bank lending was increased to $1.4 trillion in 2010.[20] These trends were accompanied by deteriorating investment return rates – the consequence of massive governmental anti-crisis programmes. The economic model adopted in the 20th century focused primarily on mobilization of resources rather than improvement of efficiency. China's economic growth since 2010 has been steadily falling, and in 2018 dropped to 6.6% - the lowest level in 28 years. In 2019, it further shrank to 6.1% and the IMF forecasts that in 2020 the growth rate will drop to 5.8%.[21] While it is still an impressive rate, it clearly shows that the Chinese authorities have to find different sources of growth to address rising social pressures. Intensified American pressure, aging populations and rising social expectations make transformation an imperative. The inability to sustain economic growth means that China will not

19 Cai and Chan (2009).
20 World Bank (2010).
21 IMF (2019).

become a superpower comparable to the United States and therefore will share the fate of other failed potential superpowers of the 20th century, such as the Third Reich, the USSR, and Japan. The authors of the 2019 China Defense White Paper are therefore right in concluding that China has entered 'a critical stage of its historical development.[22] The issue of transformation has become one of the most persistent topics in the official Party discourse. The failure to address the structural problems of the economy will result in China's waning chances of becoming a truly global superpower. Therefore, the technological sphere in the third and fourth decade of the 21st century will likely witness intensification of the US-China competition, as Beijing will try to climb up the 'ladder' of international division of labour, and Washington will attempt to impede these efforts.

Technological modernization in light of strategic documents

The realization that to withstand and overcome internal and external pressures the CPC has to introduce qualitative reforms of China's economy resulted in significant efforts made by the Party to build domestic technological capacity. In fact, since the very establishment of the People's Republic of China, self-reliance both in economic and technological aspects was one of Mao's greatest ambitions. It could not be fulfilled due to the devastating impact of 'the Great Leap Forward' and the Cultural Revolution on China's economy and social life. After Mao's death and Deng's election by Politburo as a chief leader, the door to rational economic reforms and technological advances has been opened. On the conceptual

[22] PRC State Council (2019).

level, there has been a higher degree of continuity between the 'revolutionary' and 'reform' eras than is commonly recognized .[23] Self-reliance, even if unreachable at that moment, has been a pervading idea resonating within the Party. In the post-1978 era, science and technology were identified as one of the 'four modernizations' – the guiding and overarching concept of Chinese transformation, later inscribed into the Party and state constitutions.[24] Technological progress has been pursued mainly through Foreign Direct Investments (FDI) based on the principle 'Market for technology' or *Quid Pro Quo*.[25] This model of technological advancement, despite some tangible gains, has failed to deliver expected progress and domestic innovative capacity. Since the early 2000s, the approach toward the issue has been changing, but it was in 2005-2006 when China started pursuing an ambitious national innovation agenda in earnest.[26]

In 2005, the Chinese administration issued *Outline of Medium and Long-term National Plan for Science and Technology Development* (MLNP). The plan emphasized the innovation-driven development and prioritized specific areas for improvement. MLNP pushed for advancement in particular as regards core technologies, agriculture, defense industry, and human capital. The document set the following goals for China to be achieved by 2020: rising Gross R&D expenditure (GERD) as a share of the GDP to 2.5%, contribution of S&T to economic growth to reach 60%, dependency on foreign technology to fall below 30%, China among

23 Kerr (2006).
24 Hsü (1990): 92-94.
25 Holmes, McGrattan, Prescott (2015).
26 Ding and Li (2015): xxi.

five leading nations in terms of patents granted per capita.[27] Most of these expectations were beyond China's real abilities (as 'leapfrogging' technological leaders), however, the document set the direction for the 11th, 12th and 13th Five-Year Plans (FYPs) which set out more rational targets. The course has been maintained or even strengthened since Xi Jinping took power in China in 2011. The trade war with the United States further accelerated the debate about 'technological autonomy' and 'decoupling', and strengthened the position of CPC hardliners.[28] These efforts include both the level of strategic planning and practical implementation of set out goals. China's 12th and 13th FYPs made it clear that the restructuring of the economy has to be treated as an imperative for China's future development. the 12th FYP (2011-2016) concludes: "Scientific progress and innovation will support the transformation [...] China should upgrade its capabilities in indigenous research and innovation in science, technology and administration, train more innovative talents and improve education for workers."[29] The document also stressed the significance of increasing R&D spending and achieving technological autonomy, which can be translated as a drive to reduce reliance on American software and hardware. For that reason, the US and the governments of major innovation leaders criticized this policy for its discriminative approach toward foreign enterprises.[30] The 13th FYP has to be regarded as a clear continuation of the 12th and 11th FYPs as it reiterated major goals envisioned by the preceding documents, which aimed to rebalance and restructure the Chinese

27 Ding and Li (2015): 10-11.
28 Wei (2019).
29 PRC National People's Congress (2011).
30 Koleski (2017): 7.

economy. The ongoing shift is expected to reduce overreliance on investments, infrastructure, exports, and base long-term growth on domestic consumption and innovativeness. To achieve that, the 13th FYP advocated greater emphasis on 'innovation-led growth' and more sensible investments with greater return rates. The analysed documents show considerable continuity and consistency as regards their vision of China's development paths. While there were some modifications of targets or prioritized areas, they were cosmetic in character.

FYPs provide a general framework for more specific policies oriented toward more specialized areas, among which *Made in China 2025* (MIC) and *New Generation Artificial Intelligence Development Plan* are particularly significant as they cover critical technological areas. *Made in China 2025* was launched in 2015 as an ambitious attempt to create globally competitive companies in the core sectors of the economy and to reduce reliance on foreign technologies.[31] The strategy pursues 'indigenous innovations' and 'self-sufficiency' which can be achieved by increasing the market share of Chinese suppliers for "basic core components and important basic materials" to 70% by 2025.[32] Other MIC targets include 40% of mobile phone chips as well as 70% of industrial robots and 80% of renewable energy equipment to be manufactured domestically in China by 2025. The strategy identified ten sectors as crucial for future development: ICT, robotics, aerospace and aviation equipment, maritime equipment and shipbuilding, railway equipment, energy-efficient and new-energy vehicles, electrical equipment, new materi-

31 Zenglein and Holzmann (2019): 8.

32 Wübbeke, Meissner, Zenglein, Ives, Conrad (2016): 7.

als, medical devices, and agricultural machinery. The motivations underlying the MIC strategy are perfectly rational since a major share of equipment used in China's industry, particularly in high-tech sectors, is heavily reliant on imports of crucial components. Around 70% of China's advanced textile machinery, 80% of manufacturing equipment for integrated circuits, and almost all fibre optic equipment is of foreign origin. As Xuedong Ding and Jun Li concluded: "In this sense China is still a 'manufacturing country' rather than a 'creative country'."[33] The aforementioned goals have to be achieved both by raising R&D investments, tax/financial incentives, and a growing volume of Chinese FDIs in developed countries. Mergers and Acquisitions (M&A) of high-end companies with established market access can further accelerate the process of transformation and enhance the position of Chinese enterprises on the Old Continent.[34]

New Generation Artificial Intelligence Development Plan was officially released on 20 July 2017 by the PRC State Council. AI was identified by the Chinese authorities as one of the crucial technologies of the 21st century in which China has a real chance of becoming a true leader both as regards quantity and quality. The largest base of internet users, unconstrained access to a large amount of data, digitalization of everyday services and generous government funding are perceived as China's major strengths.[35] The assessment of AI's role as one of the leading technologies in the future was shared by McKinsey report which concluded that effective implementation of AI in nineteen identified sectors

33 Ding and Li (2015): 9.
34 Paszak (2017).
35 Lee (2018).

can generate up to $5.8 trillion annually.[36] The Plan outlines a three-stage strategy of building the world's leading industry by 2050. During the first stage (by 2020), it is expected that AI will become an important driver of economic growth and the value of the AI industry will rise to over RMB 150 billion with related industries worth RMB 1 trillion. The document anticipates that several Chinese companies will assume the leading role in some very specific technological fields, such as e.g. intelligent big data. The next stage (by 2025) includes dissemination of AI solutions to numerous areas and industries, such as digitalized industry, high-end healthcare, smart cities, smart agriculture, and national defense. The value of China's indigenous AI industry is set to rise to over RMB 400 billion with related sectors exceeding RMB 5 trillion. At this point, a new legal framework including practical and ethical standards as well as an institutional regime starts to take shape. The third and final stage envisages China as the global leader of the world's AI industry with most competitive enterprises, top-notch scientific and research capacity and the most sophisticated talent pool. By that point, AI is widely employed in manufacturing, services, military and public systems. The total worth of AI business in China hits RMB 1 trillion, and related industries account for over RMB 10 trillion.

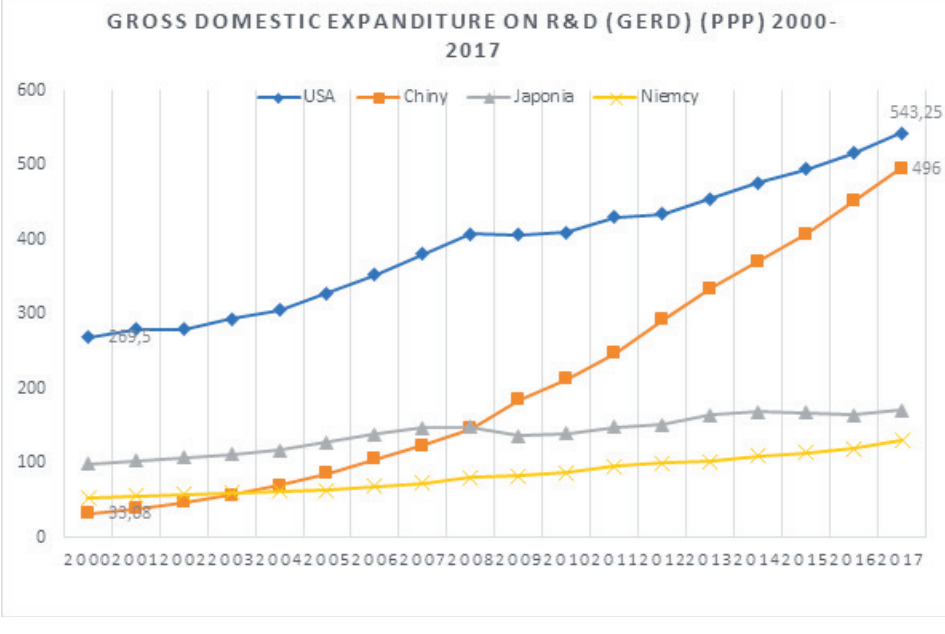
On the level of strategic planning, the Chinese authorities have accurately identified most important technological deficiencies, set many ambitious goals and incorporated several policies to achieve them. Nevertheless, previous experiences suggest that at least some of the targets might be unrealistic and China may reach very few if any of them. While strategic

[36] Kaniyar, Srivastava, Tisnovsky (2019): 18.

planning is necessary, very often it does not take into account that such things like 'innovation' or 'technological advancement' are a product of a complex interplay of multiple factors and cannot be centrally planned or designed.

Closing the technological gap

Increasing R&D capacity remains at the forefront of China's efforts to become a technological leader and a developed economy as reflected in the priorities set out in the FYPs, MIC and official statements of top politicians. During the 2000-2017 period, China's Gross domestic expenditure on R&D (GERD) grew from modest $33.08 billion to $496 billion while at the same time American spending rose from $269 billion to $543 billion.[37]



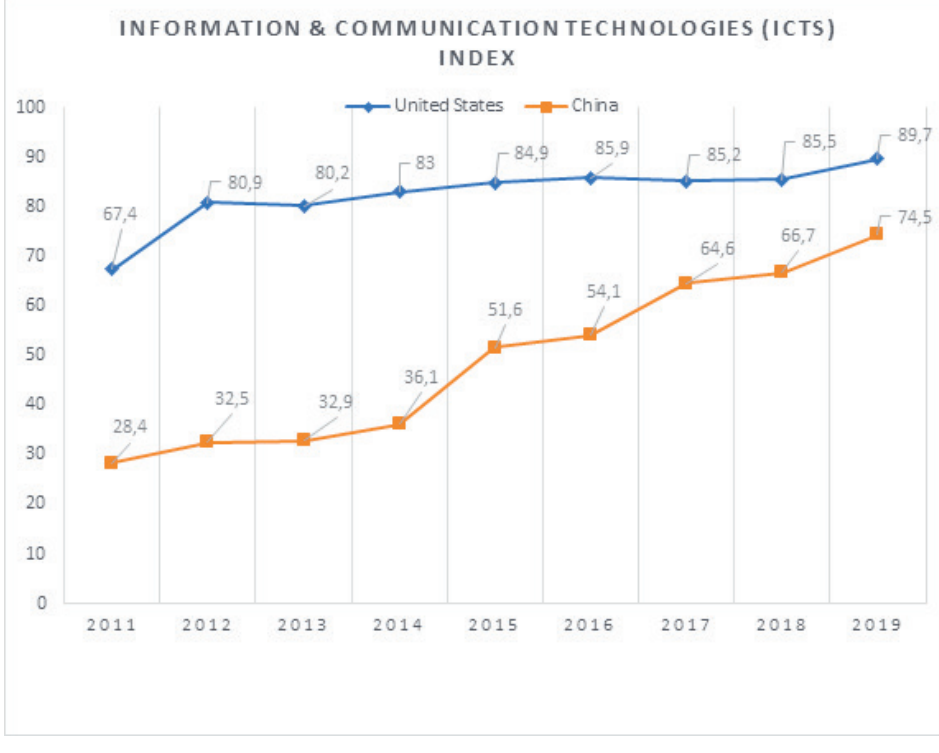
[37] OECD (2020).

The US advantage remains significant, especially given the effect of GERD accumulation over the years and the efficiency rate of spending, yet this advantage has weakened considerably in relative terms. In 1991, China's R&D expenditure accounted only for 0.72% of its GDP, while in the case of the US and Japan it accounted for 2.5% and 2.7% respectively. Since the beginning of the 21st century, China's share of GERD in the GDP rose from 0.89% to 2.14% in 2017.[38] While some progress has been made, it is still below 2.5% set in the 13th FYP[39] and the indicators achieved by most innovative economies such as the United States (2.78%), Japan (3.21%), South Korea (4.55%) or Germany (3.038%).[40]

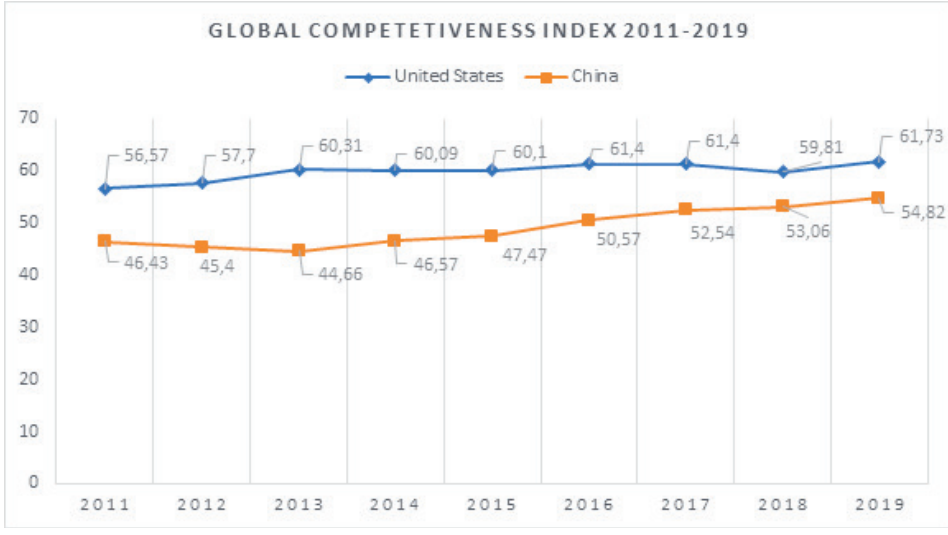
Intensified spending in recent years, despite questionable efficiency,[41] has brought some positive results such as improvement of the ICT-Index and the Global Innovation Index (GII). These indicators have been designed by Cornell University, INSEAD and World Intellectual Property Organization (WIPO) to measure international innovation trends. Since 2011, China has recorded a rapid rise in the ICT ranking, improving its rate from 28.4 to 74.5 points in 2019.[42] Simultaneously, the US has also made substantial progress from 67.4 to 89.7 points maintaining a healthy advantage but relatively weakening. The ICT Index provides insights only into a narrow field, a wider picture is provided by GII which, apart from ICT, comprises multiple various factors. From 2011 to 2019, China improved its GII from 46.33 to 54.82,

38 OECD (2020).
39 China Power (2019).
40 OECD (2020).
41 Han C., Thomas S. R., Yang M., Ieromochnachou P., Zhang H. (2017); Hong J., Feng B., Wu Y., Wang L. (2016).
42 WIPO (2019).

while the US advanced from 56.57 to 61.73.43 Gains are not as striking as in the case of ICT, but nevertheless it helped China narrow the gap vis-à-vis the US. It is also worth noting that China started from a relatively low position, therefore at the initial stage gains were easier to achieve. The true challenge will be to continue the positive trend in an increasingly hostile international environment, facing exponentially more complex technical problems.



43 Ibidem.

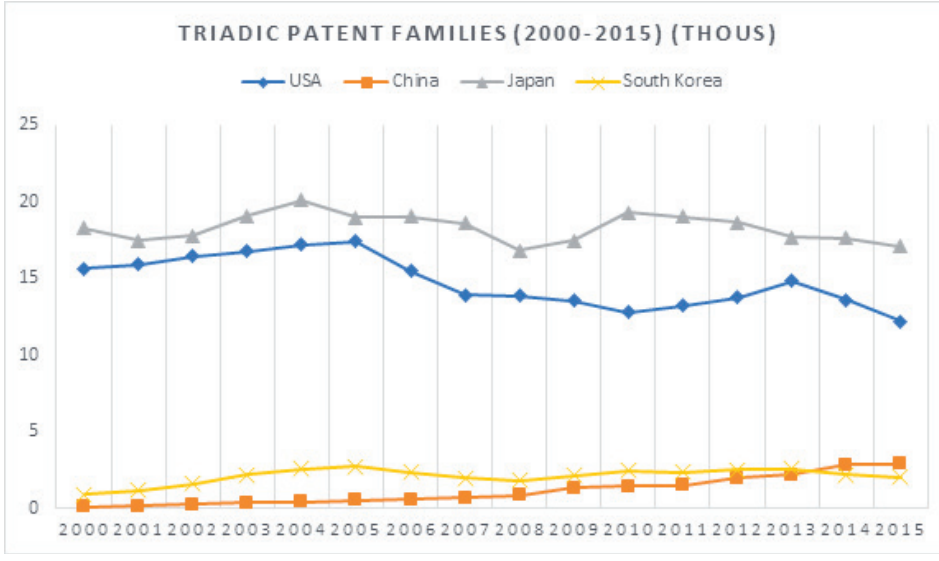


The dynamic rise of patent application both domestically and abroad can be also to some degree credited to innovation-oriented government policies and higher R&D spending. The total number of sophisticated patents is one of the indicators that reflect a country's level of innovation as well as its ability to protect key technological inventions. China's domestic patent applications have been rising sharply since 2011, with abrupt acceleration in 2014 that continued until 2017. The total number rose from 0.938 to 3.536 million and more than tripled over the course of six years. Despite an extraordinary growth, this process almost certainly does not precisely reflect China's improving innovativeness or effectiveness of R&D spending. The post-2011 situation resembles 'the Great Wall of Patents' after China's entry to the World Trade Organization in 2001,[44] when the number of applications rose sharply, but they were mostly of low quality. The sudden rise of applications coincides with the launch of policies and strategies and can be explained by the drive

[44] Hu and Jefferson (2009).

of local governments and companies to respond to the political pressure and financial incentives provided by the central authorities. The argument that quantity does not translate into quality can be supported by OECD data about triadic patents. Triadic patents are widely considered to be the 'gold standard' of patents since they are jointly filed in the Japan Patent Office, the United States Patent and Trademark Office and the European Patent Office. Patents granted by these institutions ensure real protection of intellectual property and its innovativeness, but are difficult and costly to obtain.[45] The graphic demonstrates that China has been making a steady progress in the ranking, surpassing South Korea but still lags far behind the US and Japan. Of all granted patents only 19% were recognized as 'inventions', the rest was split between 'utility models'(56%) and 'designs' (25%). Inventions constitute the most sophisticated category of patents, while utility models and designs are regarded as second-class patents. What is more, China's patents are largely concentrated in the ICT industry, due to the robust development of telecommunication champions such as Huawei and ZTE.[46] China is fairly innovative in ICT, as exemplified by its advances in 5G development, but fails to reach similar highs in other areas. Therefore, while the rising number of domestically filed patents can to some degree be indicative of positive changes in China's economy, it does not level with the position of global technological leader.

45 China Power (2019).
46 Ibidem.



Since 2014, the Chinese authorities have also intensified efforts to build an indigenous semiconductor industry, which could eliminate one of China's greatest technological vulnerabilities. Semiconductors/ 'chips' or integrated circuits (ICTs) are a vital part of most highly advanced electronic appliances such as computers, smartphones, medical equipment or industrial machinery. Their production is arguably one of the most knowledge-intensive and lucrative sectors of manufacturing.[47] What is more, it is also dominated by American giants such as Intel, Qualcomm, Broadcom, Micron or European (NXP, STM and Infineon), Japanese (Toshiba, Sony) or Korean (Samsung, SK Hynix) companies. This further complicates China's situations, since the potential sources of knowledge are located in the countries which are its strategic or industrial competitors. Chinese chipmakers account only for 5% of the world and 16% of domestic markets[48] and

47 VerWey (2019): 3.
48 SIA (2019): 3.

even devices made by Huawei, ZTE or Lenovo are predominantly based on imported components. Potential entry of any company into the semiconductor market encounters numerous obstacles, e.g.: 'first mover advantages, economies of scale, brand recognition, stickiness and customer loyalty, intellectual property (IP), and most importantly, high and fixed capital expenditures'.[49] Sanctions imposed on Huawei and ZTE by the administration of Donald Trump demonstrated that semiconductors can also play a substantial role in the strategic competition between the two countries. It further convinced the Chinese elites that building a national and independent chip industry is necessary both for the economy and national security. In April 2016, President Xi warned that: "Internet core technology is the greatest "vital gate", and the fact that core technology is controlled by others is our greatest hidden danger."[50] In November 2018, he further asserted that: "Internationally, advanced technology and key technology is more and more difficult to obtain. Unilateralism and trade protectionism have risen, forcing us to travel the road of self-reliance."[51] In June 2014, the National State Council released *Guidelines to Promote National Integrated Circuit* Industry which highlighted the need to accelerate development of the chip industry by creating the National Integrated Circuit Industry Investment Fund and tax incentives. The first round in 2014 raised RMB 138.7 billion and the second round in 2019 collected RMB 200 billion primarily from governmental institutions and state-owned-enterprises. Despite numerous reaffirmations of the strategy, in 2018 China imported integrated circuits worth over $300

49 VerWey (2019): 4.
50 Xi Jinping (2016).
51 Wildau (2018).

billion recording a staggering deficit of over $200 billion.[52] For the first time, this number exceeded $300 billion, which means that China's dependence on imported chips is not increasing but weakening.

Expansion of Chinese Foreign Direct Investments (FDIs) intended to acquire high-end companies, improve market access and force technology transfers are another tool in the transformation process. One of the examples is the growing volume of Chinese venture capital in the US, which was growing steadily since 2009 and in 2016 reached a record-high level of $46 billion.[53] Rising security concerns in the US prompted the government to introduce a screening mechanism designed to prevent unwanted transfer of sensitive technologies. As a result, in 2017, the value of investments fell to $29 billion and in 2018 it dropped even further to a mere $4.8 billion. Similar activities have taken place also in Europe. During the 2011-2013 period, the influx of capital from China tripled reaching €6-8 billion annually, yet the breakthrough came in 2014 when the inflow of Chinese capital into the EU rose to €14 billion. In the following years, this amount grew exponentially to €20 and €34 billion in 2015 and 2016 respectively.[54] Symptomatically, the share of M&A in all transactions ranges from 86 to 95%,[55] showing that Chinese investors are not interested in building new industrial sites (Greenfield Investments), but in seeking valuable assets such as: technologies, market access, valuable brands or organizational and managerial experience. Even more telling is the fact that as much as one-third of the invested capital

52 CSIA (2019).
53 Hanneman, Gao, Lysenko (2019).
54 Hanneman and Huottari (2017): 5.
55 Ibidem.

goes to the high-tech sectors which are the main drivers of innovation and R&D. Geographical concentration of capital in the most powerful European economies as Germany, UK, France and Italy[56] further demonstrates that in the long run this process is oriented toward gaining competitive advantage and technological 'self-sufficiency'.

Conclusions

During the first two decades of the 21st century, China has emerged as the only potential challenger of the US hegemonic position in the international system. Since the beginning of Donald Trump's presidency, the competition between the two countries intensified but was largely confined to the economic and political realms. The devastating costs of a potential armed conflict make it an undesirable option for both sides, leaving technology and economy as a relatively peaceful setting for a resolution of the superpower competition. The severity of structural stresses imposed on the system by Sino-American rivalry will be determined by the ability of the Chinese leadership to sustain high growth rates. China faces an imperative of transformation as the previously employed model of development is not capable of delivering the desired outcomes. China's authorities cannot rely anymore on cheap labour, massive investments and assembling products for transnational corporations. The future goal is to build domestic technological capacity, innovative and efficient industries, increase domestic consumption and the role of services. Particularly important is the creation of cutting-edge AI industry, digitalization and

[56] Paszak (2017).

informatization of existing industrial sites, further development and expansion of IT and Telecommunication and other high-end sectors. Achieving 'self-sufficiency' and reducing dependence on software, semi-conductors and advanced machinery of foreign origin is another leading motivation. The trade war and American sanctions imposed on Chinese companies have exposed and exploited these technological vulnerabilities accelerating the debate about economic 'autonomy'. To achieve the envisioned goals, the CPC has recognized technological progress as a leading theme in strategies, policies and programs such as the 11th, 12th and 13th Five-Year Development Plans, Made in China 2025 or New Generation Artificial Intelligence Development Plan. In order to reach the ambitious goals set by the documents, the Chinese authorities have employed a wide array of instruments such as tax deductions and subsidies for R&D activities, public investments in crucial sectors such as semi-conductor industry, support for high-profile FDIs. These initiatives so far have brought mixed results. China has progressed in many fields: its GERD has risen to more than 2.1% share of GDP and its total value has reached almost $500 billion in 2017; from 2011 to 2019, China improved its GII from 46.33 to 54.82 and the ICT-Index from 28.4 to 74.5 points; [57] the total number of domestically filed patents rose from 0.938 to 3.536 million. Contrary to the Party's bold rhetoric, reliance on foreign technology, especially on imported advanced machinery and semiconductors, has not decreased. The increasing number of patents, while impressive, does not tell the whole story, as it is driven primarily by low-end applications. In the case of China, quantity does not necessarily translate into quality.

[57] WIPO (2019).

Given that, China faces an enormous challenge. Successful transformation will help China sustain high growth rates in the long-term and enable it to become the next superpower undermining the US long-standing supremacy. Failure to address most pressing structural challenges will result in a stalled growth and waning chances of becoming a truly global superpower.

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