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Promoting Scientific Cooperation between China and Islamic Countries in the Middle East under the Belt and Road Initiative

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Abstract

Objective: This paper proposes strategies for promoting scientific cooperation between China and Islamic countries in the Middle East under the Belt and Road Initiative (BRI), while also identifying and mitigating potential threats.

Method: The paper adopts a structure-agent theoretical framework and uses documentary and analytical methods.

Results: The paper results that strategies for promoting scientific cooperation can be divided into three levels: micro (individual scientists and institutions), meso (national science and technology agencies and universities), and macro (inter-governmental agreements). These strategies are affected by a number of factors, including the networked nature of international scientific cooperation and the center-periphery structure of the global science system.

Conclusion: The paper concludes that scientific cooperation is a key component of China's macro-diplomacy and that it has the potential to improve relations between China and the countries of the Middle East in other fields. However, the paper also emphasizes that other political, economic, cultural, and social factors can hinder scientific cooperation, and that these factors must be addressed in order to maximize the benefits of this cooperation.

Keywords: International Scientific Cooperation, China, Middle East, Islamic Countries, Belt and Road Initiative.

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Introduction

International scientific cooperation is a hallmark of the scientific community, driven by knowledge synergies, cost-sharing, the resolution of global issues, and the individual, national, and transnational advancement of knowledge (He, 2009). Its roots trace back to the early 17th century, coinciding with the era of "specialism." As science specialized, collaboration among scientists expanded, resulting in increased research productivity, broader research scopes, and the establishment of scientific networks (Finardi, U. and Buratti, A., 2016). Scientific cooperation emerged as a response to this specialization in science. The growth of international scientific cooperation has been propelled by factors such as the international division of labor among researchers, the complex and non-linear nature of technology, the open innovation paradigm, global challenges, and advances in communication and information technology (Gui, Q.C.; Liu, C.L.; Du, D.B. , 2018).

A closer examination of the evolution of international scientific cooperation reveals that initial collaborations primarily occurred among scientists from advanced nations. This reflects the propensity of scientists from developed countries to collaborate with their peers in other developed nations, driven by the concentration of modern science and robust funding systems in these countries. Consequently, global scientific networks predominantly centered around developed nations, notably the United States of America and European Union member states. Nevertheless, this network has rapidly expanded globally, with between 40 and 50 countries emerging as central players in 2011, and currently, almost all 201 countries participate in international scientific cooperation. Despite this expansion, international cooperation maintains a power law hierarchy (Leydesdorff, Loet. Wagner ,Caroline, 2005) . Gui et al.'s research on the structure, dynamics, and determinants of international scientific cooperation during the period 2000-2015 demonstrates that traditional scientific powerhouses like the United States of America, Great Britain, Germany, France, and Canada continue to occupy central positions in the global scientific network. Consequently, international scientific cooperation retains a discernible center-periphery structure (Gui, Q.C.; Liu, C.L.; Du, D.B. , 2018).

China, as the world's largest emerging power, has challenged the hegemony and unilateralist policies of the United States while bolstering its economic and political influence, establishing itself as a prominent actor in global affairs. China has implemented various strategies to play a central role in the global science network, including national-level efforts to promote science and the internationalization of its education and research system. By the end of 2018, the number of international students studying in Chinese universities had doubled since 2009, reaching approximately 500,000 (moe, 2019). China's strategy involves close collaboration with key players in the global science network, cooperative efforts with neighboring countries that share language and culture, and institution-building initiatives within Belt and Road countries, constituting the third pillar of this strategy. The interactions with Middle East nations fall within the framework of this third axis (Gui, Q.C.; Liu, C.L.; Du, D.B. , 2018).

Since 2014, with the launch of the Belt and Road Initiative aimed at promoting economic and infrastructure cooperation in Asia and Eastern Europe, China has committed to intensify science and technology cooperation with countries encompassed by the initiative. Simultaneously, over 65 countries in West Asia, Southeast Asia, South and Central Asia, the former Soviet Union, and Eastern and Central Europe have joined this initiative. A pivotal moment in this process was the Beijing summit in 2017, where Chinese President Xi Jinping pledged a 100 billion Yuan ($14.5 billion) investment in the Silk Road Fund, established by China in 2014. Concurrently, President Chunlibai of the Chinese Academy of Sciences (CAS) unveiled plans for a science and technology cooperation network to be completed by 2030 (Gui, Q.C.; Liu, C.L.; Du, D.B. , 2018).

China's extensive and intricate efforts to expand its presence and influence in one of the world's most significant geo-economic and geo-strategic regions, the Middle East, are exemplified by comprehensive strategic partnership agreements with Middle East countries. This endeavor has been met with mutual enthusiasm from Middle Eastern governments as they shift their international policy toward the East. This shift has culminated in expanded economic, political, cultural, environmental, scientific, and technological collaborations and the conclusion of extensive, long-term contracts with China. Thus, this introduction sets the stage for the central inquiry: How can the Belt and Road Initiative enhance scientific cooperation among member Islamic countries in the Middle East region with China? What are the merits and drawbacks of this scientific cooperation? Furthermore, what challenges and opportunities does it present, and how can it elevate the region's scientific prowess?

Literature review

Within the realm of studies pertaining to international scientific cooperation, cooperation has emerged as a defining criterion for scientific relationships. These studies highlight that international scientific cooperation enhances researchers' capacity and potential to address intricate problems through collaboration with experts possessing diverse experiences and skills (Singh, M., & Hasan, N., (2015, January)). In investigations concerning the growth drivers of international scientific cooperation, Waltman et al. underscore the significance of great science in fostering international collaboration. Notably, the construction of large accelerators has played a pivotal role in advancing scientific research in Europe. Additional influential factors include the utilization of expensive equipment (such as the Large Hadron Collider), the universal adoption of English as the language of science, and multidisciplinary research approaches. Moreover, the expansion of scientific collaboration has coincided with the proliferation of scientific journals and co-authorship, aligning with the professionalization of science and the adoption of sophisticated scientific tools (Waltman, L., Tijssen, R., and Eck, N., 2011). Another catalyst for collaboration is the growth of scientific communities in different nations, which bolsters research quality and its impact and visibility (Presser, 1980) (Glänzel, W. and Schubert, A., 2001), (Waltman, L., Tijssen, R., and Eck, N., 2011).

Promotion of international scientific cooperation is underpinned by two primary drivers: a focus on scientific mobility and participation in international research networks. Emerging economies have strategically leveraged these factors to attain advantageous positions within the global scientific landscape. It is crucial to note that scientific mobility exhibits two distinct forms. The inherent tendency of scientific resources, akin to other limited resources, is to gravitate toward centers of excellence. However, advancements in communication technology and the presence of research infrastructure allow a core group of interconnected researchers to elevate a moderately endowed country to prominence at the global level (Mindeli, L.E., Markusova, V.A., 2015). Fahnrich, in his exploration of scientific diplomacy (Fähnrich, 2017), delves into the concept within the realm of political science research, with a particular focus on research and development (R&D) policy analysis and international relations. Literature review findings suggest that variations in national knowledge capacities and political cultures give rise to diverse strategies and objectives in scientific diplomacy. Nevertheless, the overarching goal remains the safeguarding of a nation's national interests.

Furthermore, another study posits that "from a policy perspective, national (regional) investments in research and development must be justified on the basis of identifiable national interests." In this context, collaboration with universities is just one strategy to further political objectives "within the broader framework of public diplomacy." Scientific diplomacy essentially embodies the expression of soft power. The utilization of diplomatic tools to advance goals in scientific policy aligns with the realities of the knowledge society, where university administration assumes a prominent role in politics. Thus, diplomatic actions in the realm of science are a product of political interests (Leach, 2015).

Viewed through the lens of the article "Globalization of Science and International Scientific Cooperation: A Network Approach" (Gui, Q.C.; Liu, C.L.; Du, D.B. , 2018), numerous factors underpin international scientific cooperation. These include the international division of labor among researchers, the intricate and non-linear nature of technology, the open innovation paradigm, global challenges, and advancements in information and communication technology.

Many studies in the field of international scientific cooperation have predominantly focused on the expansion of international scientific collaboration, network analysis and visualization, and network structure examination. Social network and complex network analyses are utilized to scrutinize and elucidate the structure of international collaboration. Drawing on co-authorship data spanning six domains, Wagner and Leydesdorff (Wagner, C. S., Whetsell, T. A., & Leydesdorff, L., 2017) demonstrate that international cooperation functions as a self-organized network governed by a power law. Gui and Liu (Gui, Q.C.; Liu, C.L.; Du, D.B. , 2018) investigate the structure, dynamics, and determinants of international scientific cooperation from 2000 to 2015, revealing the continued centrality of traditional scientific hubs, including the United States of America, Great Britain, Germany, France, and Canada. These findings highlight a central core group dominating international scientific cooperation, underscoring the presence of a clear center-periphery structure.

Certain articles have emphasized the influence of network structure on the performance of individual actors within the network. According to social network theory, an actor's output is partly contingent on its position in the network structure (Guan, J., Zuo, K., Chen, K., & Yam, R. C, 2016). In their article "Microcosm Impact on Innovation" (Guan, J., & He, Y., 2007)Guan and Yen employ USPTO patent collaboration data to reveal that microcosm characteristics exhibit an inverted U-shaped relationship with innovation output, a finding that has implications at the national level. Other studies have delved into the determinants of international scientific cooperation. Montobbio and Sterzi, in their article "Technology Internationalization in Emerging Markets" (Montobbio, F., & Sterzi, V., 2013), employ the gravity model to demonstrate that international technology collaboration correlates positively with technological proximity and a common language but negatively with the strength of intellectual property rights.

China's international scientific cooperation has been the focus of numerous articles, examining it from two primary perspectives: its role and position in China's international policies and the nation's economic development programs (Zhang, Duanhong, Wenjia Ding, Yang Wang, and Siwen Liu., 2022) (Fravel, December 2010). Additionally, quantitative investigations into China's scientific cooperation, with an emphasis on joint articles, student exchanges, and participation in bilateral or multilateral international scientific research, have been conducted (Fu, X., Fu, X. M., Ghauri, P., & Hou, J., 2022); (Vieira, E. S., Cerdeira, J., & Teixeira, A. A., 2022), (Arunachalam, S., & Gunasekaran, S., 2002). These studies consistently highlight the continuous growth of China's international scientific cooperation indicators. Of particular note are increases in international students, joint international articles, and participation in international collaborative research endeavors. However, research examining China's scientific cooperation with Middle East countries has primarily explored it within the context of these countries' macroeconomic and trade relations. Consequently, this article's investigation into China's scientific cooperation with Middle East nations, framed by China's policies and macro strategies, and its endeavor to identify avenues for capitalizing on the opportunities presented by this cooperation while mitigating its potential challenges, constitutes a central innovation in this research.

Theoretical Framework and Research Methodology

The increasing prominence of science and technology as primary drivers of national development, coupled with nations' efforts to chart a knowledge-based path to development, has resulted in a heightened focus on science across all facets of government policies. This global emphasis has given rise to systematic and intricate endeavors by countries to enter the global scientific network and actively participate within it. In the contemporary interconnected world, international scientific cooperation serves as a crucial mechanism for harnessing global scientific advancements while leveraging and strengthening national capacities. This cooperation operates at three key levels: the micro level involving individuals, the medium level involving organizations, and the macro level involving governments.

The international scientific cooperation network has experienced rapid expansion, particularly after 2000. With the network's growth, influence and power have disseminated widely among countries at a global scale (Leydesdorff, Loet. Wagner ,Caroline, 2005). In essence, this expansion has led to a distribution of influence and power among countries, with the central group within the network becoming more exclusive. Using an analogy, Leydesdorff and Wagner liken this evolution in international scientific networks to a mountain that expands at its base while simultaneously elevating its summit to a higher and steeper position. Consequently, despite the emergence of new key nodes in the network, the gap between core countries and others has widened, perpetuating a core-periphery system within the global science network. This gap is observable across all three levels: micro, medium, and macro, within the governing network.

Moreover, the networking of the global science system has given rise to network effects in international cooperation patterns in science. Within the framework of network logic, international science shares characteristics with other complex adaptive systems where order emerges from interactions among numerous agents pursuing their own strategies. According to Leydesdorff and Wagner's research, during the period from 2000 to 2005, the global scientific cooperation network has solidified the formation of a core and principal group. Supported by a robust national scientific system, this core group efficiently harnesses the knowledge within the global network. Other countries orbit around this central core (Leydesdorff, Loet. Wagner ,Caroline, 2005). Consequently, one common model for elucidating international scientific cooperation is the application of the core-periphery theory, initially introduced by Emmanuel Wallerstein to explain the world system.

The central tenet of this theory rests on the division of labor shaped by countries' developmental levels. Core countries, endowed with greater access to resources of power and wealth, dictate trends and emerge as the primary beneficiaries in interactions with other countries. Peripheral countries, occupying a lower developmental tier, are subjugated in this unequal relationship. An intermediate category, known as the semi-periphery, consists of countries that are more developed than their surrounding counterparts but remain distant from the central countries. These semi-peripheral nations are subjected to colonization by the core through an inequitable relationship while simultaneously exerting a similar inequitable influence over the periphery.

The amalgamation of these three approaches furnishes a theoretical framework rooted in network logic as the prevailing mechanism in international scientific cooperation formation. It also addresses the unequal structure of scientific cooperation, contingent upon countries' developmental levels and power, by analyzing the structure and agents involved in countries' scientific cooperation efforts across three levels: macro (policymakers), medium (educational and research institutions), and micro (scientists and researchers). In this framework, cooperation across all three levels is underpinned by an incentive-reward axis (Gui, Q.C.; Liu, C.L.; Du, D.B. , 2018). This implies that actors at all levels collaborate with the primary motivation of attaining rewards and benefits, making this goal the central driver for cooperation with other actors.

Within this theoretical framework, the structure of international scientific cooperation is elucidated through document analysis. Official documents and records pertaining to the international scientific cooperation efforts of the target countries serve as the basis for extracting this structure. Furthermore, this framework identifies influencing factors on these collaborations and proposes strategies for their enhancement.

Since the beginning of the reforms in the field of higher education, China's policies have focused on strategies to stabilize and integrate the country's higher education system at the global level. Promotion of international scientific cooperation with developed countries, exchange of professors and students, participation in international projects with the priority of developed countries with the aim of entering the global network of science has been done. In the second step, creating a network of developing countries centered on China has been the focus of China's international scientific policies. With the definition of the Belt and Road Grand Plan in the last decade and China's efforts to play a central role in global relations, the creation of a scientific network centered on China has been part of the country's policies under the Belt and Road Initiative. Programs such as awarding scholarships, defining joint projects centered on China, and attracting researchers and professors under institutions related to the Belt and Road programs have been carried out. (Gui, Q.C.; Liu, C.L.; Du, D.B. , 2018).

China's International Scientific Collaboration

The leadership of Mao during a tumultuous period marked by conflict with Japan, internal strife between national and communist forces, and geopolitical tensions with the Soviet Union and the United States posed formidable challenges for China. Furthermore, Mao's policies, such as the Great Leap Forward, which resulted in widespread famine and loss of millions of lives, and the Cultural Revolution, which saw the purging of progressive elements, further complicated the governance of the world's most populous nation. The transformation in China's trajectory began with the ascent of Deng Xiaoping, who initiated reforms spanning political, economic, cultural, social, scientific, technological, and foreign policy domains, ultimately reshaping China from a destitute nation into a global governance contender (Plume, 2011). The focus here lies in the realm of science.

An exploration of China's historical reform process reveals that restructuring in education and science commenced under Deng Xiaoping's direct guidance even before other sectors. In continuation of these reforms, starting in the mid-1990s, the Chinese government embarked on a series of measures aimed at facilitating and expediting the development of science and technology. This strategic shift, encapsulated in the "rejuvenating the country with science, technology, and education" strategy, played a pivotal role in propelling China's ascent in the domains of science and technology. This ascent can be attributed to several factors, including a stable political environment, coherent science and technology policies, increased investments in research and development, reforms in the science and technology system, and the ethos of open innovation (Cao, C.; Suttmeier, R.P., 2017)

Crucially, the promotion of international scientific cooperation stands as a vital pillar within China's science and technology policy framework. The simultaneous expansion of scientific collaboration with both developed and developing nations illustrates China's approach to scientific diplomacy. It underscores China's perspective on science as both a developmental goal and a tool for advancing global policies as an emerging power (Gui, Q.C.; Liu, C.L.; Du, D.B. , 2018).

According to the Ministry of Science and Technology of China, by 2023, China had inked 115 intergovernmental agreements pertaining to science and technology cooperation, establishing relations with 161 countries and regions. Notably, China's initial agreements were primarily with communist countries during the 1950s and 1960s. However, since the late 1970s, China's approach shifted, with an inclination toward expanding scientific and technological cooperation with developed Western nations. Moreover, China has forged scientific cooperation agreements with developing countries, particularly as part of the Belt and Road Initiative, encompassing political, economic, and cultural fields (Wagner, C. S., & Simon, D. F. , 2023).

China's international strategy for harnessing the benefits of international scientific cooperation is intrinsically tied to its broader international policy objectives. During an era dominated by Maoist ideologies and idealism in foreign policy during the 1950s and 1960s, communist nations were the focal point of China's scientific collaboration. However, with extensive reforms and a modernization drive encompassing science, defense, industry, and technology, China's approach gravitated toward scientific cooperation with Western nations (Simon, 2021). At this juncture, China, as a developing nation, recognized the necessity of cultivating partnerships with scientifically advanced countries to access foreign knowledge, technology, capital, and equipment. Consequently, the G7 countries, being the most developed industrialized nations, became China's primary focus for scientific cooperation (Wang, X., Xu, S., Wang, Z., Peng, L., & Wang, C. , 2013).

Since the 1970s, China's scientific landscape has undergone rapid transformation, spurred by reforms and economic liberalization. China's international scientific publications have consistently surged both quantitatively and proportionally on a global scale. Prior to this transformation, Chinese scientists refrained from publishing their research abroad due to political constraints, resulting in limited interaction between Chinese and foreign scientists. The Chinese scientific system and the international scientific community scarcely converged. However, in 1978, coinciding with comprehensive economic, educational, and scientific policy reforms under the banner of economic reform and opening up, the Chinese government began an annual increase in its budget allocation for scientific research. The establishment of the National Natural Science Foundation of China (NSFC) aimed to provide funding for basic scientific research conducted by Chinese scientists. NSFC has actively pursued cooperation across all levels and fields, signing 66 cooperation agreements with scientific foundations and research institutions from 36 countries, primarily developed nations (Marginson, 2018).

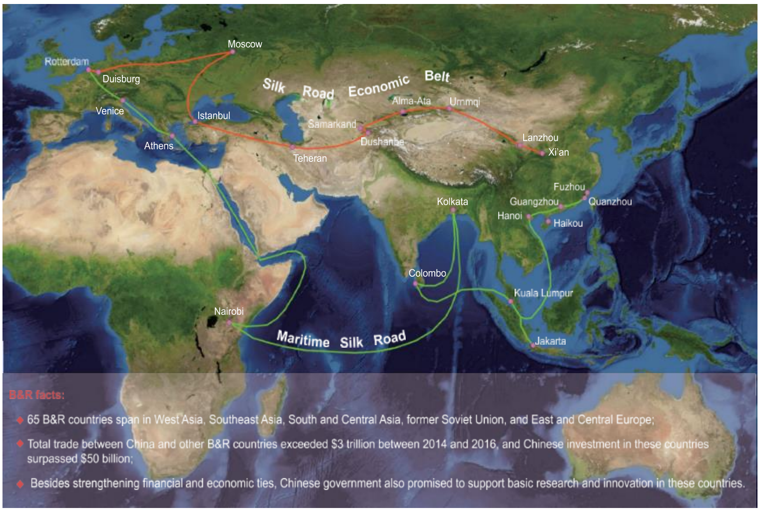
Since then, China's utilization of science and technology has been integrated into the country's scientific diplomacy, advancing its presence in the global knowledge network and bolstering public diplomacy. This multifaceted approach encompasses various initiatives, including the deployment of scientific attachés in 144 embassies worldwide, the conclusion of over 114 intergovernmental agreements for scientific and technological cooperation, collaborations with more than 166 countries and regions, and active participation in international scientific institutions (moe, 2019).

The Belt and Road Initiative (BRI)

In 2013, Chinese President Xi Jinping introduced the concept of the "Silk Road Economic Belt" and the "21st Century Maritime Silk Road," collectively known as the Belt and Road Initiative (BRI). This initiative has since become a cornerstone of China's global policy. It revolves around fostering infrastructure investments and trade across three continents with a primary focus on connectivity. The overarching objective is to link these continents through enhanced energy, transportation, infrastructure development, trade, investment, education, tourism, and cultural exchanges (Githaiga, Nancy Muthoni& Alfred Burimaso, Bing Wang , and Salum Mohammed Ahmed, 2019).

As of March 2018, China's cooperation with the 65 member countries involved in the BRI encompassed 62% of the global population, 30% of the world's GDP, and 75% of global energy exchanges (WorldBank, 2018). Funding for BRI projects has been sourced through various channels. China's Silk Road Development Fund has been the largest financier, contributing over $40 billion. Following closely are the Asian Infrastructure Bank and the BRICS New Development Bank, each with a funding commitment of $100 billion. The China Investment Cooperative Sovereign Wealth Fund ranks third with a budget ranging from $50 to $100 million.

Figure 1: Sea and land route of the new Yahm Road



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Ben Simpendorfer's book, "The New Silk Road: How an Emerging Arab World Turns Away from the West and Rediscovers China," underscores the historical, geographical, and religious ties that underpin the economies along the Silk Road. According to Simpendorfer, the Silk Road represents more than a trade route; it signifies a complex web of interconnected economies. The rise of China, soaring oil prices, and the post-9/11 landscape have rekindled the significance of the Silk Road. Four years after its initial announcement, China sought to transform the ancient overland route into the world's most ambitious engineering endeavor. This initiative aimed to embrace landlocked Central Asian countries, forge land connections with West Asia, Europe, and African partners, and establish an alternative to maritime routes, thus reducing dependence on maritime powers, particularly the US Navy, which controls vital points along the sea routes linking Asia with Southeast Asia, South Asia, Africa, and Europe (Osiewicz, 2018).

BRI represents an open platform with its core objective being the establishment of "economic cooperation zones" and the reinforcement of economic and trade collaboration. Over time, the concept of BRI has continually evolved. To date, 136 countries and 30 international organizations have signed Memorandums of Understanding (MOUs) with China (July 2019). In 2017, China launched the Belt and Road Initiative for Science and Technology Innovation, emphasizing the enhancement of international science and technology (S&T) cooperation. In 2018, the Alliance of International Scientific Organizations in the Belt and Road Zone (ANSO) was founded in Beijing, serving as a dedicated platform to kickstart S&T cooperation among regional countries and promote sustainable development. In 2019, the Second Belt and Road Forum for International Cooperation introduced a thematic forum on innovation, marking a new path for science and technology innovation cooperation. Science has consequently become a central focus within the BRI, leading to an increasing number of nations seeking collaboration with China in the realm of science, effectively reshaping the global science landscape (Rezaei, Shahamak, Mouritzen, Mikkel, 2021).

Although BRI is primarily centered on trade and economic cooperation, it has incorporated cultural and scientific exchanges as vital components. These exchanges serve as the foundation for enhancing transnational collaboration across all dimensions (Rezaei, Shahamak, Mouritzen, Mikkel, 2021). Educational opportunities in China have emerged as a key avenue for scientific exchange under the BRI framework. According to China's Ministry of Education (MOE), by 2018, nearly 500,000 international students from 196 countries and regions had chosen China as their study destination, ranking China as the third most popular destination for international students, trailing only behind the United States and the United Kingdom. It is noteworthy that 77% of these international students originate from Asia and Africa. In contrast, the number of students from North America has seen a decline since 2014, marking the sole region with a decreasing trend (moe, 2019).

Beyond quantitative growth, China has witnessed structural shifts in international student education as of 2018. Notably, there has been a substantial increase, particularly among African nations (183% compared to 2013), in the number of postgraduate students, which is considered a critical indicator of the quality of higher education. Additionally, scholarship recipients from Asian countries pursuing postgraduate studies in China have experienced rapid growth (111% compared to 2013). Engineering has emerged as the most favored field among scholarship recipients, registering a growth of over 100% compared to 2013. Conversely, more than 50% of students from Western countries like the United States, England, Germany, and France have opted to study in China to gain proficiency in the Chinese language and culture (Chen, J., & Zhou, G., 2019). These divergent trends underscore the varying factors that make China an attractive destination for international students across different regions (Marginson, 2018).

Since 2016, China's Ministry of Education has introduced the Silk Road Scholarship as part of the nation's primary scholarship program. This initiative offers 10,000 government scholarships annually to students from BRI countries (moe, 2019), aiming to attract more students from these countries to pursue their education in China.

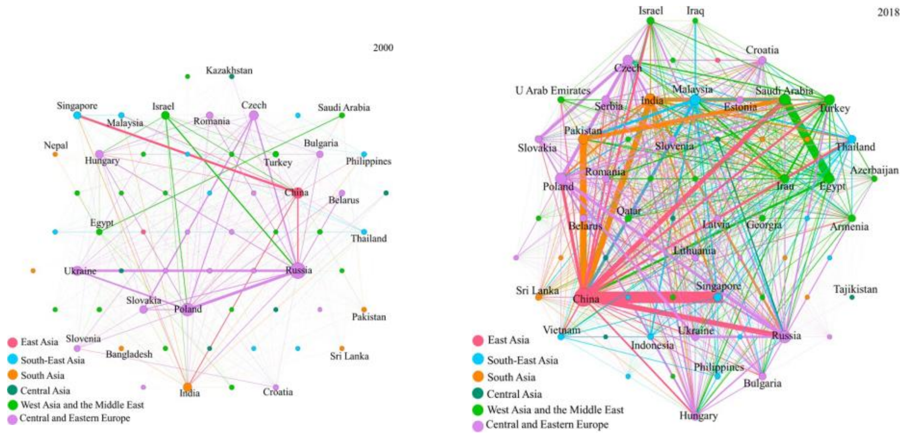

Figure 2. Topological structure of scientific collaboration network along the B&R (2000 and 2018) (Gui, Q.C.; Liu, C.L.; Du, D.B. , 2018)

At the national level, several Chinese provincial governments have implemented policies to support international students from specific regions. For example, Yunnan Province in southern China focuses on attracting students from Southeast and South Asian countries, while Guangxi focuses on students from ASEAN countries. Inner Mongolia, in northern China, offers scholarships to international students from Mongolia. By 2018, a total of 30 provincial governments had launched scholarship programs for international students (Wen, W., Wang, L., & Cui, Y. , 2022). Supporting collaborative research within the framework of the Cooperation Organization of Scientific Institutions of Member States of the Initiative (ANSO), centered in China, is another policy aimed at strengthening scientific cooperation with target countries.

In conclusion, China's macro policy on international scientific cooperation aligns with the country's broader goals of establishing itself as an influential global power. China prioritizes scientific cooperation with developed nations like the United States and European Union members, particularly Germany and France. These partnerships focus on acquiring knowledge and technology, participating in global macro projects, and enhancing the country's scientific institutions through collaboration with scientifically advanced nations. Cooperation with developing countries primarily revolves around China's efforts to advance the grand strategy of the Belt and Road Initiative, centralizing China's role. Foundational elements of this strategy include institutional development within the initiative, such as establishing ANSO, alongside bilateral agreements with target countries. Attracting skilled human resources in the field of science through foreign student recruitment and engagement of researchers and scientists in China-led scientific projects also forms part of this strategy. Furthermore, China aspires to become the epicenter of scientific cooperation in the global science network, a vital goal in these initiatives. The examination of China's scientific relations with Middle Eastern countries should be considered within this overarching context (Marginson, 2018).

China and Middle East Countries

China's engagement with Middle Eastern countries, including Iran, holds significant strategic importance within its broader initiatives. The Middle East has taken on heightened relevance for China, driven by its abundant energy resources, substantial consumer market, skilled workforce, and its alignment with the Belt and Road Initiative's route, connecting it to Europe. It is crucial to note that as China becomes more entangled in Middle Eastern disputes and conflicts, it faces an increased risk to its influence in the region (Scobell, Summer 2018). China's approach to exerting influence in the Middle East revolves around establishing comprehensive strategic relations with regional nations and fostering multifaceted ties in various domains. According to Eran, the Belt and Road Initiative (BRI) could serve as a central catalyst for both the development and sustenance of stability in the Middle East (O., 15 May 2017). China's mediation efforts in the diplomatic relations between Iran and Saudi Arabia, leading to their recent rapprochement, can be seen as part of this overarching strategy.

China's endeavors to expand its footprint in the Middle East, akin to its initiatives in other Belt and Road regions, are integral to its grand strategy of assuming a global superpower role. This global influence, particularly in the realm of soft power, is closely linked with endeavors to internationalize Chinese scientific institutions. In the initial phase of this strategy, Chinese scientific centers were encouraged to cultivate scientific partnerships with counterparts in technologically advanced countries. In the subsequent stage, China's science policymakers have set their sights on the export of scientific knowledge, encompassing interactions with scientific institutions in developing and less developed nations, including those in the Middle East (Rui, 2014). A pivotal instrument in exercising China's soft power is the establishment of Confucius Institutes across countries in the region. These institutes, established through collaboration among the Confucius Institute in China, Chinese universities, and the host universities' embassies, primarily focus on teaching Chinese language and culture. In essence, they function as language study centers affiliated with universities. This initiative represents one of China's most meticulously planned soft power strategies. The fusion of higher education with the allure of Confucianism furnishes Beijing with a distinct comparative advantage in the realm of soft power. It offers a platform for collaboration and exchange between Chinese and foreign universities and, as part of China's global messaging, underscores its government's nuanced grasp of history and its capacity for long-term planning (Kurlantzick, 2006).

Conversely, the Middle Eastern nations' efforts to amplify their roles and enhance their positions within the global scientific landscape have transformed them into regional hubs within the global science network. In this context, these nations' scientific cooperation with China can potentially elevate the global standing of individual researchers and scientists (at the micro level), scientific institutions (at the middle level), and the country as a whole within the global science network. Leveraging scientific opportunities within institutions aligned with the Belt and Road Initiative, particularly when Middle Eastern countries possess significant scientific capabilities and resources to contribute to the network, can ensure that their engagement with China as a global power does not relegate them to peripheral roles. Achieving this necessitates scientific collaboration at various levels, from micro to middle, and from the grassroots to the summit of the power hierarchy. Analyzing the performance of ANSO member countries reveals that existing cooperations primarily adopt a top-down, intergovernmental model, with governments at the center. This model may pose a hindrance to the development of international scientific cooperation among member nations, given that scientists play a primary role in scientific collaboration, while governments typically provide support and serve as a foundation (Simon, 2021).

A notable instance of China's scientific collaboration with Middle Eastern Muslim nations is exemplified by its partnership with Saudi Arabia. In 2020, the two countries marked the 33rd anniversary of their diplomatic relations, during which their relationship has evolved from a peripheral association into a comprehensive strategic partnership. This upgraded status was officially declared during President Xi Jinping's visit to Saudi Arabia in 2016. During this visit, a comprehensive strategic partnership was announced, and a High-Level Joint Committee (HJLC) was established to oversee this multifaceted partnership.

China-Saudi Arabia Comprehensive Strategic Cooperation

As China's role in the Middle East continues to expand, its collaboration with Saudi Arabia, a regional powerhouse and a key knowledge producer in the Middle East, assumes increasing significance. This scientific cooperation encompasses various facets, including student exchanges, participation in Saudi Arabia's scientific and technological projects as outlined in the country's development agenda, and the signing of cooperative agreements pertaining to artificial intelligence development. Moreover, extending beyond bilateral diplomatic channels, this relationship is situated within a broader regional framework. This model, first introduced during the 2014 China-Arab Cooperation Forum, outlines the key areas of cooperation that Beijing prioritizes in its interactions with Arab nations. These include energy, trade and investment, infrastructure development, nuclear energy, space satellite technology, and renewable energy. President Xi Jinping presented this model during his inaugural address at the 2014 China-Arab Cooperation Forum as a means of integrating Arab countries into the Belt and Road Initiative (BRI). According to this framework, each number corresponds to a distinct area of cooperation: 1 for energy, 2 for infrastructure, trade, and investment, and 3 for nuclear energy, space satellite technology, and renewable energy. This model was reaffirmed in the policy document jointly released by Arab countries and China in 2016, coinciding with President Xi's visit to Saudi Arabia (Fulton, 2020).

In light of these developments, scientific cooperation between China and Saudi Arabia is thriving along these two parallel and mutually reinforcing tracks, while also being influenced by and exerting influence on their broader collaborative endeavors.

Iran-China Relations in the Belt and Road Initiative: A Growing Partnership

Since the official recognition of the People's Republic of China by Iran in 1967, their diplomatic relations have steadily grown. This growth culminated in the establishment of formal diplomatic ties in 1971. Notably, during the Iran-Iraq war that began in 1980, China maintained a stance of neutrality (Dara Conduit & Shahram Akbarzadeh, 2019). However, a significant turning point came in January 2016 during President Xi Jinping's visit to Tehran when he emphasized the natural partnership between China and Iran in implementing the Belt and Road Initiative (BRI). President Xi urged both nations to enhance cooperation in infrastructure, interconnectivity, power generation, and energy projects under the framework of the BRI, leading to the signing of 17 contracts between Xi Jinping and President Rouhani immediately afterward (Garver, 2016).

On the sidelines of the Belt and Road Initiative Member States Assembly, China's Minister of Finance, Xiao Jie, underscored Iran's vital role in the initiative and declared, "Iran can not only participate in the plan's implementation within its borders but also serve as a driving force behind the Silk Road vision in other countries". A significant milestone in BRI's context occurred in February 2016 with the arrival of the first direct train from China to Iran. This freight train completed the entire journey from Zhejiang to Tehran in approximately 14 days, significantly faster than the sea route taking 30 days. However, the United States' withdrawal from the JCPOA agreement and the subsequent reimposition of unilateral sanctions dealt a blow to China's bilateral cooperation with Iran, affecting Iran's regional role (Shariatinia, M., & Azizi, H., 2019).

In recent years, the pivotal moment in China-Iran cooperation in the science and technology sector was marked by the signing of a Memorandum of Understanding (MoU) in 2016. Attended by the two countries' presidents, this MoU aimed at enhancing scientific and technological collaboration in various fields, including agriculture, energy, environmental protection, and biotechnology. The MoU was signed between Iran's Vice President of Science and Technology and China's Ministry of Science and Technology, as well as the Ministry of Foreign Affairs of China. Simultaneously, another memorandum of cooperation was signed regarding the establishment of the Silk Road Scientific Fund between Iran's Vice President for Science and Technology and the President of the Chinese Academy of Sciences. This memorandum primarily focuses on fostering technological cooperation among relevant institutions (Iran's presidential information website, 2016).

However, the most significant turning point in their relationship was the signing of a comprehensive strategic partnership agreement. This agreement serves as the foundation for expanding cooperation across economic, political, cultural, and other domains. The signing of this 25-year comprehensive cooperation agreement, Iran's accession to the Shanghai Cooperation Organization, and Iran's role in the development of the China Road Belt initiative all indicate a solid foundation for the expansion of bilateral relations and the prospects for further development. Scientific cooperation elements are embedded throughout the agreement, covering areas such as cooperation between scientific institutions of both countries, mutual scholarship programs, faculty and student exchanges, and support for Persian and Chinese language instruction chairs. This long-term agreement framework can help systematize and coordinate the various scientific collaborations that have primarily occurred at the micro and medium levels through academic agreements. Furthermore, membership in Belt Initiative-related organizations provides Iranian entities the opportunity to participate in the global science network (Iran's presidential information website, 2016).

Conclusion and Policy Solutions

The Belt and Road Initiative (BRI) is a long-term endeavor, and assessing its impact on scientific cooperation between China and the Middle East requires a long-term perspective. Nevertheless, the increased level and scale of scientific collaboration among the countries along the BRI path in the Middle East, along with substantial science-related agreements, underscore that BRI has laid the foundation for expanded scientific cooperation.

Several avenues through which the Belt and Road Initiative can strengthen scientific cooperation among its Islamic member countries are evident:

- Financial and Technical Support for Research and Development: Initiatives like the Belt and Road Science and Technology Innovation Action Plan and the Belt and Road Joint Research Centers offer financial support for research projects, scientist training opportunities, and the establishment of collaborative research hubs.
- Creating New Channels for Collaboration: BRI's extensive network facilitates connections between scientists from diverse nations and cultures, fostering idea sharing and best practice dissemination. These interactions can lead to novel and impactful research endeavors.
- Technology Transfer: Collaboration within BRI can pave the way for technology transfer from China to participating countries, bolstering scientific advancement. This can also stimulate job creation and economic growth in member states.
- Addressing Global Challenges: BRI's emphasis on addressing shared global issues such as climate change, poverty, and pandemics through scientific cooperation provides innovative solutions to these challenges.
- Enhancing Research Environment: BRI can contribute to improving infrastructure, including transportation and communication networks, facilitating smoother scientific collaboration and data exchange.

However, amid these opportunities, certain challenges need consideration:

- Security Concerns: Heightened Chinese influence, particularly in communication infrastructure, information technology, mining, and strategic resources within member countries, raises security concerns.
- Unequal Benefit Sharing: Disparities in development levels and the financing of joint scientific activities related to China may result in an imbalanced scientific network, with countries in the region relegated to peripheral roles.

To capitalize on the potential of BRI and overcome challenges, Middle Eastern nations can leverage their scientific capabilities, collaborate with neighboring countries, and foster stronger ties among scientific institutions. This approach can empower regional countries to actively participate in the global scientific network while reaping its benefits.

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