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ORIGINALNI NAUČNI RAD / ORIGINAL SCIENTIFIC PAPER

U.S.-CHINA ACADEMIC DEPENDENCY

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Abstract: *This study aimed to examine the extent and evolving nature of China's academic dependency on the United States using the field of computer science as the empirical setting. This analysis is situated within Alatas's framework of intellectual imperialism and academic dependency. The empirical analysis employed scientometric methods using Scopus data from 2016 to 2024, and assessed four dimensions of dependency: reliance on U.S. research ideas (international knowledge spillovers), dependence on U.S. academic employment (high-skilled human capital flows), dependence on U.S. investment in education (comparative R&D financing architecture), and dependence on U.S. media of ideas (economic geography of scholarly publishing). The results show that China's dependence on U.S. research ideas has decreased, with Chinese scholars citing domestic research at increasing rates and showing declining reliance on U.S. publications. The analysis also finds rising return migration of Chinese scientists from the United States, a pattern consistent with a redistribution of high-skilled human capital that strengthens China's national innovation system. Furthermore, evidence suggests that Chinese academic funding is overwhelmingly domestically sourced. Yet persistent structural dependencies remain, particularly in publishing, as Chinese scholars continue to rely heavily on Western, especially U.S. and European, journals for global recognition. Overall, the findings indicate that although China is moving toward greater academic self-sufficiency in this field, it remains highly dependent on Western infrastructures for intellectual recognition. This suggests that the academic relationship reflects partial rebalancing rather than complete decoupling, confirming the leading role of the U.S. in the global academic community. The findings contribute to the literature on technological decoupling, international knowledge spillovers, and the comparative political economy of national innovation systems.*

Keywords: *National innovation systems, Academic dependency, United States-China, International knowledge spillovers, Decoupling*

JEL classification: *P51; P52; O31; O38; O33*

INTRODUCTION

Academia in developing countries often follows and depends on technological and intellectual trends set by major global academic powers (Lee & Chen, 2022). This raises an important question: to what extent can research capacity in developing countries grow to be truly autonomous and attuned to country-specific economic and developmental needs? To address this question, it is important that we better understand the phenomena of intellectual imperialism and academic dependency. Similar to the political and economic imperialism of the past, a new form of imperialism has gained momentum in the contemporary world. A legacy of enduring intellectual colonialism has taken deep root within the academic and innovation structures of developing countries (Alatas, 2003). However, over the last two decades, there has been growing momentum in intellectual decolonization and academic indigenization campaigns, especially in Asia (Tenzin & Lee, 2022). Alongside its rapid economic growth, China has undergone an academic transition. Driven by sustained state R&D investment and industrial policy support, China has strengthened its research infrastructure, attracted global talent, and enhanced international collaboration.

This study aims to examine China's academic dependency on U.S. academia, situating the analysis at the intersection of the national innovation systems, and the political economy of knowledge production. The U.S. is chosen because it is the global leader in knowledge production and has the most developed academic system. The paper uses computer science as the empirical setting, since the United States is at the forefront of this discipline. To explore the recent trends in academic dependency, this paper applies selected dimensions of Alatas framework: Dependence on U.S. research ideas (measured as international knowledge spillovers), Dependence on U.S. employment (measured as international human capital mobility), Dependence on U.S. Investment in Education (measured as comparative R&D financing architecture), Dependence on U.S. Media of ideas (measured as economic geography of scholarly publishing). At the core of this research lies a Scientometric analysis, designed to measure the academic dependency over the period 2016–2024. This timeframe was selected because it marks a critical phase in the political, economic, and technological decoupling between China and the United States. The primary dataset was drawn from Scopus (Elsevier, 2025), one of the world's leading databases of peer-reviewed literature. Our findings both complicate and deepen the understanding of academic dependency as a feature of a national innovation system. Despite the state-driven indigenization efforts within Chinese academia and China's growing position as a potential global hub of knowledge production, its academic system remains deeply reliant on the Western academic core - particularly the United States - for intellectual frameworks, validation, and recognition (Ding & Elliott, 2018). The paper contributes to national innovation system, knowledge management, and the broader literature on academic dependency and intellectual imperialism. The study develops a framework that integrates concepts from the economics of innovation and comparative economic systems with insights from the sociology of knowledge. Applied to the computer science sector, it speaks to current debates on economic competitiveness and U.S.-China decoupling. Furthermore, this paper's findings will indicate whether academia mirrors the broader trend of political and economic decoupling between the United States and China.

The rest of the paper is organized as follows. Section 2 presents the key concepts necessary for understanding the latest trends in the global environment and academic dependency theory. In section 3, the research question is developed. The methodology for addressing the research question is presented in Section 4. Section 5 discusses the findings, while Section 6 concludes the paper by highlighting the theoretical and practical implications of the study.

THEORETICAL BACKGROUND

Academia plays a crucial role in enhancing national competitiveness, fostering technological advancement, and driving economic development (Muscio, Quaglione, & Vallanti, 2013). Its influence stems primarily from its core activities of cultivating research-trained graduates. In this context academia's fundamental role is to advance basic research (Grossman, Reid, & Morgan, 2001). Recent trends reveal growing commercial sponsorship of basic research within universities (Fan, Yang, & Yu, 2021). The symbiosis between academic research excellence and the broader economics of academic capitalism has been conceptualized by authors as "strategic research" (Irvine & Martin, 1984). International academic collaboration tends to be more impactful, gain access to broader audiences, and draw on diverse perspectives (Smith, Else, & Crookes, 2014) (Wagner, Park, & Leydesdorff, 2015) (Freeman & Huang, 2015). This can enhance academics' international visibility and recognition while offering commercial sponsors research outputs with potential global market applications and economic returns. Consequently, global integration is contributing to a shift toward global research priorities, sometimes at the expense of national innovation priorities. This is particularly evident in collaborations between developed and developing countries, where underlying asymmetries frequently shape research agendas.

Political economy has recently become a popular conceptual framework for studying global knowledge production in academia. Among the various research frameworks, the most prominent are intellectual imperialism and academic dependency (Galtung, 1967) (Tenzin & Lee, 2024) (Alatas, 2022) (Lee & Chen, 2022) (Tenzin, 2022) (Alatas, 2003). Much like political and economic imperialism, intellectual imperialism reflects structural asymmetries in the global production and circulation of knowledge (Galtung, 1967) between developed and developing countries. This is often referred to as scientific colonialism. Contemporary academic systems often exhibit patterns of dependence, with local scholarship shaped by dominant centers of influence in global innovation networks (Tenzin & Lee, 2022). Alatas describes this as academic dependency, a state in which one academic community's knowledge production is guided and constrained by another (Alatas, 2022). This highlights power imbalances in knowledge production within global innovation networks. Scholars in developing countries often adopt Western frameworks without questioning their relevance to local realities, thereby hindering the development of independent intellectual theories. This dependency is sustained by the dominance of Western publishers, journals, and conferences that supervise the channels of academic recognition. It is further deepened by reliance on imported curricula, pedagogical models, and research funding that often prioritize external agendas over local economic and developmental needs. Confronting these patterns has direct implications for the design of national innovation systems.

The transformation of China's academic system and national innovation system since the late 20th century represents significant academic achievement. This improvement has been driven by a strategic blend of political vision, economic reform, and a persistent quest for modernization. China's academic growth has been both quantitative and qualitative. Since then, state R&D investment rose sharply, alongside a rapid expansion in the number of universities and enrolled students. The government's long-term commitment to invest in research and development has transformed universities into engines of innovation, producing not only vast numbers of graduates but also influential scientific contributions on the global stage. Today, China is a major producer of scientific publications and patents, ranking second only to the United States in research output. Its universities are rising in international rankings, and its academic discourse is expanding beyond Western paradigms toward a more pluralistic, globally engaged model. Yet challenges remain, balancing global integration with national developmental priorities, ensuring efficient allocation of funding, and fostering academic autonomy within a state-led system.

RESEARCH QUESTION

Following the recent emergence of an academic and innovation system improvement in China, a growing body of literature has highlighted the need to critically examine the evolving role and positioning of Chinese academia within the global system of knowledge production (Lee & Chen, 2022) (Tenzin & Lee, 2022) (Tenzin, 2022) (Tenzin & Lee, 2024).

The growing capabilities of Chinese academia are reflected in recent national innovation policies and strategic directions. The Ministry of Education (2020) and the Ministry of Science and Technology (2020) have emphasized that research should primarily serve China's social, economic, and security needs (Office of the Ministry of Science and Technology, 2020). Supported by sustained R&D investments and the rapid expansion of higher education and human capital formation, Chinese universities have emerged as major contributors to global research and active participants in international megaprojects (Zha, 2024). Increasingly, Chinese scholars are publishing independently and establishing diverse global partnerships, reflecting a more confident and autonomous presence in the international academic arena (Lee & Haupt, 2020) (Zha, 2024). However, the notion of China's academic independence remains contested. China's impressive academic and technological progress is deeply intertwined with imitation rather than wholly original innovation (Lu, Liu, Liao, Xu, & Fu, 2022). Their analysis suggests that China's growth has been driven by the strategic adaptation and refinement of foreign technologies, a process that while creative still reflects dependence on external knowledge systems (Han, Jiang, & Mei, 2024) (Bloomberg, 2021). Concerns persist that much of China's research productivity is inflated by state-driven quantity targets rather than genuine scientific breakthroughs. Issues such as low international citation rates, limited cross-border collaboration, and uneven research integrity continue to signal underlying structural weaknesses within China's innovation ecosystem. Despite massive state investment, Chinese universities largely remain peripheral actors in global knowledge networks constrained by rational cost-benefit considerations (König, Storesletten, Song, & Zilibotti, 2022), weak intellectual property regimes (Zheng & Wang, 2012) and enduring cultural and institutional barriers

(Gallagher & Worrell, 2008) (Datta & Mohtadi, 2006). As scientists interviewed by Qiu observe, this bureaucratic, target-oriented governance model restricts researchers' autonomy, discourages curiosity-driven research, and suppresses original scientific innovation (Qiu, 2014).

Alatas contends that the "Global South's" dependence on Western academia extends beyond intellectual subordination and is reinforced by structural mechanisms that privilege Western control over global knowledge production (Alatas, 2022). Western media infrastructures continue to shape this landscape, with Western academia serving as the primary arbiter of scholarly legitimacy. To gain recognition, research must often be published in English and indexed in Western databases (Marginson & Xu, 2023), pressuring non-English-speaking scholars to prioritize international over local outputs (Lee & Chen, 2022). In this regard, developments in China reveal a complex and paradoxical trajectory. On one hand, Chinese academia closely follows global trends, embedding itself within Western-dominated systems of knowledge validation. Chinese research primarily circulates through Western-controlled platforms—English-language journals, citation databases such as the Web of Science and Scopus, and international ranking systems that continue to define global academic prestige (Lee & Chen, 2022). This dependency sustains the dominance of Western epistemic frameworks. On the other hand, China is actively building its own intellectual infrastructure grounded in national priorities and epistemological autonomy. Recent policy initiatives have encouraged scholars to publish in domestic journals and strengthened the country's academic infrastructure through platforms such as CNKI, WanFang Data, VIP Journal Database, and the Chinese Science Citation Database (Lee & Haupt, 2020). The government has introduced mechanisms such as the Breaking the Five-Only campaign, the Double First-Class Programme, and the China University Subject Rankings to promote quality-oriented evaluation and reduce dependence on international benchmarks. However, the transition remains uneven: many institutions continue to prioritize quantitative metrics and international visibility, revealing the enduring tension between reformist aspirations and the inertia of established academic practices (Xu & Li, 2024).

From the perspective of the innovation financing, the historical development of China's higher education system reveals a clear transition from Western-dependent financing toward state-led self-reliance and strategic autonomy. In the immediate aftermath of the Cultural Revolution, particularly during the late 1970s and early 1980s, China's efforts to rebuild its research and educational infrastructure were heavily supported by Western loans, grants, and technical assistance (Alatas, 2022). As a result, Western donors and institutions exercised significant influence over China's educational priorities, embedding a structural dependence on external funding sources and global policy frameworks rather than on domestically generated capital or expertise. From the 1980s onward, however, China began to reorient its academic financing model toward domestic mobilization and state-directed investment. Nevertheless, vestiges of financial dependency persist, particularly through international research collaborations and joint academic ventures that rely partly on co-financing from Western universities, foundations, and multinational research programs. While such partnerships continue to contribute to China's global academic visibility, their scale has gradually diminished in recent years amid intensifying geopolitical tensions and rising skepticism toward

China's political and scientific agenda (Xie, Lin, Li, He, & Huang, 2023). Thus, the contemporary Chinese academic system occupies a dual position: it demonstrates a growing capacity for financial self-sufficiency and centralized coordination, yet remains, albeit to a lesser extent, entangled with Western funding structures that continue to shape certain dimensions of its international engagement.

Another crucial dimension of academic dependence identified by Alatas concerns the mobility of human capital, specifically, the reliance of developing academic systems on foreign training, expertise, and recognition. Bilateral cooperation agreements with the advanced economies facilitated the training of thousands of Chinese scholars abroad through government-funded scholarships and institutional partnerships (Xinhua, 2017). The reliance on Western education systems also produced a persistent structural imbalance. Many of the scholars trained abroad, particularly those in elite programs, chose not to return, resulting in significant and ongoing brain drain (Hu, 2021). Empirical studies show that return decisions are strongly influenced by the prestige of the PhD-awarding institution and the academic standing of potential employers in China (Marini & Yang, 2021). Those who remain abroad often cite the greater research autonomy, superior infrastructure, and more vibrant intellectual environments found in Western universities (Sun, Guo, & Zhang, 2017). At the same time, the past two decades have witnessed a deliberate shift toward independence and domestic capacity-building within China's academic system. The Chinese government has implemented a series of high-profile talent repatriation programs, such as the Young Thousand Talents (Y1000T) scheme, which offers returning scholars competitive compensation, modern research facilities, and considerable autonomy in establishing their own teams (Marini & Yang, 2021). The growing global visibility and prestige of leading Chinese universities have further contributed to reversing the flow of scientific migration (Wang & Bao, 2015) (Li, Lo, Lu, Tan, & Lu, 2023). The dynamics of China's scientific workforce illustrate a direct implication for the economics of innovation.

RQ: To what extent and through which economic mechanisms has China's academic dependency on the United States in computer science evolved during the period of U.S.-China decoupling (2016–2024)?

METHODOLOGY

Data and sample

This study addresses the phenomenon of academic dependence in the Chinese context. Research focuses on the extent to which Chinese scholars depend on U.S. scholars. We chose computer science as a case for examining dependence because it is a highly active and rapidly evolving technology field, and one in which the United States continues to lead. The discipline of computer science originated in the United States and was introduced to China during the final decades of the twentieth century. The diffusion of computer science knowledge into China occurred through multiple channels. Initially, Western companies entered the Chinese market primarily for trade and low-value-added production, but by the 1980s and 1990s, many began transferring their research and development (R&D) operations to China (Von Zedtwitz, 2004). Consequently, most leading global technology firms established a presence in the country. An additional driver of computer science development in China was the

growing number of Chinese students pursuing higher education in the United States (Wang, Mao, Wang, Peng, & Hou, 2013). Recognizing the strategic importance of this field, the Chinese government began to view computer science as a key instrument for achieving global technological leadership. We focus our research on academic dependence because academic researchers play a pivotal role in advancing basic research, which, in turn, serves as the foundation for radical and disruptive innovations (Quaglione, Muscio, & Vallanti, 2015). By assessing this dependence, we aim to determine whether China has transitioned from being a technological imitator to an independent innovator within the global computer science landscape.

To assess dependency, we observed four dependency dimensions proposed by Alatas (2003): dependence on research ideas, dependence on employment, dependence on investment in education, and dependence on the media (Table 1).

Table 1. Operationalization of the four dependency dimensions

Dependency dimension	Economic construct	Indicator and formula	Figure	Data, population and interpretation
Dependence on U.S. research ideas	International knowledge spillovers (co-authorship)	Number of Chinese CS articles in year t with at least one co-author affiliated in country j	Figure 1	**Source**: Scopus **Population**: all CS articles with at least 1 author affiliated with a Chinese institution, 1978–2024. **Interpretation**: A rising number of collaborations with U.S. authors indicates a deepening collaborative tie; a falling share indicates disengagement, which may reflect either reduced dependence or externally imposed decoupling.
Dependence on U.S. research ideas	International knowledge spillovers (via citation)	Citation propensity: The propensity of Chinese papers to cite U.S. papers relative to Chinese papers: $P_{c,u} = \frac{n_{c,u}}{n_{c,c}}$; The propensity of U.S. papers to cite Chinese papers relative to U.S. papers: $P_{u,c} = \frac{n_{u,c}}{n_{u,u}}$; $n_{c,u}$ references from Chinese articles to U.S.-affiliated articles $n_{c,c}$ references from Chinese articles to Chinese-affiliated articles $n_{u,c}$ references from U.S. articles to Chinese-affiliated articles $n_{u,u}$ references from U.S. articles to. US.-affiliated articles	Figures 2 and 6	**Source**: Scopus **Population**: the 2,000 most-cited articles per year, 2016–2024, authored exclusively by Chinese affiliations. (Respectively U.S.) **Interpretation**: Growth of $P_{c,u}$ means Chinese authors draw on U.S. work more than on domestic work. Decline in $P_{c,u}$ means Chinese authors' declining dependence on the U.S. (Respectively, U.S.)

Dependence on U.S. academic employment	High-skilled human capital flows	Normalized return flow: $R_t = \frac{N_t}{mean\ N(2005-2010)}$	Figure 3	**Source**: Secondary data reprinted from Xie et al. (2023) **Population**: Number of U.S.-based Chinese-descendant scientists moving to China in year t and no longer publishing with a U.S. affiliation N_t normalization to the 2005–2010 mean makes fields with different workforce sizes comparable. **Interpretation**: $R_t > 1$ means outflow from the U.S. exceeds the pre-2010 baseline; a rising R(t) indicates falling reliance on U.S. academic employment as a career destination.
Dependence on U.S. investment in education	R&D financing architecture	Number of Chinese CS articles financed by different countries j	Figure 4	**Source**: Scopus **Population**: all CS articles authored exclusively by China-affiliated researchers **Interpretation**: A declining number of funding from Country J indicates growing financial self-reliance.
Dependence on U.S. media of ideas	Economic geography of scholarly publishing	Chinese CS articles published in year t in journals whose publisher is domiciled in country j	Figure 5	**Source**: Scopus **Population**: Chinese CS articles 2016–2024 **Interpretation**: increase in percentage of articles published in country j indicate growing dependence on validation infrastructure (publisher) of country j

Source: Authors' own illustration

MEASURING THE DEPENDENCY OF THE CHINESE ACADEMY ON THE U.S. ACADEMY

Chinese dependence on U.S. research ideas

At the core of this research is a scientometric analysis designed to measure the academic dependency of Chinese scholars on their U.S. counterparts in computer science over 2016–2024. This timeframe was selected because it marks a critical phase in the economic and technological decoupling between China and the United States. The primary dataset was drawn from Scopus (Elsevier, 2025), one of the world's leading databases of peer-reviewed literature. In Scopus, the study applied a strict inclusion criterion, limiting publications to those categorized as "articles," defined as original research or opinion pieces commonly published in peer-reviewed journals (Elsevier, 2020). Only records within the disciplinary domain of computer science were included. Applying successive filters to Scopus records authored exclusively by China-affiliated researchers reduced the initial 11,736,256 documents to 2,060,553 in computer science, 910,802 journal articles, 714,724 English-language articles, and finally 413,619 published between 2016 and 2024. The increasing proportion of articles produced solely by domestic scholars indicates a trend toward greater research self-sufficiency and the emergence of indigenous capacity within

China's computer science community. (A detailed PRISMA diagram can be found in Appendix 1, Table A1)

Dependence on research ideas captures international knowledge spillovers, a significant concept in the economics of innovation. Figure 1 illustrates the pattern of China's international academic collaborations, focusing on partnerships with the United States, the European Union (with and without the United Kingdom), and the United Kingdom individually. The data reveal that the U.S. consistently appears as China's most significant research collaboration partner, indicating China's strong academic dependence on the United States. However, the Figure 1 also reflects the impact of escalating U.S.-China tensions on the academic sphere. Beginning around 2018, coinciding with the onset of political and economic frictions between the two nations, the rate of U.S.-China academic collaboration began to decline and has since stagnated. In contrast, China's collaborations with other international partners, particularly those within the European Union, have continued to expand.

Figure 1. Number of Chinese academic papers in collaboration with selected countries (1978-2024)

Source: Authors' own illustration based on data from Scopus

To quantify academic dependence on ideas, this study measures the propensity of Chinese research articles to cite U.S. publications relative to domestic ones. This selection was made under the rationale that citation frequency reflects the influence of academic knowledge (Kreiman & Maunsell, 2011). Citations are widely recognized as an objective indicator of the acquisition and diffusion of knowledge and ideas (Jaffe & Trajtenberg, 2002). The analytical approach adopted here is based on the measurement model developed by (Han, Jiang, & Mei, 2024). To assess China's academic dependency, we extracted the 2,000 most-cited articles per year in which all authors are affiliated with Chinese institutions; these are referred to as "Chinese articles." Similarly, to evaluate U.S. academic dependency, we identified the 2,000 most-cited articles per year over the same period, authored exclusively by researchers affiliated with U.S. institutions, referred to as "U.S. articles." Scopus permits reference analysis on a maximum of 2,000 documents per query, which necessitated sampling (to mitigate potential sample bias, we conducted a sensitivity analysis, which can be found in Appendix 2). Figure 2 presents the results of the quantitative assessment of Chinese academic dependence. (Details can be found in Appendix 1, Table A2).

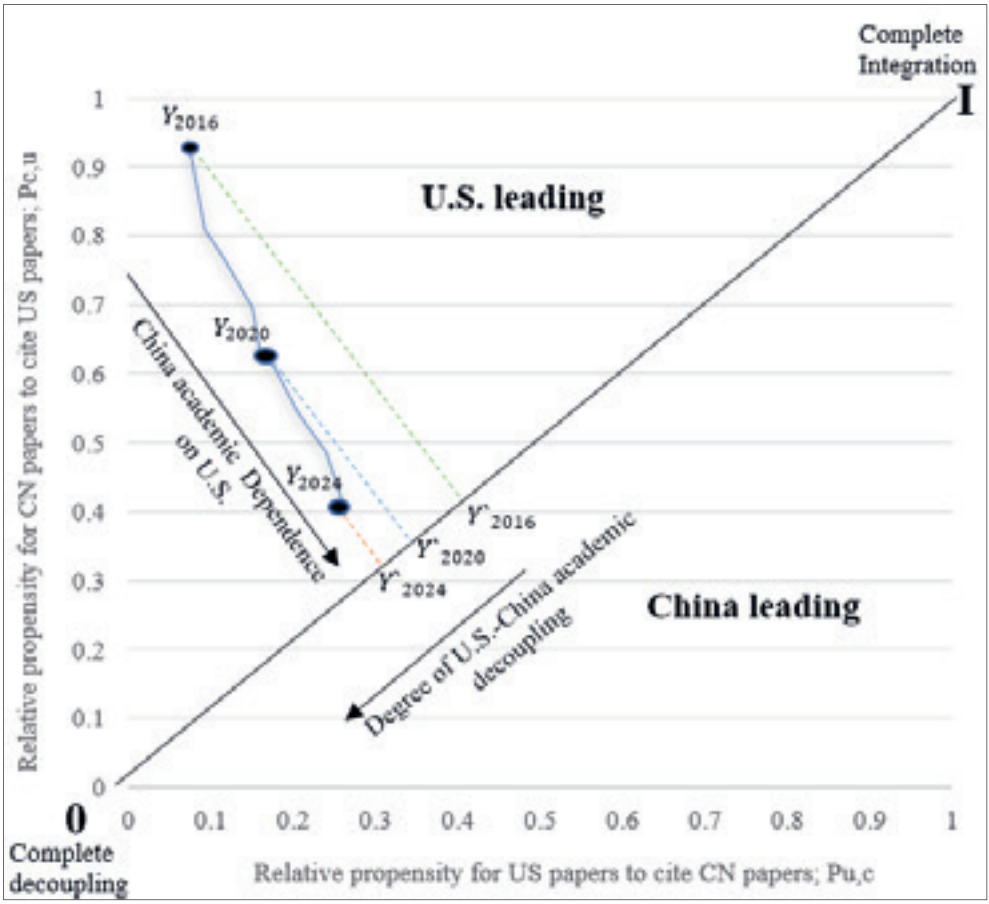

Figure 2. U.S.-China academic decoupling and dependence

Source: Authors' own illustration based on data from Scopus

Figure 2 provides evidence of China's increasing academic self-sufficiency. In 2016, Chinese scholars cited U.S. publications about ten times as often as domestic ones, reflecting a pronounced academic dependence on the United States. Over the past decade, however, this ratio has declined sharply. By 2024, Chinese authors cite U.S. papers only about twice as often as domestic publications. While this indicates that the United States retains its academic leadership and that China's dependence remains, the data suggest a rapid, accelerating reduction in that dependence. Figure 2 also shows the trends in academic decoupling. Growing academic independence is followed by growing academic decoupling. In academic literature, technological decoupling refers to the process by which countries increasingly diverge in technological standards and innovation trajectories, thereby reducing the necessity to build upon each other's research outputs (Han, Jiang, & Mei, 2024) (Zhang, 2023). In this context, "complete decoupling" would mean researchers in each country no longer cite publications from the other, reflecting two self-contained, isolated scientific ecosystems. Conversely, "complete integration" would occur when domestic authors cite foreign and domestic publications with equal probability, implying that knowledge produced

abroad is equally relevant and that no "home bias" exists in the use or recognition of external research.

Dependence on U.S. Employment

Dependence on employment captures international human capital flows. To indicate China's dependence on U.S. employment, we used corroborating secondary evidence rather than our own measurements extracted from (Xie, Lin, Li, He, & Huang, 2023) research. Figure 3 shows a notable increase in the number of returning scholars, both junior and senior, particularly in engineering and computer science. This trend suggests that Chinese academics are increasingly choosing to continue their careers in China rather than in U.S. institutions, reflecting a gradual strengthening of research opportunities, resources, and institutional prestige within China's own higher education system.

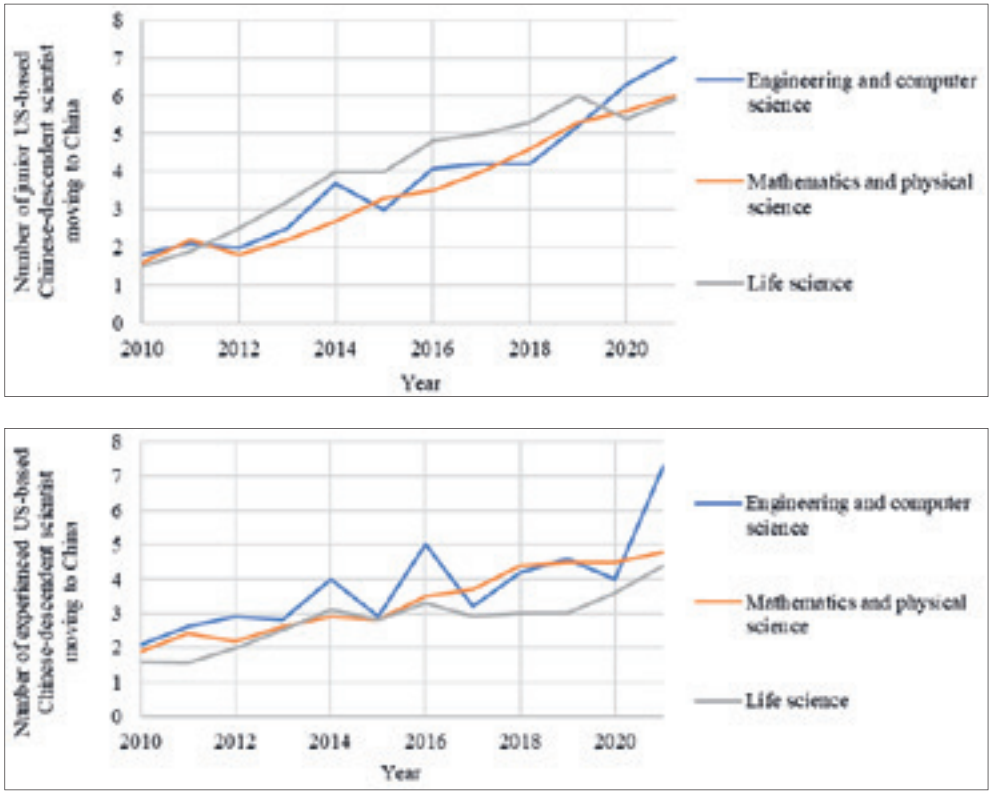

Figure 3. Trends in junior/experienced Chinese scientists migrating from the U.S. to China

Source: Reprinted from (Xie, Lin, Li, He, & Huang, 2023)

Dependence on U.S. Investment in Education

Dependence on investment in Education captures an R&D financing architecture. This dimension captures the financing of the Chinese national innovation system. Figure 4 shows the number of Chinese research projects financed by funds from China, the U.S., and other countries. Figure 4 indicates that Chinese academia is predominantly financed through domestic state sources, reflecting a model of centrally coordinated

national investment in higher education and research. Significant growth is especially evident from 2015 onward.

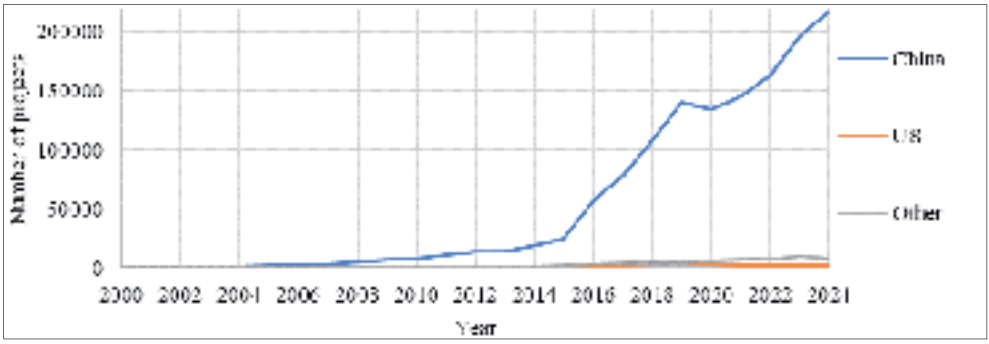

Figure 4. Number of projects financed by funds from China, U.S., and other countries

Source: Authors' own illustration based on data from Scopus (Elsevier, 2025)

Dependence on the U.S. Media

Dependence on the Media captures the economic geography of scholarly publishing – validation infrastructure. Figure 5 illustrates the changing distribution of countries where Chinese scholars publish their articles between 2016 and 2024. During the early years (2016–2018), most Chinese articles appeared in China-based journals, accounting for the highest share (around 35–40%). However, this proportion steadily declined, while publications in U.S. journals grew sharply, peaking around 2019–2020. After 2020, the U.S. share slightly decreased but remained significant. Meanwhile, publications in Swiss- and Netherlands-based journals (MDPI and Elsevier) rose considerably after 2021, reflecting the growing role of these outlets in hosting Chinese research. The shares of the UK and other countries remained relatively stable but low throughout the period. Overall, the trend suggests a gradual internationalization and diversification of Chinese scholarly publishing, with a shift from domestic to Western (especially U.S. and European) journals.

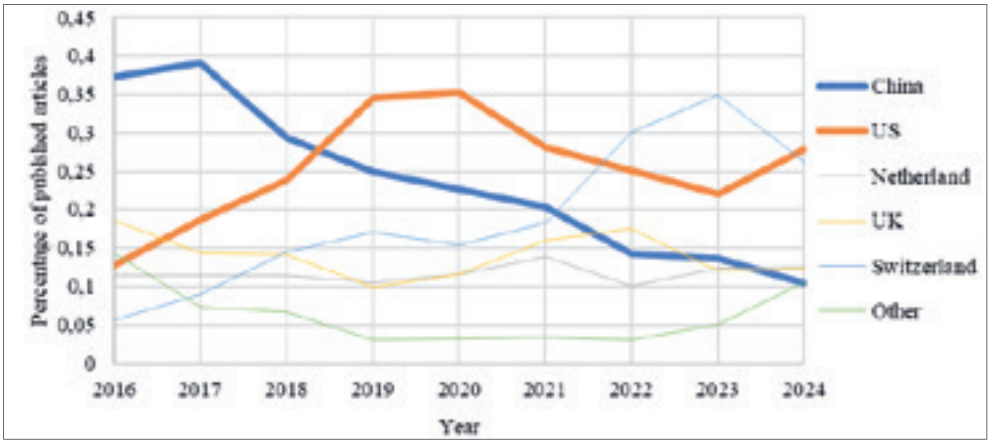

Figure 5. Country of origin of journals where Chinese computer science articles are published

Source: Authors' own illustration based on data from Scopus (Elsevier, 2025)

DISCUSSION

This research yields ambiguous findings regarding U.S.-China academic dependence in computer science. The study reveals that citations of U.S. articles in Chinese publications are declining, suggesting a growing trend of Chinese academic independence. These findin+gs align with earlier results by (Han, Jiang, & Mei, 2024), who found that China's technological reliance on the U.S. is declining. The trend of declining academic dependence coincides with the implementation of the China Initiative in the U.S. Chinese researchers may have increasingly relied on local research inputs, thereby fostering more basic research within China. However, certain findings do not confirm this trend in China (Chen, Zhang, & Miao, 2023). According to them, U.S.-China tensions negatively affected innovation in the Chinese ICT industry. This reflected the negative effect of increasing independence on Chinese creativity. Furthermore, our analysis shows that a growing number of Chinese publications in the top 1% cited publications might reflect an increase in originality and creativity in Chinese academic research (Elsevier, 2025). Furthermore, our analysis reveals that citations of Chinese articles in U.S. publications are growing. However, despite the decline, this research indicates that the United States still holds a dominant position in the U.S.–China academic relationship.

According to Alatas framework of academic dependence, reliance on "Western media" constitutes a clear manifestation of Western intellectual imperialism (Alatas, 2022). The results of this analysis indicate a growing trend of Chinese authors publishing in "Western" journals, particularly those based in the United States and Switzerland (Elsevier, 2025). While this reflects a degree of conformity with the U.S.-dominated academic system, it also signals growing recognition of Chinese scholarly work. This points to a paradox in government academic policies. On the one hand, the government promotes academic dependence on Western media. Publications in SCI or SSCI-indexed journals serve as key measures of performance for academic promotion and rewards in Chinese universities (Gu & Levin, 2021); (Xu, Rose, & Oancea, 2021). On the other hand, recent policy initiatives have encouraged scholars to publish in domestic journals and strengthened the country's academic infrastructure through platforms such as CNKI, WanFang Data, VIP Journal Database, and the Chinese Science Citation Database (Lee & Haupt, 2020), reflecting the government's devotion to freeing itself from Western media dependence.

The Chinese government is the dominant financial patron of its own research system, channeling substantial investment through initiatives such as Project 211 (1995), Project 985 (1998), and the Double First-Class Initiative (2017). This financial independence is reflected in co-authorship data: only 4% of U.S.–China co-authored publications rely solely on U.S. funding, while 44% are co-funded by Chinese sources and 32% by other international partners (Lee & Haupt, 2020), suggesting that U.S. collaboration now functions primarily as a channel for knowledge exchange and international visibility rather than financial support. Recent U.S. restrictions on federal funding for research involving Chinese institutions (U.S. Department of Justice, 2020) have further accelerated this decoupling, reinforcing China's growing financial and institutional self-reliance.

The tendency of Chinese scholars to seek academic positions within U.S. universities reflects the historically greater concentration of research opportunities, re-

sources, and institutional prestige in the American higher education system (Sun, Guo, & Zhang, 2017). This dominance is reinforced by dense networks of collaboration abroad and "hygienic" conditions in academia (competitive salaries, generous budgets, and ample grant opportunities) that continue to draw and retain Chinese scholars in Western institutions (Cañibano & Woolley, 2015). However, other study results suggest that Chinese academics are increasingly choosing to continue their careers in China rather than in U.S. institutions for over a decade already (Xie, Lin, Li, He, & Huang, 2023). This trend accelerated further, driven by the U.S.'s China Initiative in 2018. Even dual affiliation between the U.S. and China dropped sharply by 2021. This trend is particularly evident in engineering and computer science academics. Furthermore, the Chinese government is making growing efforts to repatriate its academics. The government offered generous working conditions, reduced teaching load, strong research funding, and resources to build a team (Chen & Du, 2023) (Marini & Yang, 2021). Where certain authors emphasize cultural and familial motivations, as well as the rise in prestige of Chinese universities, as the main reasons (Zhao, Liu, & Yan, 2024) (Hu, 2021). Encouraging internationalization of China's academic ecology will facilitate further progress of academic careers in China (Li & Xue, 2021).

CONCLUSION

Since the U.S.–China Science and Technology Agreement (Agreement between the United States of America and the People's Republic of China on Cooperation in Science and Technology, 1979), Chinese academic collaboration with U.S. researchers has taken off. However, in the last 10 years, the trend has lost momentum. Academic collaboration has mirrored broader trends of geopolitical and economic decoupling. This led to strategic reorientation of Chinese researchers toward broader cooperation with other Western nations, especially within Europe (Lee & Haupt, 2020) (Zha, 2024). Simultaneously, the Chinese government is making growing efforts to repatriate its academics. The paper not only contributes to the existing literature but also introduces a new research trajectory within the academic dependency and intellectual imperialism framework. While the academic dependency framework has traditionally been used to study knowledge flows in broader academic contexts, this study extends it to a high-technology sector central to the economics of innovation, comparative national innovation systems, and contemporary debates on technological decoupling. Furthermore, this paper's findings illustrate that, within computer science, China's academic ascent represents not a clean break from Western intellectual structures but rather a partial rebalancing within a still-asymmetric global system of knowledge production. This suggests that, in computer science, academic integration between the world's two leading national innovation systems does not fully mirror the broader trend of political and economic decoupling between the United States and China, and it confirms the U.S. as a global academic leader. This study measures academic dependency within a single discipline, and the findings should not be read as describing China's academic system as a whole. Computer science is atypical in several respects relevant to the measures used here: it is unusually English-dominant, it has been a priority target of Chinese state investment, and its knowledge cycles are short, so citation patterns adjust faster than in fields with longer theoretical horizons. Computer science therefore constitutes a hard case for the dependency thesis rather than a representative one, which

makes the persistence of publishing dependence documented here more, not less, notable. Extending the analysis across disciplines is a natural next step.

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LITERATURE

Agreement between the United States of America and the People's Republic of China on Cooperation in Science and Technology. (31. January 1979). *1150*. United Nations Treaty Series. Retrieved from https://treaties.un.org/doc/Publication/UNTS/Volume%201150/volume-1150-I-18102-English.pdf

Alatas, S. F. (2003). Academic dependency and the global division of labour in the social sciences. *Current Sociology, 51*(6), pp. n.p.

Alatas, S. F. (2022). Political economies of knowledge production: On and around academic dependency. *Journal of Historical Sociology, 35*(1), pp. 14-23.

Bloomberg. (2021). Xi mobilizes China for tech revolution to cut dependence on West. Retrieved from https://www.bloomberg.com/news/articles/2021-03-01/xi-mobilizes-china-for-tech-revolution-to-cut-dependence-on-west

Cañibano, C., & Woolley, R. (2015). Towards a socio-economics of the brain drain and distributed human capital. *International Migration, 53*(1), pp. 115-130.

Chen, J., & Du, X. (2023). Integration or re-mobility: Exploring the typology of academic returnees' post-return experiences in Chinese universities from the cultural assimilation perspective. *Beijing International Review of Education, 5*(4), pp. 405-422.

Chen, Y., Zhang, S., & Miao, J. (2023). The negative effects of the US–China trade war on innovation: Evidence from the Chinese ICT industry. *Technovation, 123*, 102734.

Datta, A., & Mohtadi, H. (2006). Endogenous imitation and technology absorption in a model of North–South trade. *International Economic Journal, 20*(4), pp. 431-459.

Ding, Y., & Elliott, M. (2018). How to write Chinese history in the twenty-first century: The impact of the "New Qing History" studies and Chinese responses. *Chinese Studies in History, 51*, pp. 70-95.

Elsevier. (2020). Scopus content coverage guide. Elsevier B.V. Retrieved from https://www.elsevier.com/products/scopus/content

Elsevier. (2025). Scopus [Database]. Retrieved from www.scopus.com

Fan, X., Yang, X., & Yu, Z. (2021).Effect of basic research and applied research on universities' innovation capabilities: The moderating role of private research funding. *Scientometrics, 126*(7), pp. 5387-5411.

Freeman, R. B., & Huang, W. (2015). Collaborating with people like me: Ethnic coauthorship within the United States. *Journal of Labor Economics, 33*(S1), pp. 289-318.

Gallagher, K. P., & Worrell, J. L. (2008). Organizing IT to promote agility. *Information Technology and Management, 9*(1), pp. 71-88.

Galtung, J. (1967). Scientific colonialism. *Transition, 30*, pp. 11-15.

Grossman, J. H., Reid, P. P., & Morgan, R. P. (2001). Contributions of academic research to industrial performance in five industry sectors. *The Journal of Technology Transfer, 26*(1), pp. 143-152.

Gu, J., & Levin, J. (2021). Tournament in academia: A comparative analysis of faculty evaluation systems in research universities in China and the USA. *Higher Education, 81*(5), pp. 897-915.

Han, P., Jiang, W., & Mei, D. (2024). Mapping US–China technology decoupling: Policies, innovation, and firm performance. *Management Science, 70*(12), pp. 8386-8413.

Hu, D. (2021). Understanding transnational academic migration: US doctorate recipients' choices of returning to Chinese academe. *International Journal for Educational and Vocational Guidance, 21*(3), pp. 653-669.

Irvine, J., & Martin, B. R. (1984). CERN: Past performance and future prospects: II. The scientific performance of the CERN accelerators. *Research Policy, 13*(5), pp. 247-284.

Jaffe, A. B., & Trajtenberg, M. (2002). *Patents, citations, and innovations: A window on the knowledge economy.* MIT Press.

König, M., Storesletten, K., Song, Z., & Zilibotti, F. (2022). From imitation to innovation: Where is all that Chinese R&D going? *Econometrica, 90*(4), pp. 1615-1654.

Kreiman, G., & Maunsell, J. H. (2011). Nine criteria for a measure of scientific output. *Frontiers in Computational Neuroscience, 5,* 48.

Lee, C., & Chen, Y. (2022). In what ways we depend: Academic dependency theory and the development of East Asian sociology. *Journal of Historical Sociology, 35*(1), pp. 24-36.

Lee, J., & Haupt, J. P. (2020). Winners and losers in US–China scientific research collaborations. *Higher Education, 80*(1), pp. 57-74.

Li, J., & Xue, E. (2021). Returnee faculty responses to internationalizing "academic ecology" for creating world-class universities in China's elite universities. *Higher Education, 81*(5), pp. 1063-1078.

Li, W., Lo, L., Lu, Y., Tan, Y., & Lu, Z. (2023). Intellectual migration: Considering China. In New theoretical dialogues on migration in China. Routledge.

Lu, C., Liu, Z., Liao, S., Xu, Y., & Fu, L. (2022). Is an imitation strategy an enabler or a hindrance for exploitative or exploratory innovation?—The moderating effect of embeddedness in knowledge networks. *IEEE Transactions on Engineering Management, 70*(8), pp. 2955-2967.

Marginson, S., & Xu, X. (2023). Hegemony and inequality in global science: Problems of the center–periphery model. *Comparative Education Review, 67*(1), pp. 31-52.

Marini, G., & Yang, L. (2021). Globally bred Chinese talents returning home: An analysis of a reverse brain-drain flagship policy. *Science and Public Policy, 48*(4), pp. 541-552.

Muscio, A., Quaglione, D., & Vallanti, G. (2013). Does government funding complement or substitute private research funding to universities? *Research Policy, 42*(1), pp. 63-75.

Office of the Ministry of Science and Technology, P. (4. June 2020). **科技部**办公厅关于加快推动国家科技成果转移转化示范区建设发展的通知 [Notice on accelerating the construction and development of national science-and-technology achievement transfer demonstration zones]. **中国政府网**. Retrieved from https://www.gov.cn/zhengce/zhengceku/2020-06/09/content_5518163.htm

Qiu, J. (2014). China's funding system and research innovation. *National Science Review, 1*(1), pp. 161-163. Retrieved from https://doi.org/10.1093/nsr/nwt034

Quaglione, D., Muscio, A., & Vallanti, G. (2015). The two sides of academic research: Do basic and applied activities complement each other? *Economics of Innovation and New Technology, 24*(7), pp. 660-681. doi:10.1080/10438599.2014.974944

Smith, K. M., Else, F., & Crookes, P. A. (2014). Engagement and academic promotion: A review of the literature. *Higher Education Research & Development, 33*(4), pp. 836-847.

Sun, S., Jiang, Y., & Zheng, S. (2020). Research on ecological infrastructure from 1990 to 2018: A bibliometric analysis. *Sustainability, 12*(6), pp. 2304.

Sun, Y., Guo, R., & Zhang, S. (2017). China's Brain Gain at the High End: An Assessment of Thousand Youth Talents Program. *Asian Journal of Innovation & Policy, 6*(3), pp. 274-294.

Tenzin, J. (2022). Rethinking the rise of China: A postcolonial critique of China and a Chinese critique of the postcolonial. *Journal of Historical Sociology, 35*(1), pp. 83-106.

Tenzin, J., & Lee, C. (2022). Are we still dependent? Academic dependency theory after 20 years. *Journal of Historical Sociology, 35*(1), pp. 2-13.

Tenzin, J., & Lee, C. (2024). Rethinking dependency and knowledge production amid China's rise. *American Behavioral Scientist, 68*(3), pp. 279-289.

U.S. Department of Justice. (2020). *The China Initiative: Year-in-Review (2019-20).* Retreived from https://www.justice.gov/archives/opa/pr/china-initiative-year-review-2019-20

Von Zedtwitz, M. (2004). Managing foreign R&D laboratories in China. *R&D Management, 34*(4), pp. 439-452.

Wagner, C. S., Park, H. W., & Leydesdorff, L. (2015). The continuing growth of global cooperation networks in research: A conundrum for national governments. *PLOS ONE, 10*(7), pp. e0131816.

Wang, H., & Bao, Y. (2015). *Reverse migration in contemporary China: Returnees, entrepreneurship and the Chinese economy.* Springer.

Wang, X., Mao, W., Wang, C., Peng, L., & Hou, H. (2013). Chinese elite brain drain to USA: An investigation of 100 United States national universities. *Scientometrics, 97*(1), pp. 37-46.

Xie, Y., Lin, X., Li, J., He, Q., & Huang, J. (2023). Caught in the crossfire: Fears of Chinese-American scientists. *Proceedings of the National Academy of Sciences*, *120(27)*, e2216248120. doi:10.1073/pnas.2216248120

Xinhua. (29. September 2017). *China U.S. pledge to push for renewal of sci-tech cooperation.* Retrieved from Xinhuanet: http://www.xinhuanet.com//english/2017-09/29/c_136648313.htm

Xu, F., & Li, X. (2024). Review on reform of international research evaluation in the past decade. *Bulletin of the Chinese Academy of Sciences, 39*(1), pp. 121-130.

Xu, X., Rose, H., & Oancea, A. (2021). Incentivising international publications: Institutional policymaking in Chinese higher education. *Studies in Higher Education, 46*(6), pp. 1132-1145.

Zha, Q. (2024). Reimagining China–US university relations: A global "ecosystem" perspective. *Studies in Higher Education, 49*(9), pp. 1532-1552.

Zhang, K. H. (2023). US–China economic links and technological decoupling. *The Chinese Economy, 56*(5), pp. 353-365.

Zhao, X., Liu, X., & Yan, S. (2024). Why English? Exploring Chinese early-career returnee academics' motivations for writing and publishing in English. *Humanities and Social Sciences Communication, 11*(1), pp. 1-11.

Zheng, C., & Wang, B. X. (2012). Innovative or immitative? Technology firms in China. *Prometheus, 30*(12), pp. 169-178.

Appendix 1

Table A1. PRISMA diagram

	No. of documents	Filter
Initial Query	11,736,256 documents	Only CN authors (ensure that knowledge is exclusively CN)
	2,060,553 documents	Computer science (Field)
	910,802 documents	Only articles (Type of document)
	714,724 documents	Only English language (Language)
	413,619 documents	2016-2024 (Time)
References analysis for each year separately (2016-2024)		
Year 2016	2000 documents	Sample (Most cited documents)
	67,987 documents found	Total number of references in the sample
	19,722 documents found	U.S. references
We did the same analysis for each subsequent year: 2017; 2018; 2019; 2020; 2021; 2022; 2023; 2024		

Source: author

Table A2. Sensitivity analysis

Sample: 2000 most cited		
Year	U.S. Propensity to cite CN papers	CN Propensity to cite U.S. papers
2024	0.260540818	0.408238868
2023	0.240697057	0.483959311
2022	0.205875466	0.545740466
2021	0.176627894	0.61011183
2020	0.16019224	0.627524833
2019	0.15069874	0.694685444
2018	0.115187693	0.769220246
2017	0.091955392	0.808137496
2016	0.074640024	0.929619271
Sample: Random		
Year	U.S. Propensity to cite CN papers	CN Propensity to cite U.S. papers
2024	0.198431974	0.446593533
2023	0.162802335	0.518576826
2022	0.144713675	0.559264548
2021	0.127174365	0.605690537
2020	0.111179415	0.662195037
2019	0.089549525	0.668041088
2018	0.085789348	0.782932275
2017	0.074776224	0.833606005
2016	0.054692522	0.882621143

Source: author

Appendix 2

This diagram uses (Han, Jiang, & Mei, 2024) methodology to measure academic decoupling and dependence. The vertical axis ($P_{c,u}$) is a proxy of the propensity for Chinese academic papers to cite a U.S. papers relative to citing a Chinese one. The horizontal axis ($P_{u,c}$) is a proxy of the propensity for U.S. academic papers to cite a Chinese papers relative to citing a U.S. one.

Formula 1. Citation propensity

$$P_{c,u} = \frac{n_{c,u}}{n_{c,c}}; \qquad P_{u,c} = \frac{n_{u,c}}{n_{u,u}}$$

Source: Adopted from Han, Jiang, & Mei (2024)

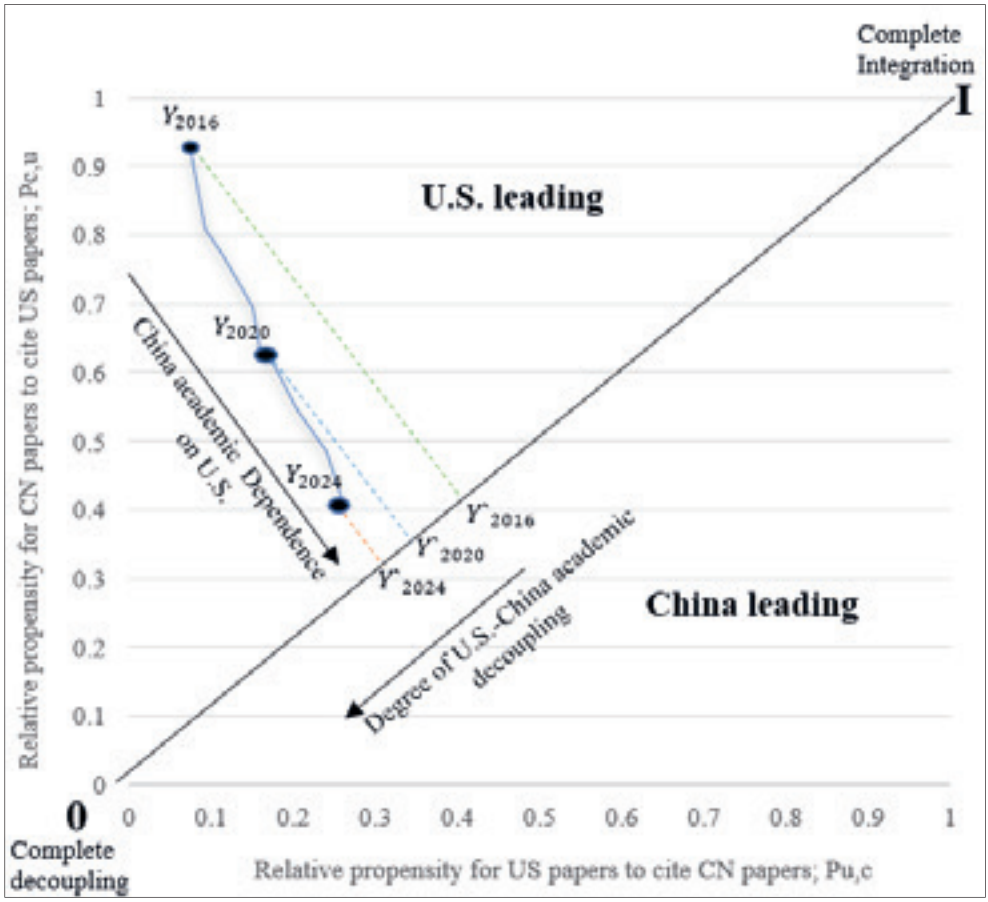

Figure 6. U.S.-China academic decoupling and dependence

Source: Authors' own illustration based on data from Scopus (Elsevier, 2025)

In the expressions above, $n_{c,u}/(n_{c,c})$ denotes the number of citations from Chinese papers to U.S. papers compared to Chinese papers, and $n_{u,c}/(n_{u,u})$ is defined analogously. Reflecting the state of parity, the 45-degree line is defined as the "par line." The triangular area above (below) the 45-degree line is defined as "U.S.-leading" ("China-leading") region. Projecting point $\boldsymbol{Y_{2016}}$ onto the 45-degree line, we decompose the vector $\boldsymbol{Y_{2016}I}$ into two orthogonal vectors $\boldsymbol{Y_{2016}\ Y'_{2016}}$ and vector $\boldsymbol{Y'_{2016}I}$ (i.e., the projection of vector $\boldsymbol{Y'_{2016}I}$ on the par line) captures the degree of U.S.-China academic decoupling. The vector $\boldsymbol{Y_{2016}\ Y'_{2016}}$ (i.e., the rejection of vector $\boldsymbol{Y_{2016}I}$ from the par line) reflects China's academic dependence on the U.S. A more detailed explanation of methodology can be found in research paper of (Han, Jiang, & Mei, 2024).