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# Identification of Strategic International Partnerships for Emergent Global Artificial Intelligence Policies

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COMMUNICATION | EDITORIAL | SPECIAL FEATURE | PERSPECTIVE | REPORT | **REVIEW**

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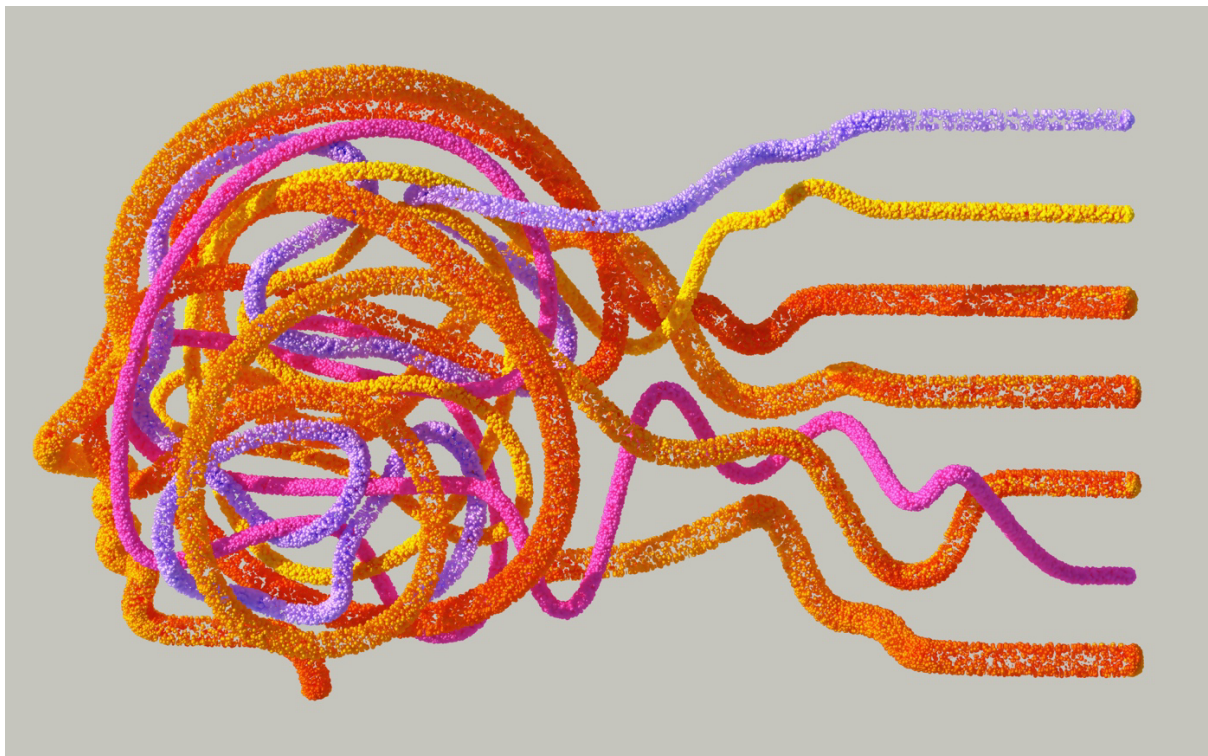


Illustration by Khyati Trehan, selected by Vivian Zhao

## ABSTRACT

Artificial intelligence (AI) has emerged as one of the defining technologies of our time. Countries worldwide are developing their AI strategies to develop their national capacities, increase economic competitiveness and growth, and address local, regional, and global issues. The vast implications of AI are guiding foreign policy actions of different countries as they find AI as a new avenue for international cooperation and competition. In this study, we review the emerging contours of AI

strategies and partnerships at national, bilateral, and multilateral levels by analysing the approach of some major countries and international forums. Here, we discuss the national strategies, bilateral collaborations, and structure and function of relevant international platforms to understand the evolving nature of international partnerships on AI. Further, we highlight the disconnect between global priorities and national strategies, collaborations among some developed and developing countries, and the ongoing deliberation on global norms and standards. Finally, we put forward some considerations for global cooperation to develop rules, norms and standards for AI.

## SCIENCE ⇒ POLICY

Building capabilities in AI is becoming increasingly important among the major economies of the world because of its economic and military implications. Moreover, AI governance and regulation in a country are being impacted by the larger geopolitical discourse. Thus, it is essential to understand the importance of AI in international relationships to develop it as a technology that promotes cooperation instead of competition.

### Key Words

Artificial Intelligence, International Relations, International Partnerships, Global AI Policies

#### Introduction

With a large number of people, corporations, and government entities using the internet for day-to-day communications and transactions, it is argued that digital technology is becoming a driving geopolitical force shaping international politics [1]. This is particularly evident from the increase in the adoption of emerging digital technologies like AI in the different foreign ministry operations (or their foreign equivalents, such as a Department of State) through tools like chatbots for consular services, use of image recognition and sentiment analysis for gauging public response, and virtual diplomatic missions [2,3].

In general, various national policies on artificial intelligence (AI) currently aim to promote the use of AI for economic growth while putting in place rules for data protection, data localization and privacy. These policies also protect data that is on servers that may become vulnerable to cyberattack and unauthorised access to data, which could be unlawfully used for data theft or data corruption by malicious third parties actors [4,5]. Additionally, AI policy aims to codify the control, ownership and beneficiaries of the result of data use and

analysis as well as the development of ‘trustworthy’ and ‘responsible’ AI by software developers [6,7]. Therefore, analysing such adopted digital diplomacy practices is especially critical with the growing trend of digital trades and transactions across countries through cross-border data flow, which is estimated to increase by 29% in bandwidth by 2022 as compared to 2021. The AI economy, too, reflects a similar estimated increase globally from \$35.92 billion to \$47.47 billion with AI applications like self-driving cars and facial recognition technology products expecting a growth trend from 22.7% and 15.7% annual CAGR growth, respectively, during the forecast periods of 2021-2026 and 2021-2028 [8].

Policies are national, but data flows beyond their geographic and political silos across the internet ocean. With a few exceptions like the European Union’s General Data Protection Regulation (GDPR) compliance adherence, international law has lagged behind the development of rapidly emerging technologies, like AI. Given the increasing importance of emerging technologies like AI, it is argued that the nation-states have the option to either ensure

greater geopolitical cooperation or geopolitical competition [9,10]. National policies, therefore, currently dominate AI regulatory rules (or lack thereof), and are vying for alliances to gain a majority consensus for international regulation for AI.

### **Research methodology**

This paper grounds itself in the assumption that a competitive, and desultory disorganised approach to AI in diplomacy may prove to be short-sighted, particularly as AI is increasingly being adopted as a diplomatic tool to retain or redistribute power on a global scale. Therefore, this exploratory paper accepts the arguments made in the extant digital diplomacy discourse that encourages the states to take concrete, strategic steps towards international cooperation and applications of emerging technologies, particularly in AI [11-13]. The methodology employed in this article involves triangulating the patterns in examination of international initiatives and platforms, national AI strategy documents, and bilateral agreements, and social media engagement to unravel patterns related to the importance granted to AI in existing foreign policy objectives and practices. The conclusion summarises the analysis of emergent patterns that provide insights on diverse international cooperation and competition strategies with respect to AI.

The scope of this study is limited to one country each selected to represent four continents, with the exception of Asia, which has two representative nations: South America (Brazil), Asia (China and India), Europe (Germany), and North America (the United States). These countries were chosen for their diverse geographic and socio-economic demographics reflected in their income profiles, GDP and technological innovation levels [14-16]. Two countries from Asia, China and India were chosen for this study as they have the largest populations and have been investing heavily in AI with possible global implications [17]. The countries under study have varied Global AI index rankings [India-17, China-2, Brazil-39, Germany-9 and the US-1]. The Global AI

Index identifies a nation's capacity for investment, innovation, and implementation of AI [18]. They have all also formulated their national strategy roadmaps to use AI for economic growth [19]. Additionally, these countries are also part of important international alliances such as the Global Partnership for Artificial Intelligence (GPAI) and the Quadrilateral Security Dialogues (QUAD). Some of them are parties to frameworks such as UNESCO agreement on the Ethics of AI, G20 AI principles, OECD AI Principles thus building their capabilities and using these alliances for competitive advantage against other economies. This, coupled with these countries attracting the highest number of patents in the field of AI, with China being the world leader, makes them good candidates for this study [20].

To carve out patterns, this paper uses a non-experimental mixed methodology to collect, triangulate, and analyse secondary data [21]. For qualitative analysis, the preliminary research method for this study is a literature review and conceptual modelling of the existing discourse around digital diplomacy, state practices around AI governance and regulation, and the various multilateral and bilateral collaborations between nation-states that specifically refer to AI or AI based technologies (referred by AI-related agreements in this paper and details of which are provided in Appendix 1). It draws data from national and international AI strategy documents and treaties, agreements, and AI specific international coalitions for qualitative analysis where the term 'contracting countries' refers to the countries having formal partnership or agreements in the area of AI.

For data visualisation and data representation of bilateral agreements, Datawrapper, a third-party software, was used [22]. Using global symbol maps available on Datawrapper (V2022) and the data in Appendix 2, the visual representations using maps highlighting the contracting countries have been showcased in the third section of this paper. This section in the paper also showcases histograms that can aid in the analysis of the bilateral agreements and

the demographics of contracting parties in these agreements to draw out any existing patterns using parameters like the contracting party's per capita income (GDP nominal) ranking as of March 2022 and their ranking in the Global Innovation Index (GII) 2021 [23,24], data for which can be found in Appendix 2.

Considering that diplomacy for AI and AI in diplomacy is still in a nascent stage across the globe, it can be assumed that scale and capacity of innovation may also be a matter of consideration for increased engagement. This study, therefore, relies on WIPO's GII to gauge any patterns in the contracting countries. These indices have been particularly chosen to understand any underlying patterns that the countries under this study use to select their contracting parties in these bilateral agreements.

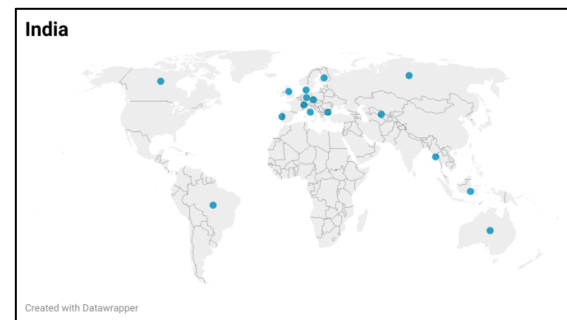
### National strategies and bilateral cooperation on AI

In this section, we look at the national strategies or policies and bilateral agreements of the countries under study to unravel major highlights and trends related to international cooperation on AI that are helping to form or strengthen political and economic alliances.

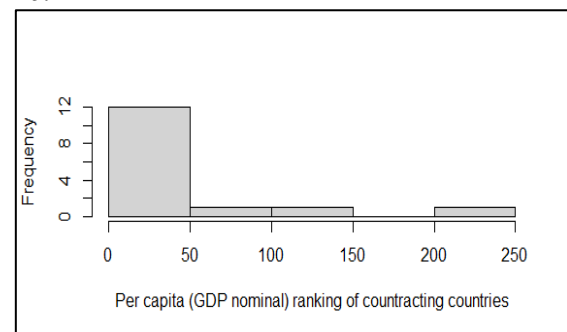
**India.** India's two-part national strategy document on AI, National Strategy for Artificial Intelligence #AIforAll, relies on seven broad principles: safety and reliability, equality, inclusivity and non-discrimination, privacy and security, transparency, accountability, and protection and reinforcement of positive human values [25-27]. Keeping the much-needed collaborative spirit for adoption and application of AI in mind, the second part of the Indian strategy focuses on coordination and collaboration with state/non-state actors within and outside India. It recognizes the government's role in catalysing partnerships, access to infrastructure, and fostering innovation amongst various private and public institutions. It envisions an umbrella organisation, the Centre for Studies on Technological Sustainability (CSTS), that will

study the AI landscape and foster globally competitive technological development.

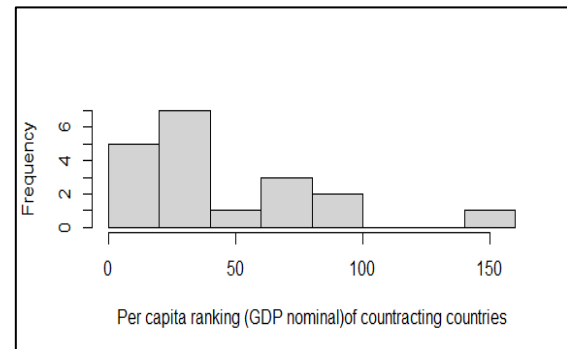
1a.



1b.



1c.



**Figure 1:** a) Visual representation of countries contracting with India for AI-related agreements. (Created with Datawrapper.) b) Histogram representing the frequency for per capita GDP ranking of India's contracting countries (in nominal terms). c) Histogram representing the frequency for GII ranking of India's contracting countries.

Almost 60% of India's contracting countries are from the European continent, which may be due to Europe's strong position in innovation of emerging technologies. This is followed closely by engagements and collaborations with Asian countries like Indonesia, Uzbekistan and Myanmar in addition to Australia and Brazil

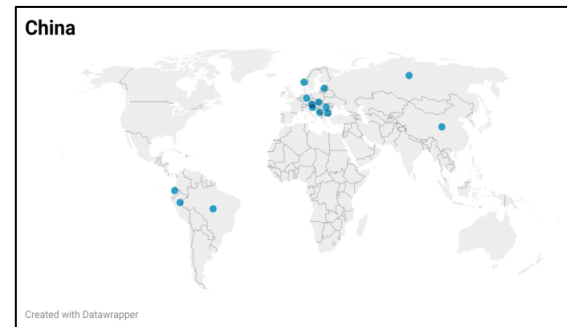
(Figure 1a). It is also worth noting that the economic profile of these contracting countries skews more towards countries with higher per capita income apart from Indonesia, Uzbekistan and Myanmar (Figure 1b). As can be observed from Figure 1c, the GII ranking of contracting countries skews towards the left as India engages and collaborates with countries that rank higher on the GII with the likes of Switzerland which ranks 1st in GII out of 132 economies considering 81 different indicators for innovation tracking. This shows India's willingness to cooperate with countries that are technologically advanced while also establishing linkages with some strategically important countries in the Global South. This approach is consistent with the paradigm of 'strategic autonomy' India applies in its foreign policy [28]. A substantial majority of the agreements that are publicly available on the official foreign ministry portal are generic agreements for science and technology cooperation with a push for Information and Communication Technologies (ICTs). Only agreements with Canada, Finland, Brazil, Australia and Portugal are specific contracts – focussed on distinct aspects of AI that are detailed in Appendix 1.

Overall, India's national strategy on AI focuses on principles such as safety, inclusivity, transparency, while its primary partnerships are with technologically advanced high-income countries.

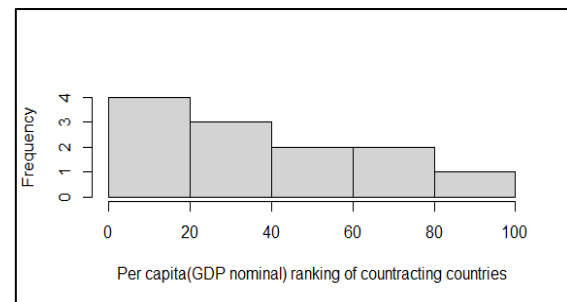
**China.** China's 'Next Generation Artificial Intelligence Development Plan' acknowledges China's strong foundations in AI and seeks to advance its development and deployment across different sectors [29]. Even though the plan contains several specific recommendations, details regarding international cooperation or competition have been largely left out [30,31]. Notwithstanding this assessment, it must be noted that the plan provides for facilitation of indigenous AI enterprises to cooperate with international research institutes and teams to comprehensively plan their innovation resources using international linkages. It highlights leveraging AI-based

technologies that provide a competitive advantage internationally. It aims to integrate international cooperation on AI in its 'One belt, One Road' strategy (now the Belt and Road Initiative). It also calls for promoting the establishment of international AI organisations, of which it would be a part, and jointly formulating related international standards [30].

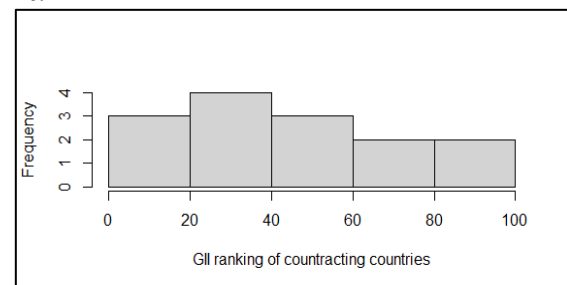
**2a.**



**2b.**



**2c.**



**Figure 2:** a) Visual representation of countries contracting with China for AI-related agreements. (Created with Datawrapper.) b) Histogram representing the frequency for per capita ranking of China's contracting countries. c) Histogram representing the frequency for GII rankings of China's contracting countries.

Almost 80% of China's contracting countries are from the European continent, followed by engagements and collaborations with Asian countries and some Latin

American countries (Figure 2a). It is also worth noting that the economic profile of these contracting countries skews more towards countries with higher per capita income (Figure 2b). Considering that China itself ranks 14th for its innovative capabilities, its engagement with countries that rank lower than itself is interesting and is probably part of China's larger strategic calculations (Figure 2c) [32,33]. The competitive tensions between the Global North and China may also be a contributing factor to its choice of contracting parties. Substantially, majority of the agreements that are publicly available on the official foreign ministry portal are generic agreements for science and technology cooperation with a push for ICTs with only agreements with Russia, Norway and Germany having specific contracts that are focussed on distinct aspects of AI, described in Appendix 1b.

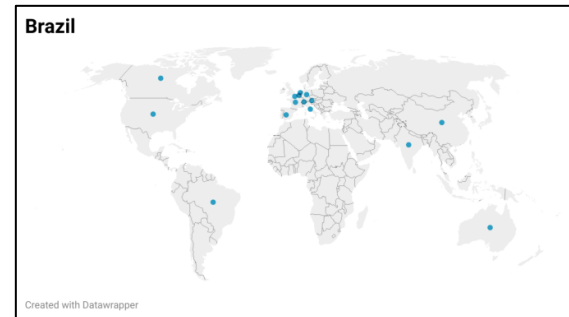
In summary, China's national strategy aims to advance the development and deployment of AI across sectors, while facilitating cooperation between indigenous AI enterprises and international research institutes. Here, a significant majority of agreements are generic science and technology agreements with high income countries.

**Brazil.** In 2021, the Brazilian government adopted a strategy on AI for the Brazilian state to: a) contribute to the development of ethical principles for responsible AI, b) promote sustained investment in AI research and development, c) remove barriers to AI innovation, d) empower and train professionals for the AI ecosystem, e) stimulate innovation and the development of Brazilian AI in an international environment, and f) promote an environment of cooperation between public and private entities like the Ministry of Science, Technology and Innovation, the Brazilian Industry Research and Innovation Company, industry, and 17 research centres for the development of AI.

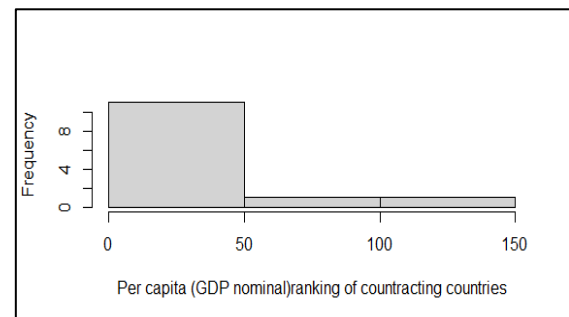
Brazil's strategy for international collaboration and cooperation in AI hopes its national network will 'intensify international exchange of knowledge and reciprocal

collaboration' with countries in Europe, Israel, UK and North America but lacks further details explaining execution of the plan [34-36].

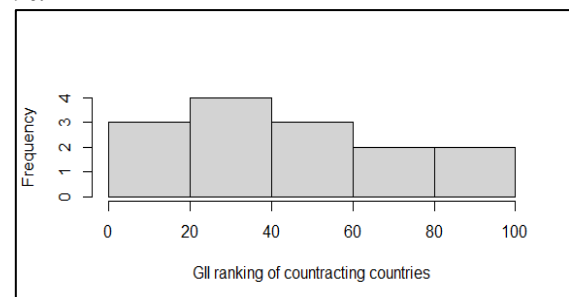
**3a.**



**3b.**



**3c.**



**Figure 3:** a) Visual representation of countries contracting with Brazil for AI-related agreements. (Created with Datawrapper.) b) Histogram representing the frequency for per capita ranking of Brazil's contracting countries. c) Histogram representing the frequency for GII rankings of Brazil's contracting countries.

Like India and China, most of Brazil's contracting countries (almost 60%) are from the European continent, followed by 15% of its engagements and collaborations with Asian countries (India and China) and North America (US and Canada) along with Australia (Figure 3a). It is also worth noting that the economic profile

of these contracting countries is highly skewed towards countries with higher per capita income and global innovation indices ranging from 1 to 46, reflecting Brazil's ambition to employ know-how from the world's leading countries in AI innovation and research (Figures 3b & 3c). The majority of publicly available agreements on the official foreign ministry portal are generic. A push for ICTs having specific contracts that are focussed on distinct aspects of AI exists only with India, China, US, Italy, and Australia, as detailed in Appendix 1.

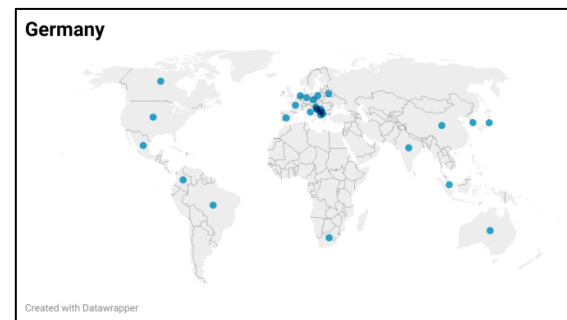
Overall, the Brazilian strategy focuses on promoting innovation in AI through investment in research and development. It has established international cooperation mostly with high income and more innovative countries.

**Germany.** In 2018, the German Federal Government launched its Artificial Intelligence Strategy aimed at making Germany and the EU global leaders in the development and use of AI technologies, safeguarding the responsible development and use of AI, and integrating AI in society in ethical, legal, cultural and institutional terms (The Federal Government 2020). However, the COVID-19 global pandemic induced geopolitical and sociocultural shifts that prompted updates to its AI strategy in 2020. These shifts prioritised the technical expertise, research, transfer and application, regulatory framework and society—with a strong emphasis on issues of pandemic control, environmental and climate protection, and European and international networking—in an effort to foster the spirit of ‘internationalisation of AI research’ [37].

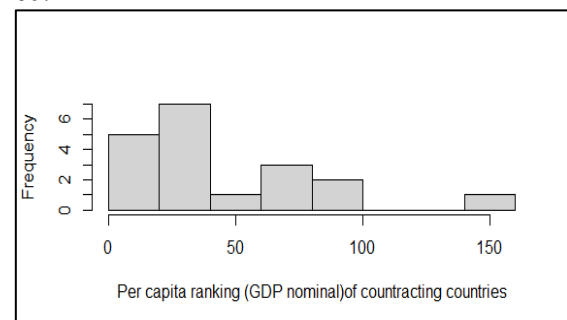
The federal government's international cooperation and collaborative efforts can be grouped into four categories: a) its efforts within the EU to bolster the network and mobilise expertise across EU to establish ethical guidelines and develop basic and applied research in the medium and long term; b) its efforts for cooperation with France, Canada, and Japan to promote collaborative research and development projects in the context of ‘Industry 4.0’, c) its efforts to establish contact in Silicon Valley

as a ‘networking centre’, and d) its efforts towards Global South partner governments to create global public goods and implementation capacities in the field of AI. Additionally, the AI strategy plan also aspires to establish a network of think tanks focussed on international standardisation and regulatory forums as a part of ‘international AI governance’ to further the pursuit of ethical and equitable AI in the world.

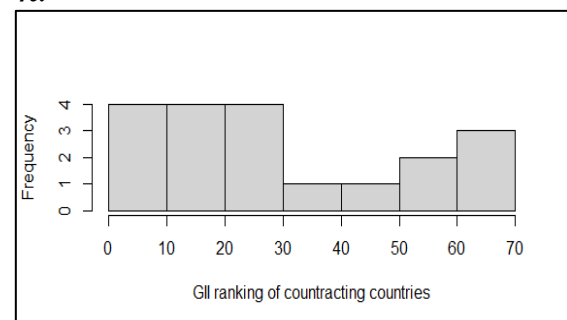
4a.



4b.



4c.



**Figure 4:** a) Visual representation of countries contracting with Germany for AI-related agreements. (Created with Datawrapper.) b) Histogram representing the frequency for per capita ranking of Germany's contracting countries. c) Histogram representing the frequency for GII rankings of Germany's contracting countries.

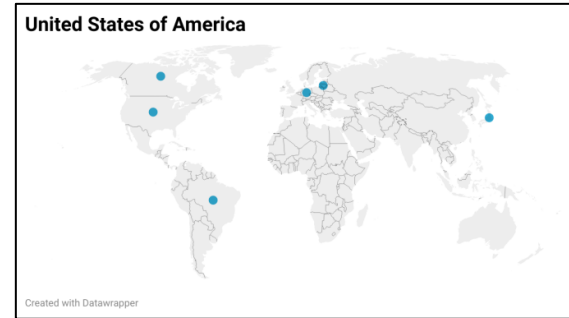
Of all the countries in this study, Germany's engagement for international AI cooperation is the most diverse, with approximately 36% of its contracting countries being from the European continent, followed by engagements and collaborations with Asian (India, China, South Korea, Singapore and Japan), North American (US, Canada and Mexico), South American (Brazil and Columbia), African countries (South Africa), and Australia (Figure 4a). It is also worth noting that the economic profile of these contracting countries skews more towards countries with higher per capita income (Figure 4b). Global innovation indices of contracting countries ranging from 3-68 with the majority of contracting countries falling within 3-30 in their ranking in the global innovation indices, reflecting Germany's ambition to employ know-how from the world's leading countries in the field of AI innovation and research (Figure 4c). Most publicly available agreements (~57%) on the official foreign ministry portal are generic agreements, except a push for ICTs with Brazil (almost 42%), as detailed in Appendix 1d.

In summary, Germany has a diverse international engagement on AI and has a strategy that aims to make it a global leader while safeguarding the responsible development and use of AI and integrating it into society.

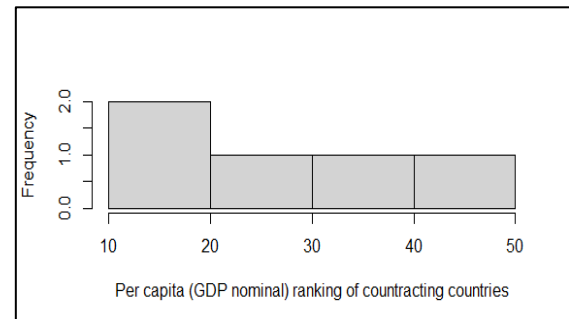
**United States.** The 2019 Executive Order 13859 enlisted several projects for the National Artificial Intelligence initiative to promote and ensure US leadership in the space of development and innovation of AI [38]. In addition to ensuring AI infrastructural needs are met, it prioritises effective methods for AI collaborations within the federal government. The following year's annual report endorses - supporting international collaborations and partnerships in line with its national values, those 'grounded in evidence-based approaches, analytical research and multi-stakeholder engagement' [39]. The report further provides evidence of its international participatory engagement over the past years: the G7 Innovation and Technology

Ministerial, G20 Digital Economy Ministerial, NATO, the European Union, OECD, and such other multilateral discussions and bilateral agreements with its allies on matters of mutual agreement.

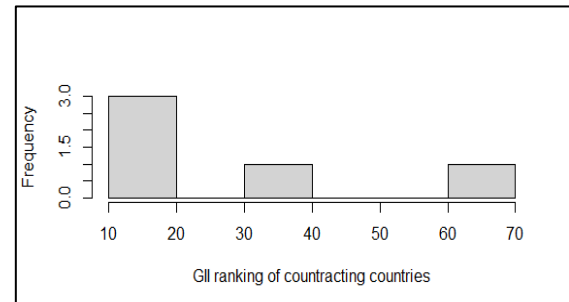
5a.



5b.



5c.



**Figure 5.** a) Visual representation of countries contracting with the United States for AI-related agreements. (Created with Datawrapper.) b) Histogram representing the frequency for per capita ranking of the US's contracting countries. c) Histogram representing the frequency for GII rankings of the US's contracting countries.

At the outset, it must be noted that compared to other countries studied here, the number of publicly available contracts specifically relating to the US is smaller than other countries (Figure 5a). However, the contracting countries are more diverse than countries that have been studied so far in this

section. Despite its diversity, like other countries so far, almost 40% of US's contracting countries are from the European continent while the rest belong to North America (Canada), Asia (Japan) and South America (Brazil). It is interesting to note that many close trade partners such as Mexico (a member of the North American Free Trade Agreement) and close allies such as most members of NATO are missing from this list. It is also worth noting that the economic profile of these contracting countries skews more towards countries with higher per capita income, just like the global innovation index ranking (Figures 5b & 5c). Unlike the countries studied so far, many agreements that are publicly available on the official Department of State portal are specific agreements that focus on distinct aspects of AI, with a detailed in supplementary material 1e. Only its agreement with Brazil is a generic science and technology cooperation with a push for ICTs.

Taken together, the US executive order highlights the efforts in place and process to ensure the US leadership in the area of AI by synergising efforts within the government and developing international partnerships. The US has a small number of focused international cooperation agreements on AI with a diverse set of countries.

### **Major international initiatives and discussion platforms on AI**

Next, we looked at the major multilateral and global platforms used for AI related policies and diplomatic negotiations to examine their current structure, objectives, and functionality. We find that AI has been an active area of discussion in several major international forums. A concise summary of major AI-related forums are below.

***Global Partnership on Artificial Intelligence (GPAI)***. Launched in 2020, GPAI works as a multistakeholder initiative bringing together experts from science, government, industry, civil society and international organisations to promote multidisciplinary research and international collaborations on AI-related priorities [40]. It

currently has 25 nation-states as members, and its thematic focus includes responsible AI, the future of work, data governance, – innovation, and commercialisation. GPAI is a product of G7 discussions and aims to implement some of the OECD recommendations on AI [41]. With many powerful democratic countries being its member, GPAI is likely to emerge as one of the most important global forums for discussions on setting up the norms and regulations for the global governance of AI. Due to its nature as a multi-stakeholder platform, it is arguably well placed to develop a global framework for AI cooperation and governance with inputs from all stakeholders. India, Germany and the US are among the founding members of GPAI.

***OECD AI Policy Observatory***. OECD, with its 37 member states, adopted the AI principles in May 2019 to promote use of AI which is innovative and trustworthy and that respects human rights and democratic values [41]. International cooperation for trustworthy AI is one of the key principles among several other principles adopted by OECD. This principle emphasises the role of the government to cooperate across borders and sectors to share information, develop standards and work towards development of responsible AI. The principle emphasises that sharing of knowledge is important in order to build long term expertise on AI, and develop technical standards which are interoperable and trustworthy. Developing common metrics to assess the performance of AI systems such as accuracy, efficiency, robustness and advancement of societal goals is also key for strengthening international cooperation in the field of AI [42]. OECD also functions as a secretariat to GPAI to facilitate synergy between GPAI's technical work and the international policy leadership provided by the OECD.

***UNESCO agreement on the ethics of AI***. Adopted in 2021, UNESCO's standards on the ethics of AI are the first truly global framework on AI [43]. It focuses on the use of AI for promoting the human rights and achievement of the SDGs and addresses the

issues around accountability, transparency and privacy [44]. This agreement puts forward common principles and values to assist in the creation of the policy and governance infrastructure required to ensure the healthy development of AI. Even though the agreement is voluntary and non-binding, it signifies the consensus among the member states to work together for further developing a global governance framework on AI in the future. Interestingly, the US is not signatory of the agreement as it is not a UNESCO member.

**The G7.** The G7 countries which comprise Canada, France, Germany, Italy, Japan, the UK, and the US have been focusing on cooperation among the member countries in the field of AI given its important impact across all sectors and because of its strategic importance. AI has been one of the key agenda items of the G7 ministerial meetings since 2017. At the 2017 G7 ICT and Industry Ministerial meeting it issued a document titled ‘Multistakeholder Exchange on Human Centric AI for our Societies’ that highlighted the use of AI for solving the global challenges related to environment, transportation, or health [45]. In the G7 Innovation Ministerial meeting held in 2018, the countries highlighted the need for interconnectedness for innovation in AI, trust and inclusivity in the development or adoption of AI [46]. In the 2019 G7 Summit it released the ‘Strategy for an Open, Free and Secure Digital Transformation’ highlighting that AI is bringing radical transformation in the societies, economies and future of work, and AI could play an important role in achieving the Sustainable Development Goal by 2030 [47]. At the 2020 G7 Science and Technology Ministerial Meeting, it issued a Minister’s Declaration on COVID-19 in which it committed to the responsible and human-centric development and use of AI [48].

**The G20.** AI has become one of the key subjects of discussion among the member countries of the G20 nations as well. During the G20 meetings held in Osaka under Japan’s presidency in 2019, the member countries endorsed the G20 AI

principles in line with OECD Principles on AI in the leader’s Declaration [49]. The declaration highlighted the need for responsible development and use of AI to help advance SDGs. The declaration also highlighted the need for international cooperation with developing countries and other stakeholders to advance the G20 Principles of AI including sharing of knowledge with other countries, and development of global standards and metrics to measure for building trustworthy AI systems [50].

**Quadrilateral Security Dialogue (Quad).** The Quad, a multilateral setting which comprises the United States, India, Japan and Australia, has set up a ‘Working Group on Critical and Emerging Technologies’ to ‘facilitate cooperation and innovative technologies of the future’ [51]. Further, a contact group on Artificial Intelligence and Advanced Communication will be established which would focus on ‘standard-development activities as well as foundational pre-standardisation research’ [52]. Another important initiative in this direction is the establishment of the Quad Tech Network that would promote track 2 research and public dialogue on critical technologies relevant to the Indo-pacific region [53]. This network is likely to have a focus on enhancing policy cooperation in AI among the Quad nations. Collectively, these are early indicators for things to come in terms of intense future cooperation on AI among Quad members.

## Discussion

Given that all countries under this study developed some variation of a strategy or policy document on AI with an emphasis on capacity building, innovation, or international collaborations, it was observed that terms like ‘ethical’, ‘reliable’, ‘accountable’, ‘explainable’, ‘responsible’, ‘transparent’, and ‘trustworthy’ are emphasised in these national strategies and international forums. A number of emerging AI alliances were also mentioned in passing as to how they may figure into the participatory AI agreements. However,

precisely how the purposes, objectives, interpretations, and manifestation of these buzzwords translate into reality (that is, if they lead to improved international cooperation or if they are merely guises for continued strategic competition) has yet to be determined. Therefore, there is a need for further analysis of these AI alliances in relation to their societal, economic, legal, and geopolitical implications.

Upon analysing the bilateral agreements signed by the subject countries, it was observed that the number and nature of international agreements vary widely among the countries studied. The US signed fewer agreements but with more specificity, while India, China and Brazil signed more agreements that were broader in scope, as detailed in Appendix 1. Among the countries studied, it was observed that emerging economies like India and China have the highest number of collaborations with countries in the Global North, while the US had the least number of collaborations, they were mostly with developed economies (Figures 1-5). It was also noted that a vast majority of bilateral agreements (signed by both developed countries like US, Germany and China and developing countries like Brazil and India) were signed with countries having a high GII ranking and high GDP per capita income, while there was little South-South cooperation in the developing countries.

The primary explanation explored here is that these countries are still in the early stages of developing their AI ecosystem and therefore prefer linkages with advanced nations to expand their expert-base and seek co-development of their initial projects. However, the limited international collaboration among the Global South countries could also be an indication of their limited capacity or priority to invest in AI despite the need [54,55]. Forums like GPAI, G20 and OECD can play a big role in facilitating and empowering such capacity-deficient nations by enhancing their capacities and capabilities in AI. Given the nascent AI capabilities of most countries, the majority of discussions in the studied

international forums are also in their early stages. Like other emerging technologies and their regulations, countries are racing to catch up with the ever-evolving technologies and technological complexities and AI is no exception; policymakers are still debating over the potential impacts and challenges related to AI [56,57]. It is observed that while the focus of most national strategies is promoting domestic innovation and strengthening national capacities, the UNESCO recommendations place more emphasis on SDGs, human rights, privacy, and accountability (Sections 3 and 5). This disconnect is understandable, given that the priorities and mandates of different organisations may be dissimilar; however, in order to incorporate a global framework that is truly germane and adoptable for all countries, policymakers must direct more efforts towards reducing these disconnects and discrepancies by harmonisation of national and global priorities.

Notwithstanding these discrepancies, there are two important policy recommendations that pre-empt the regularisation of global strategies: i) Although there exist international platforms like GPAI, OECD AI Policy Observatory, and other such platforms that engage and expand the discourse surrounding AI regulation and governance, only select countries are part of these platforms. To ensure uniformity and congruence within local and global strategies, a truly global and inclusive platform for AI regulation and governance is the need of the hour. The regulation and governance is especially required for ensuring that appropriate safety, security and privacy measures are incorporated in the new AI-based digital platforms that are being developed. ii) The drafting of such a strategy and a set of rules and standards must be grounded in the inputs from multiple stakeholders, including local governments, academia and private industry across all countries irrespective of their capabilities and ranking. In this regard, platforms like GPAI, as a specialised international forum on AI, can provide crucial research and policy support by being more inclusive. However,

given the possibilities with AI and the effects it will have on all the countries across the globe, a truly global platform would be needed, and a special UN framework convention on AI might be the right way forward. Here, diplomats and policymakers should take leadership in negotiating such a multilateral convention based on agreeable values and principles.

### Conclusion

Amid the rising importance and investment in AI, it has an inevitable influence on both diplomatic discussions and the practice of diplomacy. AI was presented and analysed as an area of international cooperation based on the initiatives of key countries and international forums. It was noted that AI international policy discourse and national strategies for international cooperation-are still in early phases. In the future, AI governance and regulation is expected to be affected by the larger geopolitical discourse. This is because AI is viewed as a critical, strategic technology due to the platforms that can be built using it as well as its economic and military implications. Multilateral forums like GPAI, UNESCO and G20 can play key roles in defining the international rules, norms and standards related to AI and large multinational technology companies are likely to play critical roles defining the contours of AI development; engaging the technology sector, such as through regulatory and incentivized measures, to achieve the national and international AI policy objectives will continue to be a challenge. Overall, AI is already viewed as a crucial matter for diplomatic discussions but whether, in the future, these will be done in the spirit of either cooperation or competition remains to be seen.

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### **Glossary**

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AI - Artificial Intelligence

CAGR - Compound Annual Growth Rate

CSTS - Centre for Studies on Technological Sustainability

EU - European Union

G7 - The Group of Seven

G20 - The Group of Twenty

GDPR - General Data Protection Regulation

GDP - Gross Domestic Product

GII - Global Innovation Index

GPAI - Global Partnership for Artificial Intelligence

ICT - Information and Communications Technology

OECD - Organization for Economic Cooperation and Development

NATO - North Atlantic Treaty Organization

NITI - National Institution for Transforming India

QUAD - Quadrilateral Security Dialogues

SDGs – Sustainable Development Goals

UN - United Nations

UNESCO - United Nations Educational, Scientific and Cultural Organization

## Appendix 1: Bilateral agreements covering AI

Here the bilateral agreements of countries under study are listed. These agreements are either directly related to AI or cover AI in their scope.

### a) India

Sr. No	Party	Date of agreement	Expiry of agreement	Nature of agreement	Link
1	Canada	23/02/2018	23/02/2023	MoU concerning cooperation in the field of STI in areas relating to robotic systems for inspection and control in reactors and remote infrastructure, evolution of algorithms, amongst others	<a href="https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/CA18B3288.pdf">https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/CA18B3288.pdf</a>
2	Denmark	22/05/2019	22/05/2029	Agreement concerning cooperation in the field of STI in areas relating to ICT, applied mathematics and data science and technology, amongst others	<a href="https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/DN18B3419.pdf">https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/DN18B3419.pdf</a>
3	Indonesia	26/05/2018	26/05/2023	MoU concerning cooperation in the field of STI relating to information and communication technology, amongst others	<a href="https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/ID18B3268-1.pdf">https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/ID18B3268-1.pdf</a>
4	Bulgaria	05/09/2018	31/12/2022	Agreement relating to programme of cooperation in STI relating to information and communication technology, amongst others	<a href="https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/BG18B3420.pdf">https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/BG18B3420.pdf</a>
5	Czech Republic	07/09/2018	2022	Work plan for the support of STI joint projects relating to information and communication technologies, amongst others	<a href="https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/CZ18B3481.pdf">https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/CZ18B3481.pdf</a>
6	Uzbekistan	01/10/2018	01/10/2023	Agreement concerning cooperation in the field of STI in areas relating to ICT, applied mathematics and data science and technology, amongst others	<a href="https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/UZ18B3405.pdf">https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/UZ18B3405.pdf</a>
7	Myanmar	11/12/2018	11/12/2021	Work plan for the support of STI joint projects relating to information and communication technologies, amongst others	<a href="https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/MM18B3523.pdf">https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/MM18B3523.pdf</a>
9	Russian Federation	29/09/2019	29/09/2024	MoU in the field of innovation (not to be considered as an international agreement)	<a href="https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/RU19B3661.pdf">https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/RU19B3661.pdf</a>
10	Finland	09/08/2019	09/08/2024	MoU concerning cooperation in the field of STI (smart cities, energy, design and manufacturing, digitalization - ESDM, IoT, AI, etc)	<a href="https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/FI19B3619.pdf">https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/FI19B3619.pdf</a>
11	Swiss Federal Council	13/09/2019		Letter of intent (not an agreement)	<a href="https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/CH19B3621.pdf">https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/CH19B3621.pdf</a>
12	Federal Republic of Germany	01/11/2019		Joint Declaration of Intent for joint cooperation in R&D on AI (not an agreement)	<a href="https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/DE19B3615.pdf">https://www.mea.gov.in/Portals/1/LegalTreatiesDoc/DE19B3615.pdf</a>

13	Federative Republic of Brazil	25/01/2020	31/12/2023	Programme of Science and Technology Cooperation (biotechnology, renewable energy, earth sciences, information and communication technology, etc.)	<a href="https://www.mea.gov.in/Portal/LegalTreatiesDoc/BR20B3666.pdf">https://www.mea.gov.in/Portal/LegalTreatiesDoc/BR20B3666.pdf</a>
14	Italy	06/11/2020		Addendum to the Executive Protocol for Scientific and Technological Cooperation between Italy and India on industrial projects	<a href="https://mea.gov.in/bilateral-documents.htm?dtl/33172/List_of_MoUs_signed_coinciding_with_the_IndiaItaly_Virtual_Summit">https://mea.gov.in/bilateral-documents.htm?dtl/33172/List_of_MoUs_signed_coinciding_with_the_IndiaItaly_Virtual_Summit</a>
15	Australia	04/06/2020		Framework Arrangement on Cyber and Cyber-Enabled Critical Technology Cooperation.(signed)	<a href="https://mea.gov.in/bilateral-documents.htm?dtl/32728/List_of_the_documents_announced_during_India_Australia_Virtual_Summit">https://mea.gov.in/bilateral-documents.htm?dtl/32728/List_of_the_documents_announced_during_India_Australia_Virtual_Summit</a>
16	Portugal	14/02/2020		MOU between VEDA Defence and UA Vision for production of drones  MOU between Hindustan Aeronautics Ltd. and CEiiA in aeronautics.	<a href="https://mea.gov.in/bilateral-documents.htm?dtl/32395/List_of_MoUsAgreements_exchanged_and_announced_during_State_Visit_of_President_of_Portugal">https://mea.gov.in/bilateral-documents.htm?dtl/32395/List_of_MoUsAgreements_exchanged_and_announced_during_State_Visit_of_President_of_Portugal</a>
17	Brazil	25/01/2020		MoU on Cooperation between the Indian Computer Emergency Response Team (CERT-In), Ministry of Electronics and Information Technology (MEITY) of the Republic of India and the General Coordination of Network Incident Treatment Centre, Department of Information Security, Institutional Security, Cabinet of the Presidency of the Federative Republic of Brazil (CGCIIR/DSI/GSI) on cooperation in the area of Cyber Security.	<a href="https://mea.gov.in/bilateral-documents.htm?dtl/32325/List_of_MoUsAgreements_exchanged_during_State_Visit_of_President_of_Brazil_to_India">https://mea.gov.in/bilateral-documents.htm?dtl/32325/List_of_MoUsAgreements_exchanged_during_State_Visit_of_President_of_Brazil_to_India</a>
18	United Kingdom	04/05/2021		Joint Declaration of Intent between UK Department of Culture, Media and Sport and Indian Ministry of Electronics and Information Technology aims to deepen cooperation on emerging technologies, digital infrastructure, and data policies  MoU on cooperation in the field of Telecommunications/ ICT	<a href="https://mea.gov.in/bilateral-documents.htm?dtl/33840/List_of_MoUsDeclarations_agreed_announced_at_the_IndiaUK_Virtual_Summit_May_4_2021">https://mea.gov.in/bilateral-documents.htm?dtl/33840/List_of_MoUsDeclarations_agreed_announced_at_the_IndiaUK_Virtual_Summit_May_4_2021</a>

## b) China

Sr. No	Party	Agreement Date	Expiry Date	Nature of agreement	Link
1	Austria	31/05/2021		Memorandum of Understanding (MoU) on Cooperation between China Science and Technology Exchange Center and the Austrian Research Promotion Agency in information communication, technology connectivity, personnel exchange, commercialization of research results and other areas.	<a href="http://en.most.gov.cn/pressroom/202106/t20210625_175426.htm">http://en.most.gov.cn/pressroom/202106/t20210625_175426.htm</a>
2	Ecuador	23/09/2019	23/09/2024	Agreement relating to programmes of cooperation in the fields of biodiversity, agriculture, ICT and intelligent manufacturing through exchanges of science and technology personnel and joint research, so as to contribute to the progress of science and technology and the improvement of people's livelihood in the two countries.	<a href="http://en.most.gov.cn/pressroom/201912/t20191217_150491.htm">http://en.most.gov.cn/pressroom/201912/t20191217_150491.htm</a>
3	Russia	5/06/2019		MoU to establish China - Russia Research and Technology Innovation Fund  22nd Meeting of S&T Subcommittee of the Chinese-Russian Committee on Preparing Regular Meetings of the Government Heads where several sessions were held including new materials, smart transportation, energy technology and AI. In accordance with the agreement reached by the two sides, the 23rd meeting will be held in China in 2019.	<a href="http://en.most.gov.cn/pressroom/201907/t20190719_147854.htm">http://en.most.gov.cn/pressroom/201907/t20190719_147854.htm</a> <a href="http://en.most.gov.cn/pressroom/201907/t20190719_147855.htm">http://en.most.gov.cn/pressroom/201907/t20190719_147855.htm</a>  <a href="http://en.most.gov.cn/pressroom/201812/t20181218_144152.htm">http://en.most.gov.cn/pressroom/201812/t20181218_144152.htm</a> <a href="https://drive.google.com/drive/folders/1FzxdMXNQevCVHggmKsLd9wWcBEysAVjv?usp=sharing">https://drive.google.com/drive/folders/1FzxdMXNQevCVHggmKsLd9wWcBEysAVjv?usp=sharing</a>
4	Brazil	18/06/2019		Agreement on cooperation in the fields of biotechnology, nanotechnology, smart city, renewable energy, AI, big data, space science and technology, agricultural science and technology, solid state lighting, climate change, ICT and electric vehicles	<a href="http://en.most.gov.cn/pressroom/201907/t20190723_147874.htm">http://en.most.gov.cn/pressroom/201907/t20190723_147874.htm</a>
5	Peru	21/06/2019		MOU on STI Cooperation between MOST China and CONCYTEC Peru in areas such as ICT, renewable energy and rational use of energy, agricultural science and technology, biodiversity, environmental protection, marine resources, fisheries and aquaculture.	<a href="http://en.most.gov.cn/pressroom/201907/t20190724_147901.htm">http://en.most.gov.cn/pressroom/201907/t20190724_147901.htm</a>
6	Austria	09/04/2018 28/02/2019		Memorandum of Understanding on Research Personnel Exchanges between China and Austria  China-Austria Science and	<a href="http://en.most.gov.cn/photonews/201805/t20180515_139511.htm">http://en.most.gov.cn/photonews/201805/t20180515_139511.htm</a>  <a href="http://en.most.gov.cn/pressroom/201907/t20190724_147901.htm">http://en.most.gov.cn/pressroom/201907/t20190724_147901.htm</a>

				Technology Cooperation Work Plan which identified the following areas of cooperation: information communication, quantum information, intelligent manufacturing, healthcare, renewable energy, food, agriculture and biology, and environment and smart city	om/201905/t20190510_146512.htm
7	EU	13/12/2018	2018-2020	Agreement on Cooperation in Science, Technology and Innovation, particularly in the field of civil aviation, agriculture, food and biotechnology, microbial technology, environment and sustainable urbanisation and multilateral cooperation, discussed the overall framework of the roadmap for China-EU cooperation in research and innovation, and deliberated on future cooperation in water resources, artificial intelligence, basic research, health, ocean, space, personnel exchanges and new modalities of cooperation.	<a href="http://en.most.gov.cn/pressroom/201902/t20190226_145271.htm">http://en.most.gov.cn/pressroom/201902/t20190226_145271.htm</a>
8	Montenegro	8/11/2018		Protocol of the Third Session of the Joint Committee on Science and Technology Cooperation Committee of the People's Republic of China and the Republic of Montenegro, particularly in the field of agriculture, geology, ICT, chemistry, etc	<a href="http://en.most.gov.cn/pressroom/201812/t20181225_144312.htm">http://en.most.gov.cn/pressroom/201812/t20181225_144312.htm</a>
9	Norway	6/09/2018		Willingness to strengthen STI cooperation, particularly impact of artificial intelligence, robotics and digital technology on social development	<a href="http://en.most.gov.cn/pressroom/201810/t20181016_142191.htm">http://en.most.gov.cn/pressroom/201810/t20181016_142191.htm</a>
10	Republic of Latvia	18/09/2018		Agreement on Science and Technology Cooperation, drug research and development, material science, ICT, electronics and so on	<a href="http://en.most.gov.cn/pressroom/201811/t20181130_143927.htm">http://en.most.gov.cn/pressroom/201811/t20181130_143927.htm</a>
11	Slovakia	18/09/2018		Memorandum of Understanding on Jointly Sponsoring China-Slovakia Science and Technology Cooperation Projects signed in 2017 and promote the establishment of long-term cooperation platforms, such as joint research centres and laboratories in the fields of material science, ICT, and laser technology	<a href="http://en.most.gov.cn/pressroom/201811/t20181130_143928.htm">http://en.most.gov.cn/pressroom/201811/t20181130_143928.htm</a>
12	Germany	02/03/2018	2018-2022	Agreement between the Government of the People's Republic of China and the Government of the Federal Republic of Germany on Science and Technology Cooperation, national innovation strategies and economic transformation, innovation and bilateral cooperation, AI and future	<a href="http://en.most.gov.cn/pressroom/201803/t20180330_138875.htm">http://en.most.gov.cn/pressroom/201803/t20180330_138875.htm</a>

				cooperation, dialogue on innovation policy, intelligence and innovation of future cities, and intelligent manufacturing and smart services in China and Germany	
13	Slovenia	26/03/2018		Agreement on the 12th Session of the Inter-governmental Committee between the People's Republic of China and the Republic of Slovenia on Cooperation in Science and Technology, approving new bilateral inter-governmental science and technology exchange projects in extensive areas including physics, chemistry, biology, agriculture and food technology, information and communication technology, environmental protection, and materials science	<a href="http://en.most.gov.cn/pressroom/201805/t20180515_139512.htm">http://en.most.gov.cn/pressroom/201805/t20180515_139512.htm</a>
14	Romania	24/04/2018		Protocol of the 43rd Regular Session of the Committee on Science and Technology Cooperation between the People's Republic of China and the Republic of Romania, particularly in the field of biological economy, information and communications, space, energy, environment and climate change, biological nanotechnology, advanced materials and health	<a href="http://en.most.gov.cn/pressroom/201806/t20180608_139936.htm">http://en.most.gov.cn/pressroom/201806/t20180608_139936.htm</a>
15	Bulgaria	06/07/2018		Intergovernmental agreement on science and technology cooperation, in the fields of agriculture, biotechnology, ICT, new materials and etc	<a href="http://en.most.gov.cn/pressroom/201807/t20180718_140733.htm">http://en.most.gov.cn/pressroom/201807/t20180718_140733.htm</a>

### c) Brazil

Sr. No.	Party	Agreement Date	Expiration Date	Nature of Agreement	Link
1	India	25/01/2020	31/12/2023	Programme of Science and Technology Cooperation (biotechnology, renewable energy, earth sciences, information and communication technology, etc. )	<a href="https://www.mea.gov.in/Portal/LegalTreatiesDoc/BR20B3666.pdf">https://www.mea.gov.in/Portal/LegalTreatiesDoc/BR20B3666.pdf</a>
2	India	25/01/2020		MoU on Cooperation between the Indian Computer Emergency Response Team (CERT-In), Ministry of Electronics and Information Technology (MEITY) of the Republic of India and the General Coordination of Network Incident Treatment Centre, Department of Information Security, Institutional Security, Cabinet of the Presidency of the Federative Republic of Brazil (CGCTIR/DSI/GSI) on cooperation in the area of Cyber Security.	<a href="https://mea.gov.in/bilateral-documents.htm?dtl/32325/List_of_MoUsAgreements_exchanged_during_State_Visit_of_President_of_Brazil_to_India">https://mea.gov.in/bilateral-documents.htm?dtl/32325/List_of_MoUsAgreements_exchanged_during_State_Visit_of_President_of_Brazil_to_India</a>
3	China	18/06/2019		Agreement on cooperation in the fields of biotechnology, nanotechnology, smart city, renewable energy, AI, big data, space science and technology, agricultural science and technology, solid state lighting, climate change, ICT and electric vehicles	<a href="http://en.most.gov.cn/pressroom/201907/t20190723_147874.htm">http://en.most.gov.cn/pressroom/201907/t20190723_147874.htm</a>
4	US	16/12/2019	16/12/2020	Agreement relating to the technology safeguards associated with US participation in launch from Alcantara Space Centre	<a href="https://www.state.gov/wp-content/uploads/2020/09/19-1216.1-Nonproliferation-Technology-Safeguards-Brazil-3.18-3.26.2019-TIMS-61004.pdf">https://www.state.gov/wp-content/uploads/2020/09/19-1216.1-Nonproliferation-Technology-Safeguards-Brazil-3.18-3.26.2019-TIMS-61004.pdf</a>
5	Spain	05 July 2018	31 August 2019	Bilateral call to finance projects of technological innovation and the innovative companies in both countries	<a href="http://www.finep.gov.br/cooperation-agreements;">http://www.finep.gov.br/cooperation-agreements;</a> <a href="http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf">http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf</a>
6	Austria	05 July 2018	31 August 2019	Bilateral call to finance projects of technological innovation and the innovative companies in both countries	<a href="http://www.finep.gov.br/cooperation-agreements;">http://www.finep.gov.br/cooperation-agreements;</a> <a href="http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf">http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf</a>
7	Belgium	05 July 2018	31 August 2019	Bilateral call to finance projects of technological innovation and the innovative companies in both countries	<a href="http://www.finep.gov.br/cooperation-agreements;">http://www.finep.gov.br/cooperation-agreements;</a> <a href="http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf">http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf</a>
8	France	05 July 2018	31 August 2019	Bilateral call to finance projects of technological innovation and the	<a href="http://www.finep.gov.br/cooperation-agreements;">http://www.finep.gov.br/cooperation-agreements;</a>

				innovative companies in both countries	<a href="http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf">http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf</a>
9	Germany	05 July 2018	31 August 2019	Bilateral call to finance projects of technological innovation and the innovative companies in both countries	<a href="http://www.finep.gov.br/cooperation-agreements">http://www.finep.gov.br/cooperation-agreements</a> ; <a href="http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf">http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf</a>
10	Netherlands	05 July 2018	31 August 2019	Bilateral call to finance projects of technological innovation and the innovative companies in both countries	<a href="http://www.finep.gov.br/cooperation-agreements">http://www.finep.gov.br/cooperation-agreements</a> ; <a href="http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf">http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf</a>
11	Switzerland	05 July 2018 2009	31 August 2019 -	Bilateral call to finance projects of technological innovation and the innovative companies in both countries  Bilateral Cooperation on Scientific Research and Technological Development, mainly on information and communication technologies	<a href="http://www.finep.gov.br/cooperation-agreements">http://www.finep.gov.br/cooperation-agreements</a> ; <a href="http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf">http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf</a> ; <a href="https://stip.oecd.org/stip/interactive-dashboards/policy-initiatives/2021%2Fdata%2FpolicyInitiatives%2F15660">https://stip.oecd.org/stip/interactive-dashboards/policy-initiatives/2021%2Fdata%2FpolicyInitiatives%2F15660</a>
12	Canada	July 2020	July 2030	Bilateral call to finance projects of technological innovation and the innovative companies in both countries; Framework Agreement Between the Government of Canada and the Government of the Federative Republic of Brazil for Cooperation on Science, Technology and Innovation	<a href="https://nrc.canada.ca/index.php/en/stories/igniting-innovation-through-collaboration-agreement-brazils-national-innovation-organization-creates">https://nrc.canada.ca/index.php/en/stories/igniting-innovation-through-collaboration-agreement-brazils-national-innovation-organization-creates</a> ; <a href="https://www.treaty-accord.gc.ca/text-texte.aspx?id=105145&amp; ga=2.72379920.2046175729.1646140776-1794230724.1646140776">https://www.treaty-accord.gc.ca/text-texte.aspx?id=105145&amp; ga=2.72379920.2046175729.1646140776-1794230724.1646140776</a> ; <a href="https://www.international.gc.ca/country-pays/brazil-bresil/relations.aspx?lang=eng">https://www.international.gc.ca/country-pays/brazil-bresil/relations.aspx?lang=eng</a>
13	EU	August 2007	Renewed until 2022	Science and Technology Cooperation Agreement between the European Community and Brazil, particularly in ICT, interalia	<a href="https://www.lawinsider.com/clause/science-and-technology-cooperation-agreement-between-the-european-community-and-brazil">https://www.lawinsider.com/clause/science-and-technology-cooperation-agreement-between-the-european-community-and-brazil</a> ; <a href="https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=LEGISSUM:4335518">https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=LEGISSUM:4335518</a>
14	Italy	November 2021		Science and Technology Cooperation Agreement, particularly in the field of AI, basic sciences, infectious diseases and obstetrics	<a href="https://www.lodivalcynews.com/italy-and-brazil-science-and-technology-9-cooperation-agreements/">https://www.lodivalcynews.com/italy-and-brazil-science-and-technology-9-cooperation-agreements/</a>
15	Australia	September 2017	-	Science and Technology Cooperation Agreement for all areas of science, technology and innovation may be supported under this Agreement, excluding defence-related activities	<a href="https://www.aph.gov.au/-/media/02_Parliamentary_Business/24_Committees/244_Joint_Committees/JSCT/2018/Science_Technical_Brazil/Treaty_text_-_Brazil.pdf?la=en&amp;hash=43323357D1C21BAB3E95829FFF96E0108722BD81">https://www.aph.gov.au/-/media/02_Parliamentary_Business/24_Committees/244_Joint_Committees/JSCT/2018/Science_Technical_Brazil/Treaty_text_-_Brazil.pdf?la=en&amp;hash=43323357D1C21BAB3E95829FFF96E0108722BD81</a>

## d) Germany

Sr. No.	Party	Agreement Date	Expiration Date	Nature of Agreement	Link
1	India	30/10/2007 01/11/2019		MoU on the creation of Indo-German Science and Technology Centre  Joint Declaration of Intent for joint cooperation in R&D on AI (not an agreement)	<a href="https://www.mea.gov.in/Portal/LegalTreatiesDoc/DE07B0471.pdf">https://www.mea.gov.in/Portal/LegalTreatiesDoc/DE07B0471.pdf</a> ; <a href="https://india.diplo.de/in-en/themen/weitere-themen">https://india.diplo.de/in-en/themen/weitere-themen</a> ;  <a href="https://www.mea.gov.in/Portal/LegalTreatiesDoc/DE19B3615.pdf">https://www.mea.gov.in/Portal/LegalTreatiesDoc/DE19B3615.pdf</a>
2	Canada	16/04/1971	In force	Agreement on Scientific and Technical Cooperation	<a href="https://www.treaty-accord.gc.ca/text-texte.aspx?id=102060&amp;_ga=2.250167119.811410193.1619036315-1476737171.1618838444">https://www.treaty-accord.gc.ca/text-texte.aspx?id=102060&amp;_ga=2.250167119.811410193.1619036315-1476737171.1618838444</a> ; <a href="https://nrc.canada.ca/en/stories/supporting-collaborative-projects-between-canada-germany-artificial-intelligence-value-added">https://nrc.canada.ca/en/stories/supporting-collaborative-projects-between-canada-germany-artificial-intelligence-value-added</a>
3	US	18/02/2020	18/02/2030	S&T collaboration, to address issues of mutual significance including AI infrastructure and data access, sharing, and management, quantum technologies; advanced energy science and technologies (e.g., in fusion materials, artificial photosynthesis, and advanced battery technologies); health security research, including during outbreaks; and the bioeconomy.	<a href="https://www.state.gov/joint-statement-on-german-u-s-science-and-technology-cooperation/">https://www.state.gov/joint-statement-on-german-u-s-science-and-technology-cooperation/</a> ; <a href="https://www.dhs.gov/xlibrary/assets/agreement_us_germany_sciencetech_cooperation_2009-03-16.pdf">https://www.dhs.gov/xlibrary/assets/agreement_us_germany_sciencetech_cooperation_2009-03-16.pdf</a>
4	South Africa (through EU)	15/12/2021	In force	Science and technology cooperation agreement	<a href="https://ec.europa.eu/info/sites/default/files/research_and_innovation/strategy_on_research_and_innovation/documents/za_roadmap_2018.pdf">https://ec.europa.eu/info/sites/default/files/research_and_innovation/strategy_on_research_and_innovation/documents/za_roadmap_2018.pdf</a> ; <a href="https://esastap.org.za/wp-content/uploads/2021/06/Focus-Areas-for-better-Coordination-and-Strengthening-of-European-Research-and-Innovation-Cooperation-Programmes-with-South-Africa.pdf">https://esastap.org.za/wp-content/uploads/2021/06/Focus-Areas-for-better-Coordination-and-Strengthening-of-European-Research-and-Innovation-Cooperation-Programmes-with-South-Africa.pdf</a> ; <a href="https://www.nrf.ac.za/south-africa-and-germany-renew-science-technology-agreement/">https://www.nrf.ac.za/south-africa-and-germany-renew-science-technology-agreement/</a>
5	Japan	20/03/2011  28/04/2016	In force	Science and Technology Cooperation Agreement  Joint statement Regarding Japan-Germany Cooperation on IoT/Industrie 4.0	<a href="https://eeas.europa.eu/headquarters/headquarters-homepage/19229/eu-japan-science-and-technology-relations_en">https://eeas.europa.eu/headquarters/headquarters-homepage/19229/eu-japan-science-and-technology-relations_en</a>  <a href="https://www.meti.go.jp/english/press/2016/0428_04.html">https://www.meti.go.jp/english/press/2016/0428_04.html</a>

6	China	02/03/2018	2018-2022	Agreement on Science and Technology Cooperation, national innovation strategies and economic transformation, innovation and bilateral cooperation, AI and future cooperation, dialogue on innovation policy, intelligence and innovation of future cities, and intelligent manufacturing and smart services in China and Germany	<a href="http://en.most.gov.cn/pressroom/201803/t20180330_138875.htm">http://en.most.gov.cn/pressroom/201803/t20180330_138875.htm</a>
7	Spain	29/07/2021	In force	Memorandum of Understanding to exchange best practices in the field of self-sovereign digital identity at technical, regulatory and operational level	<a href="https://www.bundesregierung.de/breg-de/suche/germany-and-spain-and-join-forces-on-the-development-of-a-cross-border-decentralised-digital-identity-ecosystem-1947302">https://www.bundesregierung.de/breg-de/suche/germany-and-spain-and-join-forces-on-the-development-of-a-cross-border-decentralised-digital-identity-ecosystem-1947302</a>
8	Belarus	26/11/2015	In force	Agreement on Science and Technology Cooperation, in the field of information and communication technologies, biotechnologies, new materials and energy	<a href="http://gknt.gov.by/en/news/2015/belarus-and-germany-discussed-the-prospective-areas-of-scientific-and-technical-cooperation/">http://gknt.gov.by/en/news/2015/belarus-and-germany-discussed-the-prospective-areas-of-scientific-and-technical-cooperation/</a>
9	South Korea (through EU)	04/11/2021	In force	Agreement on building a Gaia-X Hub in Korea (A project initiated by Europe, focusing on Germany, to respond to the data ecosystem currently led by U.S. companies like Amazon and Google, and secure data sovereignty and self-determination. It aims to build a global standard by establishing rules and technology infrastructure needed for data sharing.)	<a href="https://www.ajudaily.com/view/20211104155515369">https://www.ajudaily.com/view/20211104155515369</a> ; <a href="https://mss.go.kr/common/board/Download.do?bcIdx=1029876&amp;cbIdx=244&amp;strelFileNm=7722f325-4edf-45f6-b2e5-9320b01a7cc7.pdf">https://mss.go.kr/common/board/Download.do?bcIdx=1029876&amp;cbIdx=244&amp;strelFileNm=7722f325-4edf-45f6-b2e5-9320b01a7cc7.pdf</a>
10	France	22/01/2019	In force	Franco-German Cooperation and Integration;  a roadmap for a Franco-German Research and Innovation Network on artificial intelligence	<a href="https://www.diplomatie.gouv.fr/en/country-files/germany/events/article/french-german-declaration-of-toulouse-16-oct-19">https://www.diplomatie.gouv.fr/en/country-files/germany/events/article/french-german-declaration-of-toulouse-16-oct-19</a>
11	Poland	22/04/2021	In force	Polish-German border and regional cooperation Agreement	<a href="https://uni.wroc.pl/en/an-important-cooperation-agreement-with-helmholtz-zentrum/">https://uni.wroc.pl/en/an-important-cooperation-agreement-with-helmholtz-zentrum/</a> ; <a href="https://nawa.gov.pl/en/nawa/news/new-opportunities-for-students-and-scientists-from-poland-and-germany">https://nawa.gov.pl/en/nawa/news/new-opportunities-for-students-and-scientists-from-poland-and-germany</a> ;
12	West Balkan States	2012	2023	Promotion of EU Integration, by placing emphasis on vocation training for digitalization process	<a href="https://www.giz.de/en/worldwide/31773.html">https://www.giz.de/en/worldwide/31773.html</a>
13	Brazil	05 July 2018	31 August 2019	Bilateral call to finance projects of technological innovation and the innovative companies in both countries	<a href="http://www.finep.gov.br/cooperation-agreements">http://www.finep.gov.br/cooperation-agreements</a> ; <a href="http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf">http://www.finep.gov.br/images/chamadas-publicas/2018/CallText_Brazil_Final_05072018.pdf</a>

14	Columbia	14.04.2011		Cooperation agreement for Vocational education and training in the field of automobile, food, textile industries and aviation sector	<a href="https://www.bibb.de/en/54561.php">https://www.bibb.de/en/54561.php</a> <a href="https://www.bibb.de/en/press/emitteilung_525.php">https://www.bibb.de/en/press/emitteilung_525.php</a>
15	Singapore (through EU)	13/02/2019		Joint Declaration on Enhanced Partnership between the Republic of Singapore and the Federal Republic of Germany in the field of engineering, electronics, ICT, environmental technology, chemicals, logistics and transport, biomedical sciences, and services	<a href="https://www.bundesregierung.de/Content/EN/Artikel/2004_2007/2005/12/Anlagen/germany-singapore-declaration926847.doc?__blob=publicationFile&amp;v=1">https://www.bundesregierung.de/Content/EN/Artikel/2004_2007/2005/12/Anlagen/germany-singapore-declaration926847.doc?__blob=publicationFile&amp;v=1</a> ; <a href="https://trade.ec.europa.eu/doclib/press/index.cfm?id=1980">https://trade.ec.europa.eu/doclib/press/index.cfm?id=1980</a>
16	Australia	24/08/1976		German-Australian Cooperation on Industrie 4.0: Australia-Germany Treaty on Science and Technology Cooperation on IoT standardisation in international standardisation fora	<a href="https://www.industry.gov.au/sites/default/files/2019-03/german-australian-cooperation-on-industrie-4.0.docx">https://www.industry.gov.au/sites/default/files/2019-03/german-australian-cooperation-on-industrie-4.0.docx</a>
17	Mexico	23/04/2018	In force	MoU on cooperation Industrie 4.0 and digital policy, particularly in relation to industrial cybersecurity, international standardization, Industrie 4.0 test labs, internet governance, regulatory and international policy and governance reform	<a href="https://www.plattform-i40.de/IP/Redaktion/DE/Downloads/Publikation-gesamt/deutschland_mexiko_Declaration_intent.pdf?__blob=publicationFile&amp;v=2">https://www.plattform-i40.de/IP/Redaktion/DE/Downloads/Publikation-gesamt/deutschland_mexiko_Declaration_intent.pdf?__blob=publicationFile&amp;v=2</a>
18	Italy	18/01/2017	In force	A joint agreement identifies the three areas of cooperation: standardisation, SME support and labour, education and training.  Trilateral cooperation between Italy, Germany and France on Digitizing the Manufacturing Industry Common Position on “Data Ownership“	<a href="https://www.plattform-i40.de/IP/Redaktion/EN/Standardartikel/international-cooperation-trilateral-2018.html">https://www.plattform-i40.de/IP/Redaktion/EN/Standardartikel/international-cooperation-trilateral-2018.html</a> <a href="https://www.plattform-i40.de/IP/Redaktion/DE/Downloads/Publikation-gesamt/Vereinbarung_deutsch_italienische_Kooperation.html">https://www.plattform-i40.de/IP/Redaktion/DE/Downloads/Publikation-gesamt/Vereinbarung_deutsch_italienische_Kooperation.html</a> ; <a href="https://www.plattform-i40.de/IP/Redaktion/EN/Downloads/Publikation/wg3-trilaterale-coop2.pdf?__blob=publicationFile&amp;v=4">https://www.plattform-i40.de/IP/Redaktion/EN/Downloads/Publikation/wg3-trilaterale-coop2.pdf?__blob=publicationFile&amp;v=4</a>
19	Czech Republic	August 2016	In force	Bilateral research cooperation between the German Research Center for Artificial Intelligence (DFKI) and the Czech Institute of Informatics, Robotics and Cybernetics (CIIRC)	<a href="https://www.plattform-i40.de/IP/Navigation/EN/ThePlatform/Structure-Organization/InternationalCooperation/Czech-Republic/czech-republic.html">https://www.plattform-i40.de/IP/Navigation/EN/ThePlatform/Structure-Organization/InternationalCooperation/Czech-Republic/czech-republic.html</a>
20	Netherlands	11/10/2018	In force	MoU on cooperation Industrie 4.0 and digital policy, particularly in relation to industrial cybersecurity, international standardization, Industrie 4.0 test labs, internet governance, regulatory and international policy and governance reform	<a href="https://www.plattform-i40.de/IP/Redaktion/EN/Downloads/Publikation/smart-industry-nl-agreement.pdf?__blob=publicationFile&amp;v=4">https://www.plattform-i40.de/IP/Redaktion/EN/Downloads/Publikation/smart-industry-nl-agreement.pdf?__blob=publicationFile&amp;v=4</a>

e) US

Sr.No	Party	Agreement Date	Expiration date	Nature of agreement	Link
1	Lithuania	26/02/2019	25/06/2028	Agreement for Scientific and Technological Cooperation, including including medicine and public health, technology and innovation, procedures for transfer of data and technology, and transfer and use of equipment, materials, including human biological specimens, environmental and other samples, and funds, and other relevant issues	<a href="https://www.state.gov/wp-content/uploads/2019/04/19-226-Lithuania-Scientific-Cooperation.pdf">https://www.state.gov/wp-content/uploads/2019/04/19-226-Lithuania-Scientific-Cooperation.pdf</a>
2	Brazil	16/12/2019	16/12/2020	Agreement relating to the technology safeguards associated with US participation in launch from Alcantara Space Centre	<a href="https://www.state.gov/wp-content/uploads/2020/09/19-1216.1-Nonproliferation-Technology-Safeguards-Brazil-3.18-3.26.2019-TIMS-61004.pdf">https://www.state.gov/wp-content/uploads/2020/09/19-1216.1-Nonproliferation-Technology-Safeguards-Brazil-3.18-3.26.2019-TIMS-61004.pdf</a>
3	Japan	01/01/2020	Termination by notice	Agreement concerning digital trade	<a href="https://www.state.gov/wp-content/uploads/2021/05/20-101.1-Japan-Trade-and-Investment-Digital-Trade-10.7.2019.pdf">https://www.state.gov/wp-content/uploads/2021/05/20-101.1-Japan-Trade-and-Investment-Digital-Trade-10.7.2019.pdf</a>
4	Japan	03/08/2020		Agreement relating to Cooperative research in the field of Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance capabilities (C4ISR capacities)	<a href="https://www.state.gov/wp-content/uploads/2021/04/20-803-Japan-Defense-C4ISR.pdf">https://www.state.gov/wp-content/uploads/2021/04/20-803-Japan-Defense-C4ISR.pdf</a>
5	Canada	12-13/01/2021	In force	Agreement between the Government of Canada and the Government of the United States of America concerning the Operation of Commercial Remote Sensing Satellite Systems	<a href="https://www.treaty-accord.gc.ca/details.aspx?language=eng&amp;id=103522&amp;t=637818680160488866">https://www.treaty-accord.gc.ca/details.aspx?language=eng&amp;id=103522&amp;t=637818680160488866</a> ; <a href="https://www.treaty-accord.gc.ca/text-texte.aspx?lcid=1033&amp;id=103522&amp;t=637818705085560253">https://www.treaty-accord.gc.ca/text-texte.aspx?lcid=1033&amp;id=103522&amp;t=637818705085560253</a>
6	Germany	18/02/2020	18/02/2030	S&T collaboration, to address issues of mutual significance including AI infrastructure and data access, sharing, and management, quantum technologies; advanced energy science and technologies (e.g., in fusion materials, artificial photosynthesis, and advanced battery technologies); health security research, including during outbreaks; and the bioeconomy.	<a href="https://www.state.gov/joint-statement-on-german-u-s-science-and-technology-cooperation/">https://www.state.gov/joint-statement-on-german-u-s-science-and-technology-cooperation/</a> ; <a href="https://www.dhs.gov/xlibrary/assets/agreement_us_germany_sciencetech_cooperation_2009-03-16.pdf">https://www.dhs.gov/xlibrary/assets/agreement_us_germany_sciencetech_cooperation_2009-03-16.pdf</a>

## Appendix 2: Data for Figures 1-5.

India			
Countries	GDP per capita ranking	HDI	GII
Canada	24	16	17
Denmark	36	10	6
Indonesia	16	107	85
Bulgaria	69	56	35
Czech Republic	12	48	24
Uzbekistan	144	106	86
Myanmar	208	147	129
Russia	11	52	47
Finland	42	11	7
Swiss	2	2	1
Germany	19	6	10
Brazil	12	84	62
Australia	21	8	23
Portugal	47	38	31
United Kingdom	26	13	4

China			
Countries	GDP per capita ranking	HDI	GII
Austria	26	18	19
Ecuador	63	86	91
Russia	11	52	47
Brazil	12	84	62
Peru	83	82	76
EU	-	106	86
Montenegro	73	48	49
Norway	8	1	20
Latvia	43	37	36
Slovakia	40	39	39
Germany	19	6	10
Slovenia	33	22	32
Romania	51	49	46
Bulgaria	69	56	35

Brazil			
Countries	GDP per capita ranking	HDI	GII
India	144	131	46
China	79	85	14
US	13	17	3
Spain	38	25	30
Austria	26	18	19
Belgium	23	14	22
France	29	26	11
Germany	19	6	10
Netherlands	16	8	5
Swiss	2	2	1
Canada	24	16	17
Italy	34	29	28
Australia	21	8	23

Germany			
Countries	GDP per capita ranking	HDI	GII
India	144	131	46
Canada	24	16	17
US	13	17	3
South Africa	92	114	60
Japan	32	19	16
China	79	85	14
Spain	38	25	30
Belarus	69	53	64
South Korea	36	23	5
France	27	26	12
Poland	46	26	38
Brazil	12	84	62
Columbia	85	83	68
Singapore	4	11	8
Australia	21	8	23
Mexico	70	74	55
Italy	34	29	28
Czech Republic	12	48	24
Netherlands	16	8	5

United States of America			
Countries	GDP per capita ranking	HDI	GII
Lithuania	41	34	40
Brazil	12	84	62
Japan	32	19	16
Canada	24	16	17
Germany	19	6	10