OBSERVARE
Universidade Autónoma de Lisboa
e-ISSN: 1647-7251
VOL. 16, Nº. 2, TD2
Thematic Dossier
Portugal and China in International Relations:
Historical Legacies and Contemporary Dynamics
February 2026

JANUS.NET
e-journal of International Relations

KNOWLEDGE, POWER AND THE MODERN INTERNATIONAL: INSIGHTS FROM PORTUGAL–CHINA SCIENCE AND TECHNOLOGY COOPERATION

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Abstract

This study provides a critical appraisal of the evolving relationship between Portugal and China in the domain of science and technology (S&T). It challenges functionalist and technocratic approaches to international S&T cooperation by advancing an extended analytical framework inspired by Shilliam's conceptualisation of the "modern international". The article argues that S&T cooperation is shaped not only by institutional arrangements and policy instruments, but also by historically constituted hierarchies, colonial and semi-colonial legacies, and asymmetries in power, resources, and epistemic authority. The study concludes that the "modern international" provides a fruitful framework to capture the historical depth and political complexity of contemporary S&T cooperation between a global innovation powerhouse and a semi-peripheral European country.

Keywords

Portugal, China, International S&T cooperation, Cooperation for Science, Knowledge power asymmetries, Historical global hierarchies.

Resumo

Este estudo oferece uma avaliação crítica da evolução da relação entre Portugal e a China no domínio da ciência e tecnologia (C&T). O artigo desafia abordagens funcionalistas e tecnocráticas à cooperação internacional em C&T, avançando um quadro analítico ampliado inspirado na conceptualização de Shilliam sobre o "internacional moderno". Argumenta se que a cooperação em C&T é moldada não apenas por arranjos institucionais e instrumentos de política pública, mas também por hierarquias historicamente constituídas, legados coloniais e semi coloniais, e assimetrias de poder, recursos e autoridade epistémica. O estudo conclui que a noção de "internacional moderno" constitui um enquadramento fecundo para captar a profundidade histórica e a complexidade política da cooperação contemporânea em C&T entre uma potência global de inovação e um país europeu semi periférico.

Palavras-chave

Estratégia de hedging, Portugal, China, Estados Unidos.

How to cite this article

Rodrigues, Carlos (2026). Knowledge, Power and the Modern International: Insights from Portugal–China Science and Technology Cooperation. *Janus.net, e-journal of international relations*. Thematic Dossier - Portugal and China in International Relations: Historical Legacies and Contemporary Dynamics, VOL. 16, Nº. 2, TD2, February 2026, pp. 80-98. https://doi.org/10.26619/1647-7251.DT0126.4

Article submitted on 3rd November 2025 and accepted for publication on 28th January 2026

JANUS.NET, e-journal of International Relations
e-ISSN: 1647-7251
VOL. 16, Nº. 2, TD2
Thematic Dossier - *Portugal and China in International Relations: Historical Legacies and Contemporary Dynamics*
February 2026, pp. 80-98
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KNOWLEDGE, POWER AND THE MODERN INTERNATIONAL: INSIGHTS FROM PORTUGAL–CHINA SCIENCE AND TECHNOLOGY COOPERATION[1]

CARLOS RODRIGUES

Introduction

This research offers a critical appraisal of the evolving relationship between Portugal and China in the realm of science and technology (S&T). It focuses on the cooperative interactions between a small, underfunded S&T system, marked by several structural limitations, and a global innovation powerhouse supported by a large, well-funded and carefully planned systemic context (Pisani et al., 2025; Sun and Cao, 2024). Differences in size and power invite a challenge to the adequacy of a purely functional and technocratic analysis of S&T cooperation between the two countries, which, in the end, would provide a neutral portrait of a tendentially balanced cooperative dynamics. By contrast, this paper seeks to move beyond functional and technocratic perspectives in order to examine how systemic asymmetries shape cooperation. In addition, it endeavors to shed light over the underlying political dimensions, which unfold across the hierarchical structures of globalized knowledge production.

This analytical context, in turn, raises theoretical challenges that mainstream approaches to international relations may be unable to resolve. In broad terms, realist, liberal and constructivist models, as articulated by authors such as Waltz (1979), Keohane (1984), and Wendt (1992; 1995), do offer powerful insights into state behavior, yet limited in their capacity to disentangle the complex and diverse dynamics of international S&T cooperation. Is cooperation primarily a matter of power and competition, or part of a broader effort to empower states pursuing national interests in a troubled world? The realist perspective risks overlooking the persistence of cooperation despite rivalries, geopolitical tensions or power asymmetries. Even amid intense geopolitical confrontation, as in the case of the Cold War, Soviet and American scientists and research centers cooperated in order to advance knowledge in specific fields, particularly space-related research (Krige, 2019). Furthermore, the view, as in Waltz (1979, p. 98), that "*variation of structure is introduced, not through differences in the character and function of units* [of international political systems]*, but only through distinctions made among them according to their capabilities*", focus on the effects of structure on cooperation between nations, overlooking important historical and epistemic dimensions. Is cooperation

[1] Conflict of Interests: The author declares that there are no conflicts of interest associated with this study.

important because it reduces the risk of international conflict by generating mutual gains within a framework of strong institutions, rules and laws? The liberal approach may leave in the shadows crucial political and cultural dimensions affecting S&T cooperation, particularly due to its emphasis on institutional efficiency in mitigating problems arising from imbalances in power, resources, capacities and policy priorities. According to Keohane (1984, p. 51), cooperation "*occurs when actors adjust their behavior to the actual or anticipated preferences of others, through a process of policy coordination*". This reasoning, although relevant to understand how cooperation can be ignited and maintained, does not say much about the determining historical configuration of preferences and the persistence of structural inequalities. Is cooperation a socially constructed process underpinned by a widely shared set of rules, values and expectations? The constructivist perspective, although powerful to analyze how identities and cultures shape S&T-related international networks, may obscure the constraining effects of intense technological competition among states and blocs. Wendt (1992, p. 395) argues that "*anarchy is what states make of it*" in order to bring identity and social structure into the discussion. However, the author leaves the historical constitutions of international relations and cooperation in the shadow. Moreover, and perhaps decisively, these mainstream theories, - largely developed under the influence of Western philosophy, political theory and history (Acharya and Buzan, 2010) - tend to be ineffective in addressing the impact of the "*ideational and perceptual forces which fuel, in varying mixtures, both Gramscian hegemonies, and ethnocentrism and the politics of exclusion*", as the same authors argue (Acharya and Buzan, 2010, p. 2). Hence, this paper tests an extended frame of reference that allows, on the one hand, going beyond a conception of international relations as solely shaped by power, institutions, or norms, and, on the other hand, avoiding a Eurocentric theoretical bias. This concern echoes the problem identified by Shilliam (2010, p. 5): "*That the colonial condition has been more the normal rather than exceptional historical path to modernity is woefully ignored in theories and approaches to IR that tend to bolt imperialism and colonialism onto existing frameworks and narratives that center upon an idealized European experience*".

The paper embeds the specific case of Portugal–China S&T relations within a framework in which knowledge generation and technological development, transfer and exchange are intertwined with history, power and dependency relations and global governance. This 'embedding' not only legitimizes the extended framework as analytical reference but also paves the way to bring Portugal's colonial past into an account of interaction between a global innovation powerhouse - underpinned by large-scale investments in research and development, technology transfer and scientific diplomacy - and a small European Union member state seeking to position itself strategically as a connector between Europe and the Global South.

From a methodological point of view, the study follows a dominant qualitative, critical-historical approach grounded in an interpretive effort underpinned by the 'modern international' framework. Accordingly, the interpretative stance underpinning the analytical strategy is informed by historical and postcolonial political economy perspectives. Rather than seeking causal generalization, the study aims to contextualize empirical patterns within broader structural, historical, and geopolitical dynamics shaping

international S&T cooperation. Qualitative data were collected through documentary analysis of bilateral agreements, memoranda of understanding, policy documents, institutional reports, and official communications produced by Portuguese, Chinese, and Macanese authorities, as well as by universities and funding agencies. Media reports and institutional websites were also analyzed, namely to identify concrete cases of cooperation, joint research centers, and funding initiatives. Although eminently qualitative, the paper also resorts to data resulting from bibliometric analysis of co-authored scientific publications indexed in the SCOPUS database and joint research projects described in the CORDIS database. Publication and project counts, disciplinary distribution, and relative weight within Portugal's international collaboration profile were analyzed for the period 2019–2025.

S&T Within the Modern International: Making the Case for Portugal and China

Is the extended 'modern international' frame of reference fit to inform the study of international S&T cooperation? Shilliam (2021) describes the *international* as something that cannot be reduced, as realist theories tend to do, to a neutral, timeless space of competitive interactions between states. Rather, it is the outcome of an evolutive process shaped by historical circumstances (e.g. colonialism, race, slavery) (ibid.), as well as by what Dube (2017, p. 76) terms "*temporal and spatial hierarchies of modernity*". The *modern*, in Shilliam's view (2017, p. 76), emerges from the recognition that international relations, both as a field of scholarly inquiry and as practice, developed alongside European modernity, which itself was constructed through empire and colonial subjugation, laying the foundations for a global configuration of unbalanced modernities. Bringing Shilliam's propositions to the domain of international S&T cooperation implies the assumption that history is a determining factor in understanding the changing imaginations, mechanics, politics, policies and practices of cooperation between scientific and technological systems. This approach aligns with Wallerstein (1984) conceptualization of a hierarchically structured world-system constituted by core, semi-peripheral, and peripheral contexts. However, although the convergence in underlining the historical production of global inequalities and the uneven distribution of scientific and technological capacities, Shilliam's 'modern international' places stronger emphasis on colonial hierarchies imposed by imbalances in epistemic power. Accordingly, it facilitates the reading of the transformation dynamics behind the former colonial Portugal's positioning as a semi-peripheral country within Europe, and China's transition from a semi-colonial condition to a core technological actor.

The co-evolution of scientific modernity and European colonial expansion resulted in a divide between certain 'developed' states, positioning themselves as producers of knowledge, developers of new technologies and centers of innovation, and other 'developing' states, cast as followers and passive users of knowledge and technologies created by the former. Within this uneven hierarchical context, S&T cooperation becomes a collaborative yet asymmetrical relationship between advanced mentors and latecomer apprentices. This imbalance is far from being something of the past, as demonstrated by

the burgeoning literature on the subject (e.g. Ishengoma, 2016; Cherry et al., 2018) and the examples of Europe–Africa cooperation provided by Nordling (2015, p. 24): "*the Nairobi Industrial Court agreed that six Kenyan doctors in an international research partnership had been systematically passed over for promotion and training, whereas their European colleagues had flourished*", and "*African scientists say that they often feel stuck in positions such as data collectors and laboratory technicians, with no realistic path to develop into leaders*". The argument, therefore, is that a form of colonial continuity persists - often rhetorically reframed as "mutual heritage" or "shared history" (Oancâ, 2025) - underpinned by a paternalistic approach that ultimately risks reproducing further scientific and technological dependency.

However, contrary to what a superficial discussion of S&T uneven hierarchies might suggest, Europe does not stand as the sole cradle of what we nowadays call science. This becomes evident when examining the decisive historical contributions made by Arab civilizations (e.g. astronomy, medicine, chemistry, mathematics) and by China (e.g. printing, paper, gunpowder, mathematics, astronomy). Accordingly, questions arise regarding the extent to which a framework centered on colonial legacies can be straightforwardly extended to regions such as China or the Arab world, both of which were at the forefront of technological development and innovation until at least the 13th and 16th centuries respectively. In China's case, however, the 19th and early 20th centuries, although not configuring formal colonization as experienced in Africa or South Asia, reflect a semi-colonial condition. As Reinhardt (2018) argues, China was not formally colonized, yet it was clearly dominated by external powers. The Opium War of 1840, culminated in the victory of British imperial forces and the signing of the Treaty of Nanjing, which, in brief, compelled China to handover Hong Kong to the British Crown and to open several coastal cities to foreign residence and trade (Wright, 2011). This traumatic episode underpins the contemporary discourse of the "Chinese Dream of National Rejuvenation", as expressed by Xi Jinping: "*The Chinese nation is a great nation. With a history of more than 5,000 years, China has made indelible contributions to the progress of human civilization. After the Opium War of 1840, however, China was gradually reduced to a semi-colonial, semi-feudal society and suffered greater ravages than ever before. The country endured intense humiliation, the people were subjected to great pain, and the Chinese civilization was plunged into darkness. Since that time, national rejuvenation has been the greatest dream of the Chinese people and the Chinese nation*"[2].

The Chinese Revolution and the founding of the People's Republic in 1949 brought this period of "humiliation" to an end. In this sense, China's revolutionary transformation aligns with the propositions of the "modern international" unveiling the possibility of resisting colonial and semi-colonial legacies and their inherent uneven hierarchies (Shilliam, 2011). Science and technology, deemed as crucial to modernizing the formerly "humiliated" nation, became a strategic priority. The Communist Party called to "march towards science", under Chairman Mao's motto: "*Now that the relations of production*

[2] Speech by Xi Jinping at the ceremony marking the CCP centenary, July 1, 2021. Retrieved from https://english.www.gov.cn/news/topnews/202107/01/content_WS60dd8d8ac6d0df57f98dc459.html.

have changed, it is necessary to increase productivity. Without science and technology, productivity cannot be improved"[3].

With planned science already well established and accepted in the country, namely due to the Sino-Japanese War and Soviet influence (Wang, 2015), China launched a twelve-year S&T plan in 1956. The Long-Range Plan for Scientific and Technological Development (1956–1967)[4], described as "*the most celebrated of China's past S&T plans*" (Sun and Cao, 2021, p. 5), laid the foundations for modern scientific development. It forged a "*triple alliance between workers, scientists and administrators*" (Yamada, 1972, p. 502), meant to support the Great Leap Forward's industrialization ambitions and a self-reliant scientific system. Although the "*hopelessly utopian*" Great Leap Forward strategy (Schoenhals, 1992, p. 591) and the turbulence of the Cultural Revolution, - with its "*distinctly anti-scientific tone*" (Wu and Sheeks, 1970, p. 462) - produced serious setbacks, these experiences informed later reforms. From 1978 onwards, under Deng Xiaoping's leadership, science and technology were repositioned at the core of China's modernization and development trajectory:

> *"The key to the four modernizations is the modernization of science and technology. Without modern science and technology, it is impossible to build modern agriculture, modern industry or modern national defense. Without the rapid development of science and technology, there can be no rapid development of the economy"* (Xiaoping, 1978)[5].

Strong centralized S&T planning and major policy initiatives - such as the 863 Programme (1986), the 973 Programme (1997), Made in China 2025 (2015), the National Key R&D Programme (2016) and the New Generation Artificial Intelligence Development Plan (2017) - have driven what Gewirtz (2019) describes as a new technological revolution. Jabbour and Moreira (2023, p. 546) characterize this trajectory as a "*New Projectment Economy*", rooted in the "*central role of China's National System of Technological Innovation since the second half of the twentieth century*".

China's transformation into a global scientific and technological powerhouse fundamentally challenges Western historical dominance in S&T and flattens the hierarchies inherited from semi-colonial Western epistemic authority (Shilliam, 2015). This ambition is encapsulated in Xinhua's commentary on the 19th National Congress of the CPC: "*By 2050, two centuries after the Opium Wars, which plunged the 'Middle Kingdom' into a period of hurt and shame, China is set to regain its might and re-ascend to the top of the world*"[6].

[3] Excerpt from a Mao Zedong speech in 1956 (Science and Technology Daily, July 7, 2012).

[4] 1956 - 1967年科学技术发展远景规划纲要 (*1956—1967 Nián kēxué jìshù fāzhǎn yuǎnjǐng guīhuà gāngyào*).

[5] Speech at the Opening Ceremony of the National Conference on Science, March 18, 1978. Retrieved from https://dengxiaopingworks.wordpress.com/2013/02/25/speech-at-the-opening-ceremony-of-the-national-conference-on-science/.

[6] Xinhua (2017). Commentary: Milestone congress points to new era for China, the world. Retrieved from http://www.xinhuanet.com/english/2017-10/24/c_136702090.htm.

Portugal, now a small semi-peripheral European country, carries a colonial legacy that situates it among the architects of persistent uneven global hierarchies. Its empire stretched over Africa, Asia and South America. It was the outcome of an expansion process that played a key role in the formation of the modern world system (Devezas and Modelski, 2007). The same authors (Devezas and Modelski, 2007, p. 34) attribute to the Portuguese two "*very important transitions in the formation of the world system*", namely, the "*creation of a global network together with instruments of global reach* [….] *and the emergence of some scientific commitment in system-building endeavor*". The importance of science and technology would give structure to the Portuguese colonial history, far beyond the decline at the end of Enlightenment, reaching the colonies' independence, in the aftermath of the 1974 Carnation Revolution (Diogo and Amaral, 2012). Science functioned as an instrument of domination, as articulated in early twentieth-century doctrines of the "science of colonization" (Costa, 2013).

Although Portugal shares this colonial trajectory with other European powers, its case exhibits two distinctive features: the relative underdevelopment of its S&T system compared with core European states, and its consequent subordinate position within European knowledge hierarchies. Portugal thus occupies a dual position, both reproducing colonial hierarchies and remaining subject to those imposed by a structurally unequal Europe. Its persistent underfunding of S&T, dependence on EU resources and precarious scientific careers exemplify this condition (Gago, 1990). As such, Portugal is a good illustration of Shilliam's (2011) argument that colonial hierarchies are uneven and layered, i.e., they are much more than a simple North-South divide.

Mobilising Shilliam's concept of the "modern international" in the analysis of Portugal–China S&T cooperation entails treating scientific collaboration as a historically situated and politically embedded process rather than a neutral exchange among formally equal partners. Accordingly, this implies the examination of the ways colonial and semi-colonial legacies shape contemporary epistemic hierarchies and expectations of expertise and the analysis of asymmetries in material resources, institutional capacity, and agenda-setting power. In addition, it requires an effort to positioning bilateral cooperation within broader global governance structures and geopolitical configurations, as well as to tracing how historical narratives - e.g., the national rejuvenation in China or the post-imperial Europeanisation and Atlanticism in Portugal - inform policy choices and cooperative practices. These operational threads guide the empirical analysis, linking observable cooperation mechanisms to deeper historical and structural dimensions.

S&T Portugal-China Cooperation: A Brief Overview

There is a wide and long-established consensus on the centrality of international cooperation in enhancing the capacity of supranational, national and subnational S&T systems to respond to increasingly complex global challenges (Gerrard, 1996; Lacasa and Vogelsang, 2024). For small S&T systems, such as the Portuguese one, international cooperation often becomes a structural need, crucial for addressing challenges such as limited funding and the lack of critical R&D critical mass, as well as for fostering modernization and qualitative improvement. As Patrício (2010, p. 178) observes,

"*Portuguese policymakers, researchers, academic staff and students have become quite aware of the benefits of internationalization*". She adds: "*A new culture has emerged, the culture that is needed for a country to fit into the new knowledge-based global economy*".

China, in turn, while modernizing its internal R&D capacity, has deliberately mobilized international S&T cooperation as an instrument to bridge the technological and innovation gap with advanced Western economies and, ultimately, to drive its transformation from a technologically dependent country into a global innovation leader. In the words of Cao (2024, p. 2): "*China has rapidly ascended to become one of the world's leading nations for scientific research. While observers frequently point to China's measures to boost domestic science as being responsible for this development, international collaboration has been at least equally critical in China's scientific rise*".

The first formal agreement between Portugal and China dates back to 1982, three years after the establishment of formal diplomatic relations. Motivated by a "*desire to strengthen the friendly relations between the two countries and to promote their cooperation in the fields of culture, science, technology, art, education and sports, on the basis of mutual benefit*" (Diário da República, 1982, p. 2957), the agreement identified as priorities cooperation between higher education institutes, academic mobility, reciprocal scholarship granting and exchange of academic theses, teaching materials, books and data. At that time, individual contacts between academics constituted the main vehicle of cooperation. Evidence of such exchanges can be found, for example, in the collaboration in materials science between Lopes Baptista, Professor at the University of Aveiro, and Yi Pan, Professor at Zhejiang University, evidenced by a significant number of joint publications (e.g., Pan and Baptista, 1996; 2000). This case also illustrates the subsequent process of institutionalization that followed these initially individual-driven interactions. The Basic Agreement on Scientific and Technical Cooperation signed in 1993 established an action-oriented institutional framework, notably through the creation of a joint commission responsible for defining priorities and overseeing implementation, which remains in place. The main areas of S&T cooperation were further specified in the Joint Declaration supporting the Global Strategic Partnership signed in 2005: information and communication technologies, biotechnology and biomedicine, physics, space sciences, materials science, the environment and oceanography. This framework was reinforced in subsequent years through additional agreements, including the Memorandum of Understanding in the Areas of Science, Technology and Innovation (2012) and sectoral agreements such as the Protocol on Cooperation in Research and Innovation in the Field of Marine Sciences (2014), culminating in the seventeen Memoranda of Understanding signed in 2018 within the framework of the Belt and Road Initiative. Among them, the memorandum establishing the Portugal–China 2030 Science and Technology Partnership introduced new fields of cooperation, including space-related research and the blue economy.

China's designation as a 'systemic rival' by the European Commission in 2019 (EC, 2019), the COVID-19 pandemic crisis, and pressure from the United States for Portugal to choose between its Western allies and China (Rodrigues, 2023) can be seen as factors that have troubled Portugal–China cooperation, particularly in S&T, as illustrated by the

Portuguese government's decision to exclude Chinese firms from the development of 5G networks. Rodrigues (2025, p. 198) refers to a "*notable cooling of enthusiasm*" after 2019. The same author (Rodrigues, 2025) adds that, in the case of Portugal, the cooling effect, although visible in several domains, "*did not relegate China to the category of rival*". Accordingly, Portugal–China S&T relations may be described as sound yet nuanced. Soundness is reflected in the joint establishment of research centers (Table 1), joint research programmes and projects - including those promoted by the Portuguese Foundation for Science and Technology and China's Ministry of Science and Technology, as well as EU-funded initiatives - and a substantial body of co-authored publications (Table 2) produced through prolific cooperation between scientists in both countries, at both individual and institutional levels.

Table 1. Portugal-China cooperation: Joint Research Centers

Year	Initiative
2017	**International Joint Research Center for Marine Biology -** Partners: University of Algarve and Shanghai Ocean University
2018	**CASS-UC Centre of China Studies -** Partners: University of Coimbra (UC) and the Chinese Academy of Social Sciences
2021	**5GAIner - 5G + IA Networks Reliability Centre -** Partners: Huawei, University of Aveiro, IT- Institute of Telecommunications
2024	**China-Portugal Joint Institute for Climate and Energy -** Partners: China University of Petroleum (Beijing) and IST- Instituto Superior Técnico
	China-Portugal International Joint Laboratory in Herbal Medicines - Partners: University of Lisbon (Faculty of Pharmacy) and Jiangxi University of Traditional Chinese Medicine.
	Sino-Portuguese Laboratory on Marine and Environmental Sciences - Partners: Institute of Science and Environment (University of Saint Joseph Macao), Portuguese Catholic University, Portuguese Institute for Sea and Atmosphere (IPMA), and Institute of Oceanology (Chinese Academy of Sciences).
2025	**Sino-Portuguese Joint Research Center for Sustainable Chemistry and Materials -** Partners: CICECO (University of Aveiro) and East China University of Science and Technology.
	China-Portugal Joint Laboratory on AI and Public Health Technologies - Partners: INESC-ID, Guangzhou Laboratory, Guangzhou Medical University, and Macao University of Science and Technology.
	STARlab - Partners: University of Minho, University of Trás-os-Montes e Alto Douro and IAMCAS- Innovation Academy for Microsatellites Chinese Academy of Sciences.
	Joint Laboratory in Artificial Intelligence for Healthy Longevity - Partners: University of Coimbra and Macao Polytechnic University

Source: Author

As shown in Table 2, between 2019 and 2025 nearly 16,000 scientific articles indexed in the SCOPUS database were co-authored by researchers working in Portugal and China, representing approximately 4% of Portugal's internationally co-authored output. During this period, China ranked 10th among Portugal's international scientific partners, in a list led by Spain, the United Kingdom and Brazil.

Table 2. Portugal-China cooperation: co-authored papers (2019-2025)

Subject Area	Number	%
Engineering	2435	15,30%
Physic & Astronomy	2282	14,34%
Medicine	1490	9,36%
Materials Science	1269	7,97%
Computer Sciences	1014	6,37%
Environmental Sciences	898	5,64%
Chemistry	838	5,27%
Biochemistry & Genetics	791	4,97%
Biology	637	4,00%
Earth & Planetary Sciences	565	3,55%
Mathematics	536	3,37%
Chemical Engineering	512	3,22%
Social Sciences	446	2,80%
Energy	380	2,39%
Multidisciplinary	302	1,90%
Immunology & Microbiology	244	1,53%
Business & Accounting	200	1,26%
Psychology	176	1,11%
Pharmacology	174	1,09%
Neuroscience	158	0,99%
Economics & Finance	145	0,91%
Decision Sciences	139	0,87%
Health Professions	101	0,63%
Arts & Humanities	82	0,52%
Nursing	66	0,41%
Veterinary	26	0,16%
Dentistry	09	0,06%
TOTAL	**15915**	**100,00%**

Source: Scival Elsevier (n.d.)

Table 2 further indicates that more than 60% of these co-authored publications fall within the fields of engineering, physics and astronomy, medicine, materials science and computer science. Overall, cooperation appears strongly oriented towards technical and applied sciences. This emphasis may be attributed to several factors, including China's innovation priorities, Portugal's specialized expertise in these domains, and the objectives of funding institutions. Moreover, the technical focus of early cooperative initiatives in the 1980s appears to have shaped subsequent trajectories. A similar pattern is observed

in Horizon Europe projects (2021–2027) coordinated by Portuguese organizations with Chinese institutions as associated partners. According to the CORDIS database, approximately 15% of the 107 projects coordinated by Portuguese entities involve Chinese partners. This represents a significant increase compared with the Horizon 2020 programme (2014–2020), during which Chinese participation was marginal, with only four out of 672 projects.

In this context, the general cooling of EU–China relations in the field of S&T appears to have had a less pronounced impact on Portugal–China cooperation than in some other EU member states, where stricter eligibility rules for R&D funding, heightened knowledge-security concerns and restrictions on Chinese researchers' access to sensitive research facilities produced a stronger deterrent effect (Cai and Zheng, 2025). Nevertheless, there is evidence that the deteriorating geopolitical environment - particularly the strained relations between China, the EU and the United States - has influenced Portugal–China cooperation, primarily at the level of public discourse.

While collaboration on the ground has remained largely robust, it has been accompanied by a weakening of its public and political articulation. The case of the "5GAIner — 5G + AI Networks Reliability Centre", established in 2021 at the University of Aveiro and funded by Huawei, illustrates this dynamic. The laboratory, which provides "*a 5G experimentation environment for the different stakeholders taking part in the 5G ecosystem*" (Quevedo et al., 2023, p. 514), developed internationally recognized R&D projects and maintained close ties with industrial firms and public organizations. It was awarded with the "Huawei Corporate-Level Excellent Technical Cooperation Project 2022" and received considerable public attention. However, the ban imposed in May 2023 by the Portuguese government on the participation of companies headquartered in non-NATO countries in 5G development - a decision that directly affected Huawei - apparently changed the situation. Signaling a shift in the relational dynamics between Portugal and China (Rodrigues, 2025), this decision, as expected, impacted on the S&T cooperative dynamics involving Huawei and research organizations. The research objectives pursued by the 5GAIner laboratory are still underpinning research activities at the University of Aveiro, but no connection to Huawei can be established with basis on available information.

Exploring the Extended "Modern International"

Science and Technology cooperation between Portugal and China, despite differences in power and scale, may be regarded as a natural development within the globally shared understanding that the internationalization of scientific and technological systems is of fundamental importance. However, when the aim is to test the extended concept of the "modern international" as a meaningful analytical framework for examining cooperative dynamics between the two systems, this notion of "naturality" acquires important nuances. These nuances are grounded in history, geography and politics, and are rooted in Macao. In this sense, when interpreting the current status of Portugal-China S&T cooperation through the "modern international", Macao provides an effective analytical path to go beyond the limited view of cooperation as motivated by any sort of functional

complementarity or convergence of interests. Rather, the current dynamics emerge from historically constructed relations though which knowledge, power, and legitimacy have circulated unevenly across colonial and post-colonial configurations.

Macao became a permanent Portuguese trading base in 1557 through a concession granted by the Ming dynasty and was formally transformed into a colonial territory more than three centuries later, following the signing of the Lisbon Protocol and the Sino-Portuguese Treaty of Friendship and Commerce in 1887. Although never ratified, the treaty conferred sovereignty over the territory upon Portugal. Portuguese colonial rule persisted until 1976, when China gradually resumed certain sovereign powers within the post-revolutionary Portuguese decolonization process, culminating in Macao's handover to China in 1999 and its incorporation into the "One Country, Two Systems" framework as the second Chinese Special Administrative Region. The smooth and successful negotiations during the transition period (1988–1999) are widely regarded as a key foundation of the stable and mutually beneficial relations that endure today.

Historically, Macao has served as a crucial gateway between European and Chinese cultures and systems of knowledge. As Soen (2004, p. 219) observes, "*during the late sixteenth and early seventeenth century Macao was a vibrant Portuguese trading center where Europeans and Chinese exchanged products and knowledge… and became a keystone in cultural exchange between East and West and China*". Its role as an entry point for Western medical knowledge during the late Ming and early Qing dynasties (Wu et al., 2024), European mathematical sciences (Jami, 2004), and Chinese pharmaceutical knowledge transmitted to Europe (Golvers, 2018) exemplifies this mediating function. Even in periods when Portuguese authority over Macao was severely contested, particularly during the nineteenth century, the enclave "*continued to function for China as an important point of entry for Western ideas*" (Edmonds, 1993, p. 5).

From the perspective of the 'modern international', Macao is providing support to cooperative practices that can be deemed as embedded in older regimes of global ordering and inherent uneven hierarchies. Hence, the framework provides the understanding of Portugal-China S&T cooperation as a reconfigured continuation of historically driven modes of international engagement that present unbalances, mediation, and symbolic power as constitutive dimensions. As such, it is not a simple matter of responding to the challenges of globalized science. This calls forth the need to know more about the extent to which Macao continues to fulfil a mediating role, nowadays under Chinese sovereignty. One central argument is that Portugal's colonial legacy - although now residual - has been reprocessed into symbolic capital (Ferraz de Matos, 2020), providing significant leverage for the development of exchanges and cooperative networks between China, Portugal and Portuguese-speaking countries. This symbolic capital has been institutionalized, most notably through China's establishment in 2003 of the Forum for Economic and Trade Cooperation between China and Portuguese-Speaking Countries (Forum Macao), which uses the Portuguese language as a structuring element supporting Macao's role as a platform linking China, Portugal and their former colonies (as well as Equatorial Guinea).

Macao's function as a bridging territory also extends to international S&T cooperation, as formalized in the Framework Law for Science and Technology issued by the SAR Legislative Assembly in 2000 and in the Administrative Regulation governing the Macao Science and Technology Development Fund (FDCT) established in 2004. Notably, FDCT's institutional communications explicitly identify Portugal - alongside mainland China - as a major partner in international S&T cooperation (FDCT, 2024). In addition to formal agreements between the Portuguese government and the Macao SAR (e.g., the 2001 cooperation agreement), a range of policy instruments support collaboration, including memoranda of understanding between FDCT and Portugal's Foundation for Science and Technology (FCT), (e.g., the 2017 agreement establishing joint R&D funding programmes, researcher mobility schemes and joint dissemination initiatives). These mechanisms have supported projects linking Portuguese and Chinese R&D organizations, particularly in fields such as marine sciences and health technologies (Leandro and Li, 2025).

Institutional partnerships, - especially between higher education institutions in Macao and Portugal, have long played a central role in fostering S&T cooperation and extending it to Chinese partners. The University of Macau's Vice-Rector for Global Affairs, Rui Martins, who serves the institution since 1992, states that the university "*shoulders the mission of linking mainland China, Macao, and Portugal*" (Leong et al., 2025, p. 25). Similarly, the University of Saint Joseph's initiative to establish a research alliance on healthy ageing involving six Portuguese and two Chinese universities illustrates the capacity of Macao-based institutions to generate cooperative networks.

While institution-driven cooperation has expanded, official funding mechanisms have shown signs of contraction. Antunes (2025, p. 1117) notes that the only dedicated joint funding programme involving FCT and FDCT, -launched in 2017-, has not issued new calls since 2019. This contrasts with the continued prominence of China–Macao–Portugal cooperation in official discourse. A partial explanation may lie in FDCT's growing strategic engagement with Brazil, as evidenced by the joint funding scheme negotiated with FAPESP in 2024 and launched in 2025 (FDCT, 2025).

The substantial disparities in S&T capabilities and resources between China and Portuguese-speaking countries, - including Portugal and Brazil-, invite a critical historical interpretation that points to a reconfiguration of dependencies between former colonizers and (semi-)colonized societies. China's scientific and technological development represents a form of epistemic sovereignty with growing influence over global knowledge production (Qiu et al., 2025). Conversely, Portugal's imperial decline has repositioned it from a center of knowledge dissemination to an epistemically dependent semi-periphery (Reis, 2020). This inversion creates new asymmetries within S&T cooperation and requires, as Antunes (2025, p. 1117) argues, "*special care in ensuring that this collaboration is done between equals and reduces this asymmetry*".

Yet, Portugal's colonial legacy also provides network and symbolic resources that compensate, to some extent, for its peripheral position. These resources enhance Portugal's capacity to function as a gateway in international S&T cooperation, not only towards the so-called Global South, particularly the Portuguese-speaking world, but also

towards Europe. This symbolic and network power, in turn, helps explain China's strategic interest in Portugal. Macao epitomizes the complexity of these layered historical, symbolic and geopolitical dynamics.

A first and foremost finding concerns Macao's persistence in assuming a mediating role in Portugal-China S&T cooperation. Consequently, there is scope to argue that colonial legacies are not residual, they are, rather, reactivated and institutionalized according to the nature of change in geopolitical conditions. Macao's mediation, though, occurs within a context of asymmetric scientific capacity and power. In fact, while China is strengthening its S&T system and soundly shaping global research agendas, Portugal suffers from limited resources and power inherent to its semi-peripheral position within the EU. Nevertheless, linear readings of dependency can be challenged, namely due to Portugal's historical ties, linguistic heritage, and institutional networks, which, namely in the Portuguese-speaking world, foster forms of brokerage that may offset material constraints. This duality made of enabling possibilities and structural constraints reveals the 'modern international' as a productive frame of reference to deal with the tensions of cooperation, hierarchy, and historical transformations.

Conclusion

This study has examined the evolving relationship between Portugal and China in the field of S&T, moving beyond a purely functionalist and technocratic approach. While such perspectives illuminate institutional mechanisms and measurable outcomes, they are insufficient for understanding the deeper historical and structural forces shaping cooperation. To address this gap, the study has tested an extended analytical framework inspired by Robbie Shilliam's conception of the modern international, which foregrounds history and acknowledges the enduring influence of colonial and semi-colonial legacies in structuring global science and technology.

China's transformation into a global research and innovation powerhouse complicates traditional colonial analytical assumptions. The historical narrative that cast Western science as a civilizing gift has been unsettled by China's capacity to challenge Western epistemic dominance and reconfigure global hierarchies of knowledge production. At the same time, Portugal's post-imperial trajectory has repositioned it within the semi-periphery of the global S&T system, weakening its capacity to reproduce former colonial hierarchies.

Against this backdrop, Portugal–China Science and Technology cooperation emerges as both asymmetrical and strategically significant. China views Portugal as a gateway to Europe and Portuguese-speaking scientific spaces, while Portugal seeks expanded funding opportunities, access to advanced research infrastructures and enhanced international visibility through engagement with China. Macao stands as the most tangible expression of this complex dialectic.

Despite geopolitical tensions and structural asymmetries, the analysis confirms the relevance and analytical strength of a historical, colonial and post-colonial framework for understanding contemporary S&T cooperation between nations.

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