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Kevin Zhang
Illinois State University, khzhang@ilstu.edu

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Kevin Honglin Zhang

Department of Economics, Illinois State University Normal, Normal, Illinois, USA

ABSTRACT

The US has been waging an economic decoupling from China, in which national security concerns replace economic logic and loss-loss game replaces win-win gains from globalization. The decoupling is generating profound ramifications for the world as well as the US and China. The article explores the following questions: what drives the US government to implement the decoupling? what rationales for technology separation as the core of the decoupling? and what are possible outcomes of the decoupling in the short run and long run? It argues that (a) the decoupling was motivated mainly by national security and geopolitical concerns that China's rapid rise has come to be seen as the largest threat to the US hegemony; (b) the decoupling concentrates on high-tech industries because technology is critical for the US to maintain its global hegemony, and (c) it is highly uncertain for the US to achieve its policy goals and a complete decoupling could divide the world into two economic blocs that centered on them.

KEYWORDS

Decoupling; technological decoupling; globalization; national security; geopolitical concerns

1. Introduction

The United States is conducting technological decoupling from China that has been increasingly rising as a new economic power. In the last two decades, the US-China technological ecosystem has become deeply intertwined as the Chinese economy integrated heavily with the West. While both the US and China have greatly benefited from establishing global technology supply chains that maximized production and cost-efficiency, China seems to gain more in terms of shrinking its gap to the US GDP (Fischer, 2022). Now a popular American view is that China's rise, a big challenge to the US global hegemony, could not have happened without its integration with the technologically advanced West, particularly the US (Bade, 2022). Bipartisan consensus of decoupling from China has emerged in the US government, based on the judgment that China has come the greatest danger to American security and most consequential strategic competitor for the coming decades (Bateman, 2022; Bulman, 2021; Kwan, 2020; and Capie et al., 2020).

In both countries, cross-border flows of talent, knowhow, and investments have played an important role in enabling technological advancement and promoting economic growth. Moreover, the US and China have greatly benefited from establishing global technology supply chains that maximized production and cost-efficiency (Moschella & Atkinson, 2020 and USCC, 2021). The tech-decoupling bears significant challenges for both countries, including the high level of specialization in certain industries, the costs of technology restrictions for companies and consumers, and the negative impact of restrictive measures on innovation (Tyers & Zhou, 2020; Zhang, 2020; and Wang, 2021).

CONTACT Kevin Honglin Zhang khzhang@ilstu.edu Department of Economics, Illinois State University Normal, Normal, IL 61790.

In the recent years, national security and geopolitical considerations play a dominate role in the US policymakers on the technological ties with China. The US government increasingly concerns about China's ambition to challenge US long-held technological advantage, concluding that efficiency and economic growth as the guiding principles for their tech ties need to be replaced by national security considerations (Atkinson, 2020; Moschella & Atkinson, 2020; Bateman, 2022). The resulting change is a gradual tech-decoupling of the world's two largest economies.

This study intends to discuss three issues: motives for US to decouple from China, rationales for technological separation as the core of the decoupling, and possible outcomes of the decoupling in the short run and long run. Section 2 provides a theoretical framework of economic integration and decoupling, focusing on the impact of competition and conflicts between the existing and emerging superpowers on globalization. Section 3 analyzes changes in US responses ("protect' and "promote" policies or agenda) to the emergence of China as an economic and technological superpower, focusing on "protect" (or decoupling) policies. Section 4 explores US costs of the decoupling and how likely the US may achieve its policy goals. The last section summarizes conclusions.

2. Theories of globalization and decoupling

Globalization is based on the conventional trade theory, which is one of few consensuses among economists.[1] The logic behind the concepts of comparative advantages and scale economies-product differentiations easily leads to gains from cross-country trade, capital movements (i.e., foreign direct investment, FDI) and global vale chains (GVCs). The result is that globalization with free trade and FDI can make all countries better off and free trade policy is best (if not optimal but still better than protectionism). After the Soviet Union collapsed in 1991, the US became sole superpower in the world and was able to push the American styled globalization. Actively or passively, such the neoclassical economics has dominated increasingly policymaking in most countries. Main points of the doctrine are as follows (Bateman, 2022). (a) Each country should focus on its natural comparative advantage as revealed by the market, and it doesn't matter what a nation produces (potato chips and computer chips, what's the difference?). (b) Only companies, not nations, compete. (c) Maximizing global, not national, economic welfare, matters most. (d) Any attempts at prioritizing sectors would result in either or both protectionism and inefficient "crony capitalism." (e) The principal role of government is to be a "referee" among competing private interests, not a "coach" to support and guide those interests.

Specializations of global trade and investment in high-tech industries have gone as far as GVCs have prevailed in many sectors like semiconductors, smartphones, and automobiles since the end of the Cold War. The mainstream economists and policymakers in the US had largely treated development, whether technological or economic, as a good in itself through globalization (Bade, 2022, Tu & Zhang, 2019). As low-income countries like China absorbed investment from the industrialized world, the argument went, they would "move up the value chain," developing more sophisticated industries. That would boost incomes, build middle-class citizens, and ultimately lead to democratic reforms and peace between trading partners under controls of the US. Such was the logic of comparative advantage and the capitalist peace theory that had been popular in the 1990s and 2000s. The theory implies that that the US was content to let the development of many technologies - even some critical to national security, like semiconductors - move to other countries like China. If most high-end computer chips ended up being manufactured elsewhere, that was acceptable, or even desirable.

The history of the past two century shows that national security plays a critical role of competition and conflicts between global powers (Bateman, 2022; Bulman, 2021; Zhang, 2020; Tu & Zhang, 2019). The timing of globalization and decoupling seems to coincide with global superpower peak and a new superpower emergence. The first wave of globalization was initiated by

the United Kingdom in the 19th century, and decoupling took place in the WWI as Germany emerged as a competitor. The decoupling happened again soon in the WWII as Germany recovered quickly and the US rose as another competitor. The period of the Cold War was one with decoupling between two groups of countries, led by the US and USSR, respectively, although partial globalization within each group. The second wave of globalization, started in 1991 as the USSR disappeared, pushed by the US as the sole superpower, with unprecedently integration of the world economy. Now the US government must respond to the greatest economic threat it has faced by decoupling from China.[2]

While trade theories prove that free trade is not a zero-sum game but can make all countries better off, gains from trade are not distributed evenly among countries, leading potential conflicts or even wars in the long run (Tu & Zhang, 2019). A country may rise as a superpower or enhance its hegemony through free trade or globalization. Globalization seems to be pushed by the dominant superpower like the UK in the 19th century and the US in the 20th century. As long as an emerging superpower appears, decoupling is started over by an existing superpower as responses. Both globalization and decoupling are tools for the existing superpower to maintain its competitive advantages.

3. Why decoupling and why tech-decoupling?

As a growing distrust toward China has colored national attitudes since in recent years, decoupling is increasingly viewed as a political correctness in the US. Despite their differences, both Trump and Biden administrations shared a desire for the US to reduce its dependence on Chinese products and supply chains. The COVID-19 pandemic has also heightened domestic political rhetoric on decoupling and greatly influenced public opinion about China.[3]

China's rise as a global economic power may be displayed by several indicators. (a) GDP. Figures 1 and 2 show GDP of the US and China in terms of current exchange rates and purchasing power parity (PPP) in 2000–2021. In 2016, China replaced the U.S. as the world's largest economy by PPP and in 2021 its PPP GDP is 119% of the US. China's nominal GDP was 77% of the US in 2021, and it is expected to take over the US within 10 years (World Bank, 2022). (b) Manufacturing output. In 2010, China became the world's top manufacturing nation, ending a 110-year US lead (UNIDO, 2022). (c) China became the largest exporting nation in the world in 2009, and now it is largest trade partner for more than 130 economies (World Bank, 2022). (d) Patents. In 2019, China demonstrated its immense research and development (R&D) gains by

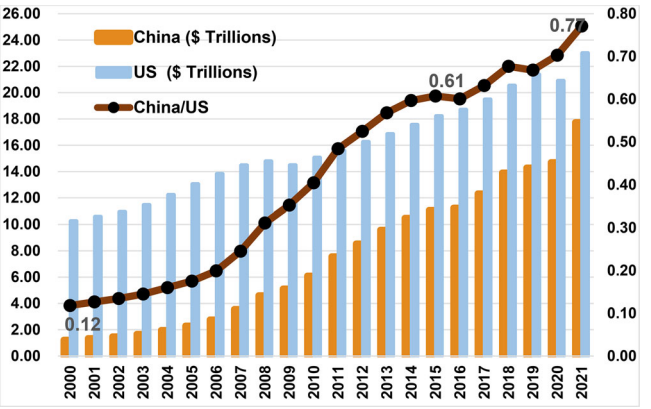

Figure 1. Exchange-Rate GDP of U.S. and China in 2000–2021.
Notes: GDP of the US and China is on left vertical axis, and the ratio of China/US on the right axis.
Sources: *World Development Indicators Database* (World Bank, 2022).

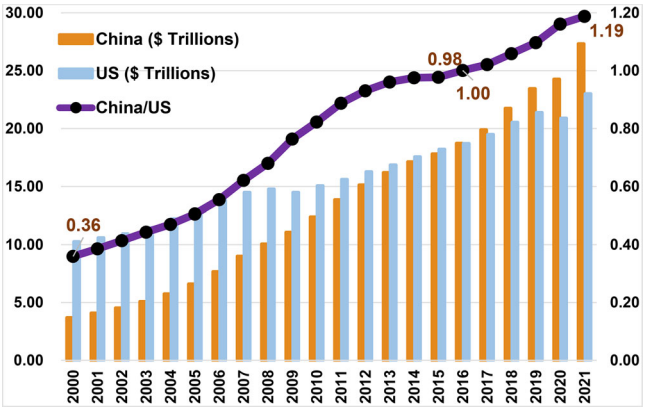

Figure 2. PPP GDP of U.S. and China in 2000–2021.
Notes: PPP GDP of the US and China is on left vertical axis, and the ratio of China/US on the right axis.
Sources: *World Development Indicators Database* (World Bank, 2022)

becoming the nation to file the largest number of international patent applications at the World Intellectual Property Organization (Bateman, 2022). A recent study by Han et al. (2022) finds that while China relied heavily on US innovation and technology in the first decade of the 21st century, its technological dependence decreased since the end of the Great Recession.[4]

Considering more 4.3 times of China's population over the US, the gap between the two countries in per capita income or economic development is still quite large. In 2021, China's GDP per capita is $12,556, only 18% of the US ($69,288), and the ratio in PPP GDP per capital is just 28% (World Bank, 2022). Is China really strong enough to challenge the US?

The growing GDP enables China to have increasing military power and technology capability, like the U.S. in the late 19th century. In its ambitions and achievements, China is viewed to have already exceed the economic impact of the Soviet Union (officially the Union of Soviet Socialist Republics, USSR) and Japan, and its multidimensional presence is much more difficult to directly counter. In the four-dimension model developed by Moschella and Atkinson (2020), China seems to differ from Soviet Union and Japan as a US rival in market, supplier, technology competitor, and geopolitical challenger. USSR in 1950-1991 was a potent military and ideological rival, but never a major market for the US or global business supplier/competitor. Japan in 1980-1996 became a tough tech competitor and an essential supplier in many industries, but it was never an essential market for the US firms and certainly was not a military or societal rival. Neither USSR nor Japan was ever an across-the-board challenger, nor anywhere near as deeply integrated with the US and West economically, and this gave the US considerably more room to maneuver.

China is viewed to be pursing leadership in all four dimensions. China has become the second largest market in the world and the largest in PPP GDP since 2016 (World Bank, 2022), the largest supplier of manufacturing output, a leading business/technology competitor, and a major geopolitical rival to the US.[5] Table 1 display how the relative position of the US and China evolved in the four dimensions over the past four decades.

Because of its multidimensional presence, China is viewed to have already exceed the economic impact of USSR and Japan, and to be more difficult to counter. For example, it was relatively easy for the US to impose broad and strict controls on technology exports to the USSR, usually with the cooperation of our allies. Likewise, the US could use Japan's dependency on the US security umbrella to wrest concessions from Japan in semiconductors and producing more cars in the US, and also in currency valuation adjustments (Moschellar & Atkinson, 2020). Doing this with Chin, however, would be much more costly, controversial, and, as we see now, difficult to get US allies such as Germany to cooperate.

Table 1. Global economic positions of U.S. and China (1980–2022).

Four dimensions		1980–1990	1990–2000	2000–2010	2010–2022
Market	US	#1	#1, rising	#1	#1, slow growth
	China	#15 growing just opening up	#10 growing more open	#2 in GDP in 2010 entering WTO in 2001 open further	#2, rising fast #1 in PPP in 2016 80% of US GDP
Supplier	US	#1	#1, rising	#1, outsourcing	#1 in high-tech
	China	#30 growing natural-resource exports	#15 rising low-tech exports	#1 in low-tech manuf. world factory #5 in others	#2 high-tech, #1 in low-tech #2 in others
Competitor	US	#1, superpower	#1, dominant	#1, dominant	#1, stagnant
	China	# 35 growing but still weak	#20 rising but not competitive	#1 in low-tech manuf. # 5 in high-tech. upgrading	#2 in manuf.-IT-tele. Equipment #3 in high-tech
Geopolitical rival	US	#1, superpower	#1, dominant	#1, dominant	#1, dominant
	China	#8, a US ally Internal focus	#7, a US friend Internal focus	#3, a US friend growing global influences	#2, A US rival Asia-Africa BRI and AIIB

Sources: Author's work based on the four-dimension model (Moschella & Atkinson, 2020).

While bipartisan consensus of decoupling from China has emerged in the US government, the justifications of decoupling vary, including the need to bring back jobs to America, to counter unfair Chinese trading practices, to address human rights abuses against minorities in China, and to preserve the US technological edge over China. US rationales for decoupling may be summarized in three kinds (Bateman, 2022). National security concerns call for maintaining a military edge over China, limiting Chinese national security espionage, preventing Chinese sabotage in a crisis, limiting Chinese influence operations, and denying support for Chinese and China-enabled authoritarianism and repression. Economic concerns call far countering unfair China's economic practices and IP theft, and competing and leading in strategic industries. Ancillary concerns fall for obtaining general leverage over China and shaping US domestic narratives.

The recent federal rules, executive orders and pending legislation aimed at China's high-tech sectors, an escalation of decoupling, could be supposed to ultimately slow or even stop Chinese technological and economic development. The great dependence on China's cheap necessities, however, has made "selective decoupling" (focusing on technology) a short-run choice for the US government.[6] Technological decoupling has fundamental reasons in long-run, including (a) technology is the engine that powers superpowers, (b) China has emerged as a second technological superpower through globalization, especially the integration with the US, and (c) the strong export controls in strategic technologies can reduce foreign threat to US national security and economic interests.

China is exceptional in adopting technology from advanced countries like the US in the developing world, as indicated in Figure 3. China's tools for acquiring technology intelligence services with non-tractional collectors, joint ventures, mergers & acquisitions, investment in science & technology, talent recruitment programs, academic collaboration, and research partnerships (Huang, 2020).

Five fields with most intensive US-China tech-competition are 5 G, artificial intelligence (AI), quantum computing, semiconductors, and self-driving vehicle (Fitch & Woo, 2020).[7] (a) 5G: China has the advantage over the US in the field. (b) AI: The US has advantage over China, but the gap between the two countries is narrowing. (c) Quantum computing: The United States has an advantage in quantum computing, and China has an advantage in quantum communication.

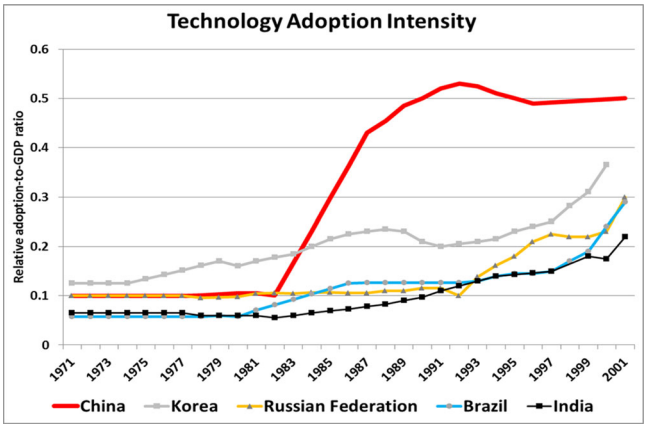

Figure 3. China is Exceptional in Adopting Technology: 1971–2001.
Source: Huang (2020).

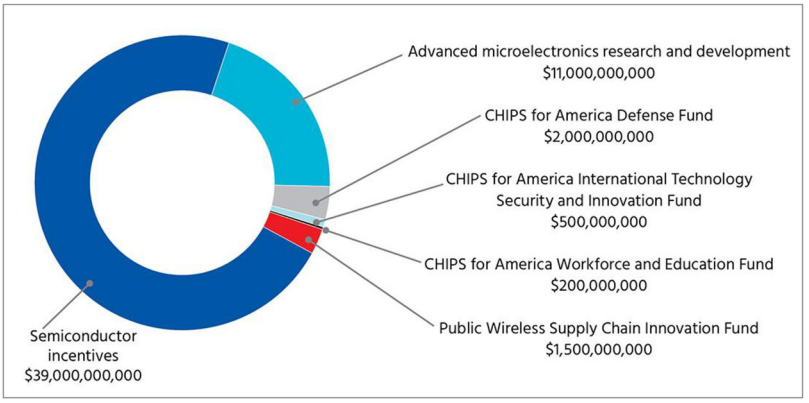

Figure 4. CHIPS for America of 2022.
Sources: Forester.com.

(d) Semiconductor: The US has advantage over China in the short term, In the long run, it's only a matter of time before China's massive investment in the chip industry pays off. (e) Self-driving vehicle: China was about one year behind international rivals in developing self-driving technology, but China is expected to come from behind soon because of its advantage of the world's largest auto market.[8]

The US tech-decoupling is related to techno-nationalism as well, which is a response to a new era of global systemic competition between differing ideologies of economic development. The techno-nationalism believes that a nation's state security, economic prosperity, and social stability should be linked to its technological capabilities and self-sufficiency. The techno-nationalist approach is quickly gaining consensus and reemerging in the new policies by US lawmakers (Capri, 2020). A recent example of this is the signing of the CHIPS for America Act into law as part of a larger US$280 billion CHIPS and Science Act appropriation. As shown on Figure 4, the CHIPS Act allocates US$54.2 billion in funding to support US domestic technology innovation, primarily aimed at the semiconductor industry.

While advocates of free markets have always contended that decoupling is largely ineffective, China's industrial policies seem to have been producing successful outcomes. In a period of approximately 15 years, China has effectively leveraged its FDI policies and aggressive technology transfer and acquisition practices to produce successful economic outcomes (Zhang, 2010, 2014,

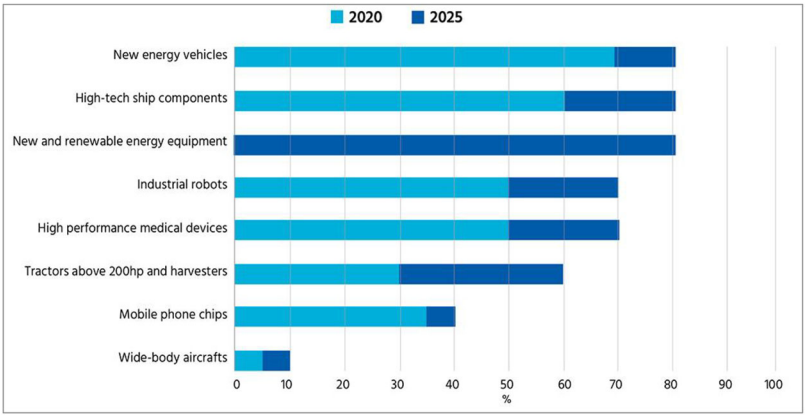

Figure 5. Targets for Domestic Market Share of Chinese Products in Made in China 2025.
Sources: Institute for Security and Development Policy (2022).

2015, 2020; and 2021; Zhao & Zhang, 2010). Made In China 2025 (MIC 2025), emphasizing technology and innovation as drivers of growth and productivity, strives to secure China's position as a global powerhouse in high-tech industries. Figure 5 displays semiofficial targets for the domestic market share of Chinese products planed in MIC 2015.

4. Does decoupling work?

The decoupling or separating US-China technology ecosystems poses significant challenges for both sides and the rest of the world. We focus on decoupling costs of the US and the feasibility of decoupling based on features of high-tech industries and GVCs.

A range of decoupling measures has been introduced to restrict Chinese access to US technology, knowhow, and data and the use of Chinese technology in security sensitive applications in the US. Table 2 lists nine categories of defensive tools or protect agenda. Specifically, measures included tighter controls of Chinese FDI in US tech companies, the "blacklisting" of many Chinese companies, such as telecoms giant Huawei and facial-recognition software firm SenseTime, via the Department of Commerce's entity list, and greater scrutiny of the work of Chinese scientists in the US. Recently, new export controls on high-end processors produced by US companies Nvidia and AMD were introduced. More multilateral efforts were made as complements to the use of unilateral instruments, since the US no longer has control over highly complex and globalized technology industries, and the support of allies and partners is imperative for the effectiveness of US decoupling measures and restructuring critical supply chains.[9]

Like trade war, decoupling does not generate a winner but is a loss-loss game in terms of economic efficiency. The short-term costs of decoupling to the US economy may be assessed at national and industrial levels. According to US Chamber of Commerce (USCC) (2021), four categories of aggregate costs at may be identified: trade, investment, people flows, and idea flows or research collaborations. The estimated annual costs (not including job losses) for each of first three categories could be $190 billion in trade, $25 billion in capital gains and $500 billion one-time GDP losses, and $23 billion in services trade. The total costs per year, therefore, could be as much as $738 billion.[10] Decoupling costs at industrial levels may be seen from four sectors (USCC, 2021): aviation, semiconductor, chemicals, and medical devices. Annual costs (not including job losses) of each sector are estimated to be $46 billion for aviation, $114 billion for semiconductor, $48 billion for chemicals, and $24 billion (more than $479 billion over a decade) for medical devices (USCC, 2021).[11]

Table 2. US large and growing tool kit of technology restrictions.

Tool kit	Major China-related developments since 2017
Export controls	• The CHIPS and Science Act passed in August of 2022 • Export Control Reform Act mandated emerging and foundational technology controls • Military end user (MEU)/end use restrictions tightened, and MEU List created • Entity List greatly expanded • Foreign direct product rule tightened for Huawei • Civilian exception rescinded • Hong Kong's preferential treatment ended
Investment restrictions	• CFIUS activity increased • Foreign Investment Risk Review Modernization Act passed • Non-SON Chinese Military-Industrial Complex Companies List created • Holding Foreign Companies Accountable Act passed
Telecoms licensing and equipment authorizations	• Secure and Trusted Communications Networks Act created the FCC's Covered List • Team Telecom formalized • Chinese carrier and cable landing licenses denied or revoked • Secure Equipment Act barred radio frequency equipment on national security grounds
Visa restrictions	• Visa ban instituted for graduate students and researchers tied to military-civil fusion • Certain Huawei employees barred • Chinese Communist Party members restricted
Import restrictions	• Broad-based tariffs imposed under a revived Section 301 of the Trade Act of 1974 • Steel & aluminum tariffs imposed under a revived Section 232 (b) of Trade Expansion Act • DJI drones and Hytera radios excluded (the former later rescinded) • Xinjiang-made goods presumptively banned
Financial Sanctions	• Chinese actors placed on SON list for human rights abuses, corruption, and Hong Kong impression • U.S. Innovation and Competition Act passed Senate (would mandate further sanctions on Chinese actors)
Technology transaction rules	• "App bans" attempted on TikTok, WeChat, and others (later rescinded) • Bulk power system 0rder instituted (later rescinded) • Information and communications technology or services (ICTS) supply chain security rule enacted
Federal use and spending restrictions	• Drone use and purchase restricted • Section 889 of the 2019 National Defense Authorization Act restricted government and contractor use of Chinese tech • "Remove and replace" rule enacted
Law enforcement	• China Initiative announced (later ended) • Nontraditional collector cases prosecuted

Sources: based on Bateman (2022).

While the decoupling costs to the American economy are high, the US government expects higher costs for China to curtail the Chinese economy. Some studies, however, suggest ambiguous outcomes of decoupling (Atkinson, 2020; Bade, 2022; Bateman, 2022; Bulman, 2021; Capri, 2020; Fischer, 2022; and Han et al., 2022). The feasibility for the decoupling to work may be assessed in the of the four-dimension framework (Moschella & Atkinson, 2020). The Chinese market is the

Figure 6. Many Major US Firms Generate Significant Revenues from China by 2020.
Sources: Huang (2020).

second largest for consumer goods and the largest for manufacturing inputs due to its largest industrial output in the world (Zhang, 2015, 2021). Figure 6 shows China-market shares of total revenues received by some major American firms by 2020. The Chinese market is critical important for the US high-tech companies such as Qualcomm, Micro, Broadcom, and Intel. Without the Chinese market, the firms could find difficult to survive. Since China is already the world's *largest market* for cars, electronics, smartphones, steel, and many other products, major global firms of both the US and its allies have to balance between their economic benefits and decoupling from China.

The decoupling outcomes are highly uncertain because China is by far world's biggest supplier, accounting for roughly 25% of global manufacturing output, which enables China to have strong leverage in some technology industries with high degree of specialization (Moschella & Atkinson, 2020). Over the last decades, the incentives for specialization have increased with the rising complexity of technology and the very different skills and resources demanded of firms that work at the cutting-edge. Due to the unique expertise and skills held by very few companies and experts globally, it is very difficult in industries such as semiconductors to simply relocate or duplicate certain elements of the relevant supply chains. Moreover, the decoupling creates challenges for US companies and third parties (for instance, European Union countries, Japan, South Korea, and southeastern Asian countries) who have no wish to take sides.

While the decoupling may work in some industries like semiconductor in the short run, it may result in China as a stronger competitor in high-tech industries in the long run. A recent study by Hwang and Weinstein (2022) investigates efficiency of one specific aspect (i.e., export controls) of the decoupling based on the case study of the US policy against China in satellites in the past five decades. The questions covered in the work are as follows. Did the US inadvertently help China make better missiles? How have export controls hurt US competitiveness? And what can or can't export controls do to prevent technology from being developed abroad? The work concludes that decoupling has limited impact, since it frequently acts as a hindrance, rather than an absolute bar, to a rival's technological progress. The success of a decoupling regime depends on the technology. The fewer the sellers, the more effective controls can be. If there are many ways to acquire goods, then U.S. efforts alone won't succeed like satellite technology, in which the rise of alternative sources, Europe in particular, undercut the efficacy of US export controls toward China. Decoupling also denies the US access to Chinese work in this field. Keeping tabs on the competition is much harder without insight into Chinese developments or breakthroughs. Restrictions can keep U.S. researchers from joining international projects that don't ban China.

The loss of that opportunity could prompt young scientists to pick European rather than US research programs.

Decoupling may intrigue China to become a real geopolitical rival to the US and a close ally of Russia who has been defined as the largest military rival of the US (Garcia-Herrero & Tan, 2020). A related challenge is that decoupling could stifle innovation. Tech companies with global markets usually reinvest shares of their revenues in R&D activities, which keeps them competitive. Consequently, a significant decrease in revenues due to market access restrictions could adversely affect the long-term technological competitiveness of both the US and China. In addition, a disruption of talent flows could negatively affect technological advancement in companies and universities (Tang et al., 2021). These negative effects on innovation as a consequence of decoupling would contradict some of the motivations in both countries for unraveling their tech ties in the first place. Efforts from the two economic giants to diversity their respective core technologies and supply chains will result in different branches of key technologies, such as artificial intelligence and 5 G communications.

International cooperation is paramount to properly address the global issues the world faces. Decoupling may inhibit international cooperation required to combat challenges that transcend national boundaries. International issues, like the climate crisis and future pandemics, require that the US and China share knowledge, technologies, and innovation with each other in order to be better equipped to solve them.

5. Conclusions

In this paper we investigate the US decoupling from China by focusing on three issues: motives for US decoupling strategy, rationales for technological separation as the core of decoupling, and possible outcomes of decoupling in both the short run and long run. We develop an analytical framework of economic integration and decoupling, focusing on the role of existing and emerging superpowers in globalization and geopolitical economy. The on-going decoupling (so called "protect" agenda) is US natural responses to rise of China, indicating a shift from economic logic to national security and geopolitical thinking. Multidimensional and close integration of US-China economy and rising Chinese economy imply a great difficulty/costs and uncertainty of outcomes. We draw conclusions in three aspects. (a) decoupling was motivated mainly by national security and geopolitical concerns; (b) decoupling concentrates on high-tech industries because they are key for the US to maintain its global hegemony, and (c) it is highly uncertain of decoupling outcomes, and a complete decoupling definite could divide the world economy into two economic blocs that centered on them.

Rise of China is not planned or designed but an accident or simply China's luck. Nobody expected that China could emerge as an economic power in merely a decade after its entry of WTO. Many factors came together at the same time seem to result in China's success, and close integration with the US and well-designed strategy are just two of them. It is nothing wrong for the US to choose the engagement policy in the past decades, and it is incorrect to claim that China's success largely depended on stealing foreign technology and conduct unfair trade practices. Since both the US and China benefit their economic integration, decoupling of course is making the two countries, plus the rest of the world, worse off.

Notes

1. Economists are famous for disagreeing with one another. But economists reach near unanimity on some topics, among the top propositions is free trade and protectionism, with almost all (93% in the 1990s) economists' consensus that tariffs and quotas usually reduce general economic welfare (Mankiw, 2020).
2. The US has a long history of responding to techno-economic challenges, including the arming of the North in the Civil War, the creation of the "arsenal of democracy" to defeat the Axis powers in WWII,

and the post-Sputnik push to out-innovate and out-produce the Soviet Union. In the 1980s and early 1990s there was a strong, bipartisan legislative and administrative push to respond to Japanese (and German) technological competition (Tu & Zhang, 2019; Bulman, 2021; Bateman, 2022).

3. An early 2020 poll on attitudes towards China found that 75% of Americans believe the US should end its dependence on China, specifically when it comes to Chinese medical technologies and exports (Bade, 2022).
4. By using the propensity for "domestic patents in a technology area to cite foreign patents relative to citing their own," Han et al (2022) created a measure that indicates the degree of technological dependence of Chin on the US. Their finding is that the propensity for new Chinese patents to cite U.S. technology has steadily decreased since 2009, indicating a significant progress in technology made by China.
5. (a) China is largest non-US market for many US firms, including Apple, Boeing, Nike, GM, Intel, Hollywood studies, McDonalds, National Basketball Association, Proctor & Gamble, Starbucks, Qualcomm, Walmart, and many others. (b) China is a major supplier of many US firms like Walmart, Target, Dell, HP, Nike, the major pharmaceutical firms, and many others. (c) China has become a major business competitor of US firms in the information technology, telecom equipment, steel, solar panel, toy, textile, and others. More importantly, China becomes increasingly competitive in more high-tech industries, especially those targeted by "Made in China 2025." (d) China has emerged as major geopolitical rival of the US, particularly in east Asia. Through its Belt and Road initiative, international development banks, engagement in global institutions such as IMF and WHO, and other efforts, China's influence in the world has risen steadily (Moschella & Atkinson, 2020; UNIDO, 2022; and World Bank, 2022).
6. The "selective decoupling" has also been criticized by restrictionists (or anti-China hawks) and cooperationists (or free traders): the former believes that "incomplete decoupling is complete non-decoupling"; The latter believes that decoupling cannot improve the competitiveness of US firms, and that it is difficult for the US to strike a balance between "suppressing Chinese technology" and "maintaining economic links with China".
7. The most notable technological battle is over 5G, the superfast cellular network that promises to be the foundation of future technologies. The U.S. government has taken unusual steps to try to thwart Huawei, a leader in cellular technology. AI is often touted as the key to a new industrial revolution, with applications like augmented reality and remote surgery. Quantum computing could help discover new drugs and decrypt encrypted data once thought to be unbreakable. Semiconductors, especially advanced computer chips, act as digital brains, coordinating all of the above technologies. Self-driving technology could fundamentally change transportation systems, infrastructure, and the way people travel (Capri, 2020; Fitch & Woo, 2020).
8. China's regulatory environment favors domestic champions seeking to win in the market of self-driving vehicle, US companies would struggle to be competitive (Fitch & Woo, 2020). Large population will provide Chinese firms with more data that can be used to improve self-driving technology. China's lead in 5G infrastructure means Chinese automakers can test in real-world settings how to use wireless technology to transmit maps and traffic data to cars, or even control them remotely in some cases. The race to self-driving technology, however, is most likely to be fragmented, given governments' tight regulation of self-driving vehicle testing and technology, as the US and China are developing their respective ecosystems in other hardware and software. The US and China are expected to succeed in their home markets first.
9. As part of the CHIPS and Science Act, the US forced Taiwan and South Korea in building new factories to produce high-end chips in the US, explicitly focusing on China.
10. Decoupling in idea flows with China would undermine US productivity and innovation, but quantification in this regard is difficult. Details in other three aspects are as follows (USCC, 2021). (a) Trade: with 25% tariffs on all two-way trade with China, the US would forgo $190 billion in GDP annually by 2025. The stakes are even higher when accounting for how lost US market access in China today creates revenue and job losses, lost economies of scale, smaller R&D budgets, and diminished competitiveness. (b) Investment: if decoupling leads to the sale of half of the US FDI stock in China, US investors would lose $25 billion per year in capital gains, and one-time GDP losses of up to $500 billion. Reduced FDI from China to the US would add to the costs and benefit US competitors. (c) People flows: If flows are reduced by half, the US would lose $15-30 billion per year in services trade exports.
11. Some details of estimations by USCC (2021) are as follows. (a) Aviation: Decoupling would mean reduced aircraft sales resulting in lower US output, falling revenues for the firms involved, and thus job losses and reduced R&D spending. Losses would be $38-51 billion annually. Cumulatively, lost market share impacts would add up to $875 billion by 2038. (b) Semiconductor: Decoupling would mean lower economies of scale, R&D spending, and a less central role in the full web of global technology supply chains. Moreover, it would prompt some foreign firms to "de-Americanize" their semiconductor activities,

putting to the test whether that is possible and further motivating China to seek self-sufficiency. $54-124 billion in lost output, risking more than 100,000 jobs, $12 billion in R&D spending, and $13 billion in capital spending. (c) Chemicals: Decoupling would mean a smaller US share in China's growing market, diversification by China and others from US suppliers, and lower R&D spending. The potential cost ranges from $10.2 billion in US payroll and output reductions and 26,000 lost jobs to more than $38 billion in output losses and nearly 100,000 lost jobs. (d) Medical devices: Decoupling would mean the added cost of reshoring supply chains and restricted product and intermediate input imports from China, along with retaliation against US exports by Beijing. US lost market share is valued at $23.6 billion in annual revenue, amounting to lost revenue exceeding $479 billion over a decade.

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