# Intellectual Property in the Indo-Pacific

## Introduction

The geopolitical challenges raised by ever-increasing amounts of wealth stored in Intellectual Property are flaring up. According to the S&P index for the 5 largest global companies by market cap, intangible intellectual property assets have skyrocketed in total company valuation: from 17% of total valuation in those companies in 1975; to 84% of total valuation in 2020[1]. The Aon report highlights that Intellectual property rights are rapidly becoming a key basis of wealth; and adds that "... wealth is not a thing. It's an act. Wealth is the commodification of an act of exclusion — an act we call property rights." [2]And in the midst of the global Intellectual Property gold rush, Asia is the major regional player. Patents filings from China, Korea and India alone propelled the region over the 2/3rd threshold of all global patents filings in 2022[3].

A new, geographically constrained wealth storage of this magnitude, whose operationalization relies on excluding others from its use through law, is bound to create geopolitical tensions. As M. Kenney puts it, "Intellectual property has long loomed as a potent element in national security strategies, but with the proliferation of advances in technology in recent decades, it has now become a central focus of geopolitical rivalry, especially between the US and China"[4]. If the Indo-Pacific is being conceived as "a strategy of countries concerned about China's growing economic influence in the immense space that stretches from the Indian Ocean to the Pacific Ocean"[5], then looking at Intellectual Property production, instrumentation and wealth creation in China, as well as Indo-Pacific Countries positioning and reactions to Chinese influence, becomes increasingly important to the reader seeking to understand the region's economic dynamics.

Yet, among the many Indo-Pacific Strategies and Frameworks put forward by countries, there is no "Indo-Pacific Intellectual Property Strategy". Mentions of Intellectual Property are limited to the recurrent accusations of IP theft between the United States and China starting in the Trump administration[6]. Indo-Pacific Technology strategies do not extensively mention the legal property frameworks in place to protect technology, in spite of the crucial and decisive nature of legal systems on innovation. However, Intellectual Property as a framework is not limited to its theft, and cannot be defined only by its results in terms of innovation. Intellectual Property's rising economic magnitude, combined with the state-centric nature of intellectual property law, begs numerous questions: what of Intellectual Property production and country-level strategies in the Indo-Pacific? Can we evidence Intellectual Property trends and composition shifts on a regional level, as a reaction to China's rise? If so, what are the key explaining factors and implications for the Indo-Pacific region?

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1 The Aon report, *Intangible Assets Strategy, Capital Markets and Risk Management*, https://www.aon.com/thought-leadership/ponemoninstitutereport.jsp

2 Has Wealth Gone Digital? Blair Fix (October 1, 2019). https://economicsfromthetopdown.wordpress.com/2019/10/01/has-wealth-gonedigital/

3 World Intellectual Property Organisation (WIPO), Worldwide IP Filings Reached New All-Time Highs in 2021, Asia Drives Growth (November 1, 2022) https://www.wipo.int/pressroom/en/articles/2022/article_0013.html

4 Margaret Kenney, *Intellectual Property as National Security: The Case of AI in the Indo-Pacific*, Global Asia, December 2022 (Vol.17 No.4)

5 PowerPoint, Session 1 of the course

6 Kenneth Holland (2021) Canada and the Indo-Pacific Strategy, Canadian Foreign Policy Journal, 27:2, 228-250, DOI: 10.1080/11926422.2021.1880949

While this introduction points out an apparent gap in the frameworks put out by countries regarding Intellectual Property, the aim of this paper is to give a snapshot of the main phenomenon evidential by quantitative data on the region's patents trends. The data may seem at first quite descriptive, yet this snapshot could influence a -likely upcoming- new pillar of Indo-Pacific Strategies.

**Paper outline and findings**

The first part of this paper will aim at determining the amount of generated Intellectual Property in the Indo-Pacific through patent grant numbers. We find that China, at first glance, seems to lead innovation and surpass all other major players, as measured by the number of patent applications. But when we "deflate" patent numbers to account for lower standards of patent entry, China is no longer accounting for the majority of patents in Asia. Instead, we observe great multipolarity of patent production between China, Japan, Korea, India and Australia. Far from being outrun by one monopolistic player, dynamic and fiercely competitive innovative industries battle within the Indo-Pacific for patents.

This competition seems intensified in specific sectors. We analyze detailed patent composition numbers for countries available: Australia, China, Hong Kong, Japan, the Philippines and Korea. We find that China presents a balanced profile in terms of category of innovation, suggesting overall technological progress. However, the geopolitical implications deepens when we evidence patterns of "reactionary spending" on R&D as a pushback to Chinese IP competition for certain countries. When Chinese Gross domestic expenditure on R&D (GERD) as a percentage of GDP increases, Korean, US, EU27 and Taiwanese budgets increase as well from 2015 to 2020. Depending on the country, between 76% and 98% of the variance in R&D expenditure is explained by Chinese R&D expenditure changes.

However, we also find that this "reactionary spending" in R&D is driven mainly by private companies, and not governments, which complicates attempts to evidence geopolitical competition intent. Our paper concludes that the coming securitization of firms, and their geo-economic instrumentation, may shift the paradigm from firm-led IP competition to proxy-led country-competition in the field of Intellectual Property. We put forward some of the implications of the findings for the Indo-Pacific as a region.

## I) PATENT PRODUCTION SNAPSHOTS IN THE INDO-PACIFIC: CONDITIONAL MULTIPOLARITY

### Patent production and filing: an overview

"Intellectual Property", as a creation of the mind of some sort, is generally subdivided into different kinds[7]:

-patents (inventions with an industrial application with a very high level of protection),
-trademarks (guarantee to a consumer that a product being bought is linked to a specific shop)
-copyrights (protects artistic value)
-know-how (applies to ways of operating production processes which may be bought or sold)

For the purposes of this paper, we will exclude know-hows, copyrights and trademarks from the analysis. This is partly due to lack of reliable information on registration in the WIPO database, copyrights and know-hows not requiring mandatory registration and therefore not being accounted for. Trademarks tend to represent a considerable volume of applications worldwide, and may give useful insights on trading or commercial practices, but are not exactly relevant to the notion of innovation or knowledge economy impacts.

Patents present several advantages for our analysis. Firstly, because it is in the interests of innovating firms and actors to get adequate protection for their IP, we can assume that they apply for the kind of protection corresponding to the nature of the innovation. Because we have no reason to think that, for example, an industrial innovation would be registered as a copyright, data about applications would be "true" to the kind of innovation taking place in one particular country.

The second ease of analysis comes from international patent systems. The World Intellectual Property Organisation (WIPO, based in Switzerland), is in charge of receiving filings, administering the 26 international IP treaties and resolving IP disputes among its 193 member countries. The only states that do not possess WIPO membership currently are states with limited recognition (Taiwan), Kosovo, Micronesia, Palau and South Sudan[8]. Though national laws do complexify IP rights, the the presence of such a large and ubiquitous international governing body will provide us with a trustworthy statistical source. Given that patents are the most codified form of IP rights, for which registration is necessary in all circumstances, we can assume that the data we collect from WIPO would be "true" to the quantity of innovation taking place in one particular country.

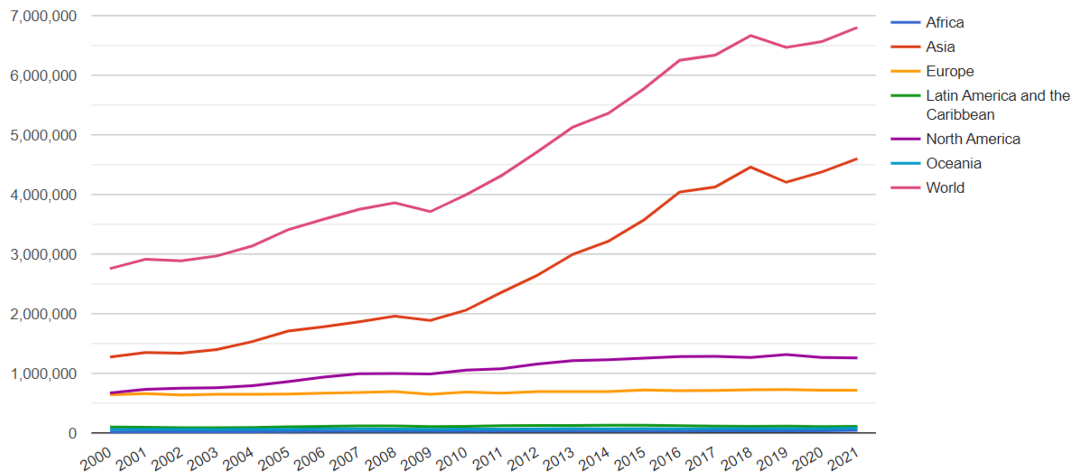
The table below will paint a broad picture of registration specificities, rights granted, specificities tied to the Indo-Pacific region and consequences in terms of analysis for our paper for patent rights. The rights granted by patent obtentions, whatever the kind of patent and whatever the country of origin (also referred to in IP rights as the "filing office"), protect for a duration of 20 years from the earliest filing date.

[7] World Intellectual Property Organization (WIPO) Index, https://www.wipo.int/portal/en/index.html
[8] World Intellectual Property Organization (WIPO) Statistics Data center, (Feb. 23 update) https://www3.wipo.int/ipstats/

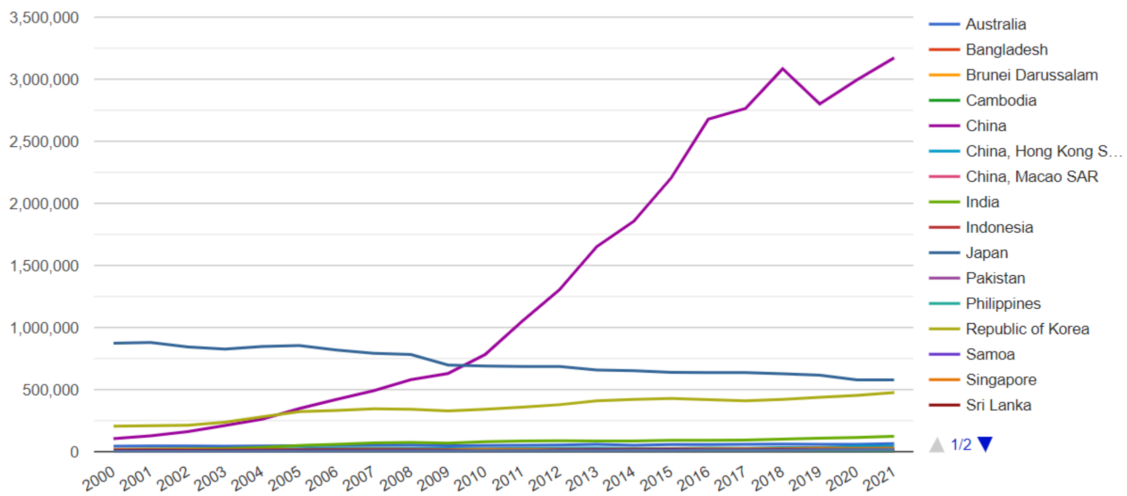
| | Coverage | Standards to meet |
|---|---|---|
| Invention Patents | Protect **inventions of products or industrial processes**, highest standards for obtention and protection | Must meet 3 standards: Absolute novelty (invention not known to the public before), represent notable progress, and have practical applicability (can produce effective result), though level of the standards varies between countries. |
| Utility models | Protect **smaller technical improvements**, generally improvements over a pre-existing innovation | Must meet 3 standards:Absolute novelty, a lower standard for notable progress, and have practical applicability. |
| Design patents | Protect **creative innovations** in the appearance or aesthetic of a product | Must meet the absolute novelty standard, have an element of creativity, and present no conflict with prior rights |

We should note that, though coverage, standards and obtentions are smoothed out universally, there are different standards for fulfilling the "notable progress step" between China, the EU and the US. High standards are in place for the EU: to be a notable progress, the invention must not be obvious to a person skilled in the art. Medium standards are in place for the US: to be a notable progress, the invention must help an ordinary unskilled person solve a problem. Low standards are in place for China: to be a notable progress, the invention should involve a degree of progress in the state of the art. Applicants prove to the filing office that they fulfill the requirements, but the decision to grant a patent is ultimately at the country's office or WIPO discretion. Both filing routes are possible for applicants, as WIPO receives applications regardless of citizenship. But the lower standards for granting patents for mainland China filing offices than in the EU/US may slightly overinflate granted patents statistics for China compared to granted patent statistics in other parts of the world.

**State of Patent applications in the Indo-Pacific: The first look: China leading innovation?**



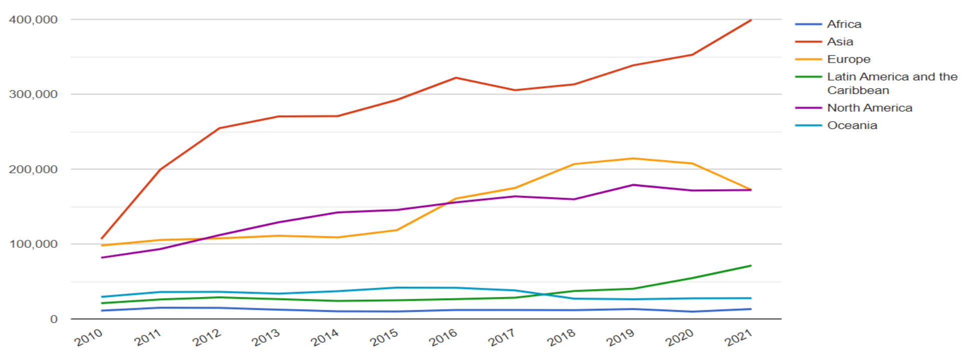
The evolution of total patent applications (direct to the country filing's office as well as through the international PCT system) by region of the world from 2000 to 2021 show that Asia is leading the global increase in patent applications, while other regions are stagnating. The highest line, which represents world total patent applications evolution, seems to be determined largely by the second highest line, Asia's share in total patent applications.




When looking closer at Asia patent applications, China is the main driving force behind patent applications increase, surpassing South Korea in 2005 and Japan in 2009. In spite of small increases, outliers in the Indo-Pacific are not picking up total patent application numbers, while China is still progressing.

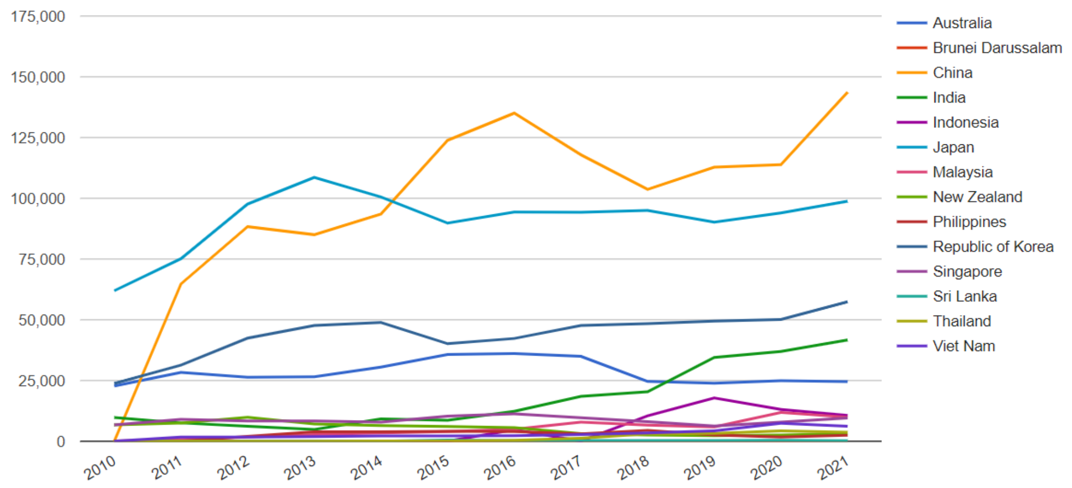
One could however object that the inflation of patent application numbers is due to lower standards for acceptance of patent applications in China (see table 1), as well as domestic incentives for encouraging applicants, that inflate the numbers of applications and de-link them from actual innovations.

This graphic presents the number of patents granted through entering the PCT national phase entry, process whereby WIPO verifies the legitimacy of domestically obtained patents, checks for infringement on other pre-registered rights, and grants what is closest to "international patent rights". If we consider the number of PCT national phase entry patents granted as representative of uninflated and thoroughly checked innovation, the graph does moderate the sheer numbers of the first look. Asia is still leading the way, but curves are closer together, with Europe becoming the second source of granted patents in 2016.



**Going beyond the first look: the multipolarity of IP production in the Indo Pacific**

If we keep digging into the PCT national phase entry granted by WIPO, the number however paints a completely different picture. "Asia" is leading the way in international patents, but this time not because of China alone, but because of the aggregation of multiple countrie's obtention numbers.




The number of granted PCT patents have increased dramatically in China starting in 2010, but has surpassed Japan only in 2014. Japan maintained its number of granted patents, with Korea in third place. India's numbers are continuously rising while Australia slightly declines. Overall, as of 2021, China obtained only 34,9% of the PCT patents granted for that year, Japan holding 24%, Korea 13,9%, India 10,1%, and Australia 6%. This paints a picture of multipolarity of the location of industrial innovation production, far from our first snapshot related to Chinese dominance.

**The conditionalities of knowledge economies**

All of the aforementioned countries leading granted PCT patent numbers have put forward declarations of intent to shift to "knowledge economies". Japanese Prime Minister Kishida Fumio has used the concept in his 2022 "Integrated Innovation Strategy"[9] ,Chinese leader Xi Jinping has spoke out to encourage "indigenous innovation"[10], India's Prime Minister Narendra Modi has laid the foundations of several localized "sciences parks" aiming to foster the "knowledge economy"[11]. While Korea has allegedly completed the transition towards "knowledge-based growth"[12], other countries

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[9] Japanese Government's Cabinet Public Affairs Office, *Integrated Innovation Strategy 2022: Making Great Strides Toward Society 5.0,* https://www.japan.go.jp/kizuna/2022/06/integrated_innovation_strategy.html

[10] Stanford DigiChina Lab, *Xi Jinping: 'Strive to Become the World's Primary Center for Science and High Ground for Innovation'* ( March 18, 2021) https://digichina.stanford.edu/work/xi-jinping-strive-to-become-the-worlds-primary-center-for-science-and-high-ground-for-innovation/

[11]Press Trust of India, *India's first digital science park aims to transform Keralo into knowledge economy*, (April 25, 2023) https://yourstory.com/2023/04/indias-first-digital-science-park-aims-to-transform-kerala

[12] Suh, Joonghae; Chen, Derek H. C. (2007) *Korea as a Knowledge Economy : Evolutionary Process and Lessons Learned*. WBI Development Studies. Washington, DC: World Bank.

such as Australia struggle with inscribing knowledge capital into competitive industries[13]. It seems like, in spite of multipolarity and differences in innovation production, all major players ascribe to the same idiom. But what is the "knowledge economy"?

"Knowledge economy", also known as "knowledge capitalism", is defined as "a new capitalist phase of development emerging in the eighties of the 20th century, in which knowledge valorization becomes the principal productive force of economic growth".[14] Ever since its popularization by Peter Drucker in his 1966 book *The effective executive*, the knowledge economy has -under its different names- been hailed as the "post-industrial" future of developed economies[15]. If it is generally accepted in political economy that products and services based on knowledge-intensive activities contribute to an accelerated pace of technical and scientific advance[16]. As such the "knowledge economy" *leitmotiv* was adopted among "rich democracies" in Europe and the United States, and is now increasingly popular among Asian countries. As has been pointed out in 2019, "The knowledge economy is presented as a way of a radical societal transformation to achieve both higher and sustainable economic growth, and as a way out of the predicament of increasing resource scarcity and climate disruption"[17].

Though "knowledge economies" are presented as a global overhaul of our economic systems, they rely on inherently geographical constraints. The literature on the shift from Global Value Chains (GVCs) to Global Wealth Chains (GWCs) illustrate the conditionality of successful value extraction based on Intellectual Property[18]. It is because other parts of the value chain are underpaid that IP firms "innovating" the final product are able to realize wealth capture.

This dual logic of exclusion constitutes what has been dubbed the "knowledge economy". Firms decide to extract wealth from Global Value Chain differentials, while legal Intellectual Property (IP) systems allow, encourage or discourage them to do so, depending on country-level strategies. In a nutshell, states decide to grant and enforce monopolies over intellectual property, just as firms decide to claim those rights as individual strategies to weaken competitors and gain larger market shares.

The state-centered nature of domestic Intellectual Property law skews multipolarity towards competition among the major players rather than cooperation. If Intellectual property in companies can only indeed generate profit through the exclusion of one part of their value chain and weakened competitors, then country-level strategies towards "knowledge economies" entail state-backed Intellectual Property exclusions towards other competing states.

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[13] The News Daily, *Our Transformation Towards a Knowledge Economy continues: why don't we feel rich?*, Oct 5, 2022, https://thenewdaily.com.au/opinion/2022/10/15/the-stats-guy-knowledge-economy/

[14] Sergio Ordóñez, and Carlos Sánchez. *Knowledge Capitalism, Globalization, and Hegemony: Toward a Socio-Spatial Approach.* World Review of Political Economy, vol. 7, no. 1, 2016, pp. 4–28. Accessed 10 Feb. 2023.

[15]Corporate Finance Institute, *What is the Knowledge Economy?* (December 2022), https://corporatefinanceinstitute.com/resources/economics/knowledge-economy/

[16] Powell, Walter W., and Kaisa Snellman, *The Knowledge Economy,* Annual Review of Sociology, vol. 30, 2004, pp. 199–220. *JSTOR*, http://www.jstor.org/stable/29737691

[17] Lukas Rezny, James Buchanan White, Petra Maresova, *"The knowledge economy: Key to sustainable development?"*, Structural changes and Economic dynamics, Volume 51, December 2019, p.291-300

[18] Seabrooke, Leonard, and Duncan Wigan. "Global Wealth Chains in the International Political Economy." *Review of International Political Economy*, vol. 21, no. 1, 2014, pp. 257–63. *JSTOR*, http://www.jstor.org/stable/24673071

## II) PATENT COMPOSITION: EVIDENCING REACTIONARY FUNDING

**Decomposing Patent Composition: Understanding shifting IP power centers in the Indo Pacific**

To use data for meaningful analysis of the region's composition patterns, we ought to look at patent publications by technology.

The WIPO database developed 35 classifications "labels" or "families" for patents by technology[19], which are presented below:

Electrical energy
Audio-visual technology
Telecommunications
Digital communication
Basic communication proc.
Computer technology
IT methods for management
Semiconductors
Optics
Measurement
Analysis of biological materials
Control
Medical technology
Organic fine chemistry
Biotechnology
Pharmaceuticals
Polymers
Food chemistry
Basic materials chemistry
Materials, metallurgy
Surface technology, coating
Chemical engineering
Environmental technology
Handling
Machine tools
Engines, pumps, turbines
Textile and paper machines
Other special machines
Thermal processes
Mechanical elements
Transport
Furniture, games
Other consumer goods
Civil engineering

We use the WIPO working document (ref) linked to make sense of these classifications and analyze them in-depth: labels 1-8 are related to electrical engineering, 9-13 are innovations through instruments, 14-24 are innovations in the field of chemistry, 25-32 are related to mechanical engineering, and 33,34, 35 are "other" fields, for furniture, games, consumer goods and civil engineering.

The WIPO database does not allow us to visualize patents by subgroups. We synthesize all the number of patents granted ourselves, of all kinds, for years 2015-2021, for each country and kind of technology patented. Due to the constraints of data collection and reporting, which differ for each country, we can only analyze Australia, China, Hong Kong, Japan, the Philippines and Korea. We will show here the state of this cumulated IP production for each country.

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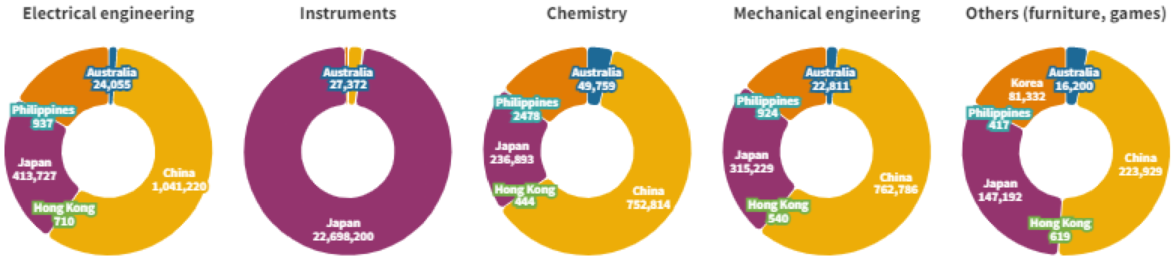
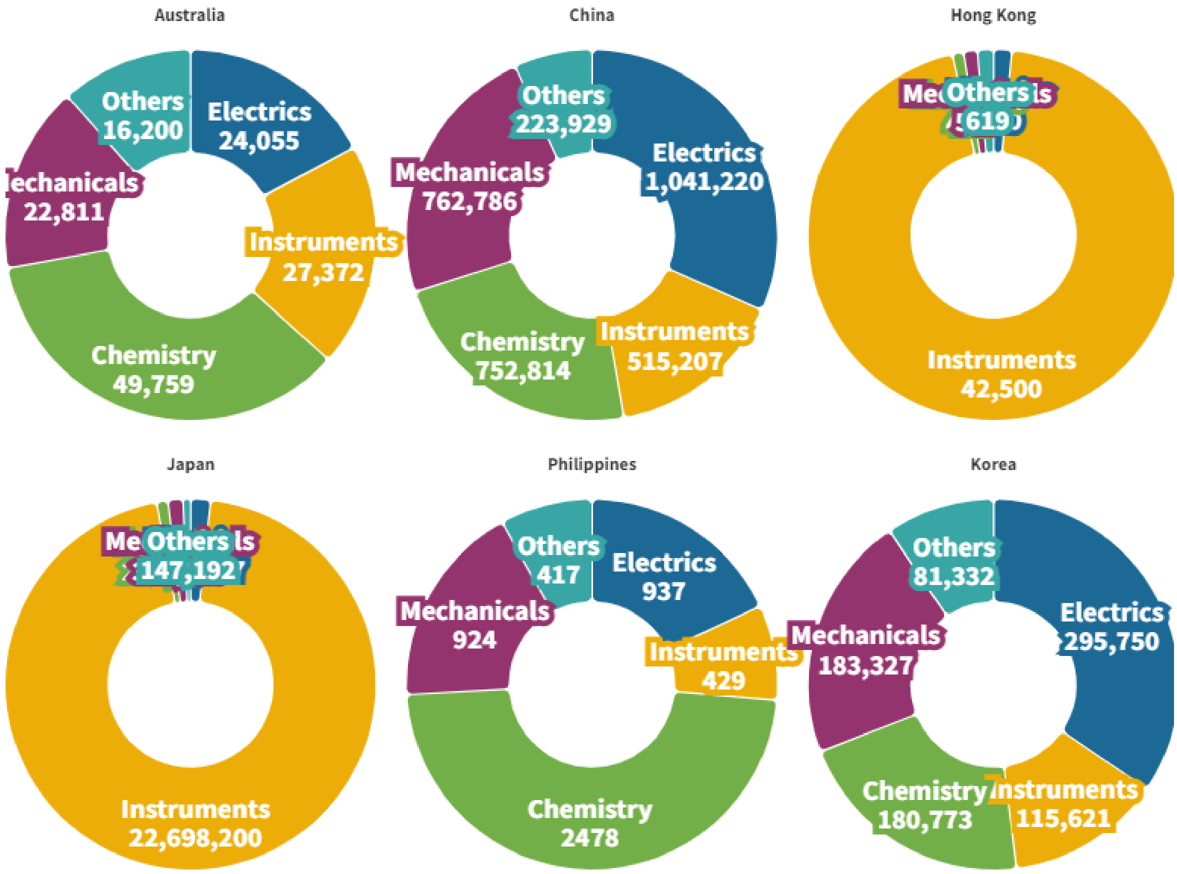
[19] Ulrich Schmoch, Final Report to the World Intellectual Property Organisation (WIPO), *Concept of a Technology Classification for Country Comparisons* (June 2008) https://www.wipo.int/export/sites/www/ipstats/en/docs/wipo_ipc_technology.pdf




*Repartition of cumulative patent production 2015-2021 by kind of technology developed*

If we transpose the categories and analyze production by country:




These graphs show China as a major producer of patents in almost every field but instruments, where they are surpassed by Japan. China's country profile presents a balanced amount of sectors for which patents are granted. This implies that innovation takes place in a variety of sectors, in opposition to intensive industry-led or state-led focus on one sector.

**Evidencing reactionary IP funding**

If patent wealth is becoming increasingly geopolitical, are we seeing reactionary patterns between Indo-Pacific allies to counter China's increasing patent depositions?

We will use the OECD library and their international co-operation in IP datasets[20] to answer the question.

The first indicator we look at is Gross domestic expenditure on R&D (GERD) as a percentage of GDP. We have 9 countries for which data is available: Australia, Japan, Korea,New Zealand, United States, EU27,China, Singapore and Taiwan, for years 2015-2020. The indicator is defined as the total expenditure (current and capital) on R&D carried out by all resident companies, research institutes, university and government laboratories, etc., in a country. It includes R&D funded from abroad, but excludes domestic funds for R&D performed outside the domestic economy. This indicator is measured as the percentage of GDP in USD constant prices.

| | Australia | Japan | Korea | New Zealand | United States | EU27 | China | Singapore | Taiwan |
|---|---|---|---|---|---|---|---|---|---|
| 2015 | 1.88 | 3.24 | 3.98 | 1.23 | 2.79 | 2.00 | 2.06 | 2.17 | 3.00 |
| 2016 | .. | 3.11 | 3.99 | .. | 2.85 | 1.99 | 2.10 | 2.07 | 03.09 |
| 2017 | 1.79 | 3.17 | 4.29 | 1.35 | 2.91 | 02.03 | 2.12 | 1.90 | 3.19 |
| 2018 | .. | 3.22 | 4.52 | .. | 03.01 | 02.07 | 2.14 | 1.81 | 3.35 |
| 2019 | 1.80 | 3.21 | 4.63 | 1.40 | 3.18 | 2.11 | 2.23 | 1.89 | 3.49 |
| 2020 | .. | 3.27 | 4.81 | .. | 3.45 | 2.19 | 2.40 | .. | 3.63 |

Though the data is sparse, we still stumble onto an interesting result if we run correlation tests. While Australia, New Zealand, Singapore and Japan do not react significantly to Chinese R&D budget changes, there are significant large positive relationships between Korea, US, EU27 and Taiwan R&D budgets and Chinese R&D budget increases.

| | Pearson correlation coefficient between domestic and Chinese R&D expenditure | P-value | Covariance |
|---|---|---|---|
| Korea | 0.8757 | 0.02223 | 0.03716 |
| United States | 0.9901 | 0.0001479 | 0.03023 |
| EU27 | 0.9676 | 0.001562 | 0.00909 |
| Taiwan | 0.9281 | 0.007561 | 0.02785 |

[20] OECD(2021), « *Indicators of international co-operation (2019 Edition)* », OECD Patent Statistics, https://doi.org/10.1787/b0b70fc7-en

In other words, when Chinese Gross domestic expenditure on R&D (GERD) as a percentage of GDP increases, Korean, US, EU27 and Taiwanese budgets increase as well from 2015 to 2020. Since this correlation is not observed for Japan and New Zealand, which have increased their expenditure on R&D through the years, this phenomena may not be pinned on a context of general increased spending on R&D. Instead, this may indicate what we call “reactionary spending”, whereby resident companies, research institutes, university and government laboratories increase investment as a reaction to competition by China.

Lack of reactionary dimensions of R&D spending might be explained in different ways. Australia and Singapore have declined over the years in terms of gross domestic expenditure on R&D as a percentage of GDP, which may translate focus on other economic areas and therefore explain lower sensitivity of IP competition. New Zealand and Japan have increased their gross domestic expenditure on R&D, but their lack of sensitivity to Chinese competition may be explained by data that is too sparse or, in the case of Japan, a so far unchallenged IP concentration in instruments.

If we run linear regressions to try and discern a causal link between Chinese R&D expenditure and other countries:

| Country | R-squared value | Translation |
|---|---|---|
| Korea | R-squared=0.7668 | 76% of the variance of Korean expenditure is explained by Chinese expenditure changes |
| United States | R-squared=0.9802 | 98% of the variance of US expenditure is explained by Chinese expenditure changes |
| EU27 | R-squared=0.9362 | 93% of the variance in EU expenditure is explained by Chinese expenditure changes |
| Taiwan | R-squared=0.8614 | 86% of the variance in Taiwanese expenditure is explained by Chinese expenditure changes |

The variance links are strong, even if sparse datasets may limit the strength of the analysis. This leads us to the interesting conclusions of the table, where we can indeed evidence “reactionary” funding of R&D as a reaction to Chinese R&D budgets.

Of course, the main question remains about the intentionality of such spending. Is the variance attributable to resident companies and private research institutes in Korea/the US/Europe/Taiwan upping their spending in reaction to Chinese R&D investment? In which case, the explanatory effects of the correlations abide by traditional models of economic competition between transnational firms seeking to retain and gain future market share. Or is the change led by university and government laboratories, or tax incentives for private company R&D, which could reflect deliberate intent of these governments at countering Chinese innovation share?

### Government efforts in R&D

We will use the OECD indicator "Percentage of Gross domestic expenditure on R&D (GERD) financed by the government" from 2015 to 2020 to run a similar analysis. According to the 2015 Frascati manual, this indicator is synthesized to reflect the level of effort in the field of R&D investment made by each government, including direct funding of public research institutes and fiscal/funding incentives for private R&D bodies. Our aim is to get a picture that is as independent as possible from regular transnational firm-level reactions to other competing Chinese firms. Instead, we wish to see if national governments decide to up their own R&D spending as a reaction to Chinese patent production. To better reflect threat perception levels, we will use the number of Chinese direct and PCT patents granted from year to year instead of our previous measure of total R&D changes. Indeed, the GERD indicator is absent for China, due to the statistical difficulty of delineating clearly where private R&D funding begins and where public R&D support ends.

Percentage of GERD financed by government

| | Total Patent grants for China | Japan | Korea | New Zealand | United States | EU27 | Singapore | Taiwan |
|---|---|---|---|---|---|---|---|---|
| 2005 | 53,305 | 16.8 | 23.0 | 43.2 | 30.4 | 35.6 | 35.7 | 31.5 |
| 2015 | 359,316 | 15.4 | 23.7 | 37.1 | 24.7 | 32.1 | 38.3 | 21.2 |
| 2016 | 404,208 | 15.0 | 22.7 | .. | 23.2 | 31.2 | 39.3 | 21.4 |
| 2017 | 420,144 | 15.0 | 21.6 | 36.3 | 22.5 | 30.1 | 37.8 | 19.8 |
| 2018 | 432,147 | 14.6 | 20.6 | .. | 21.9 | 30.0 | 37.9 | 18.8 |
| 2019 | 452,804 | 14.7 | 20.7 | 31.1 | 20.7 | 29.8 | 36.6 | 18.1 |

There are no significant correlations anywhere in the dataset. The main insight of the table is that percentages of government-financed R&D had dropped everywhere (but Singapore), outpaced by privately-financed R&D efforts.

### Shifts in public/private R&D dynamics

We know that Australia, New Zealand, Singapore and Japan do not increase their total R&D expenditure as a reaction to Chinese R&D spending, whereas Korea, US, EU27 and Taiwan R&D expenditure react strongly to Chinese innovation. However, a more in-depth analysis reveals that the composition of this total R&D expenditure has shifted: almost all governments invest less over the years and represent less percentage of total R&D efforts, which are increasingly down to private companies. This means that the observed reactionary effect of Korea, the US, the EU and Taiwan to Chinese innovation is indeed real, but driven mainly by private companies eager to preserve market share of securitized intellectual property.

This observation is consistent with the general literature, even if it is rarely quantified for countries in the Indo-Pacific. As Ivanova observed in 2019, " the development of knowledge-intensive sectors in the world economy is largely determined by the activities of private companies, consistently increasing their R & D expenditures. As a result, the path of catching-up development, which was followed by developing countries at the beginning of the XXI century, is replaced by a stage of direct competition and attempts to enter the path of advanced development. The leading role in this struggle is played by private companies."[21]

This gap can be attributed to a leftover passive attitude at the national level towards the private realm. "Most countries are technology-takers rather than technology-makers, and historically most have taken a passive approach to the technologies they deploy, including in critical national infrastructure. However, that's changing quickly. Whereas commercial imperatives once ruled supreme, states are now increasingly concerned with the implications of technology for governance, civil liberties, geopolitics, data protection and privacy, national security, ethics and trust."[22].

## Conclusion

At first sight, China seems to be driving patent production numbers in Asia. However, more detailed measures of patent types hint at the multipolarity of patent production in the Indo-Pacific. This multipolarity has been reflected in several Indo-Pacific country's displayed policy goals of a shift to "knowledge economies". The reality of Intellectual Property wealth creation systems would skew this multipolarity towards inter-country competition rather than cooperation, yet we do not have substantial evidence to suggest that this competition is instigated by Indo-Pacific governments themselves. Instead, private companies seem to be leading the competitive struggle, whilst governments have divested from R&D funding between 2005 and 2019.

The difference in nature and the interplay between private and public R&D endeavors complexify attempts to evidence governmental intent to counter China's Intellectual Property rise. Our finding is however not incompatible with the geopolitical and geographical nature of our inquiry about Intellectual Property. In the technological field, studies have shown that national governments were able to utilize and direct firm power towards their own IP goals. For example, Chinese companies becoming more competitive has "threatened both the commercial dominance of US companies as well as the geopolitical power of the US state", and as a reaction "the US has sought to shrink the 'geo-economic space' available to Huawei by using its firms, such as Google, to disrupt Huawei's supply chains"[23]. This is only one of the many examples of a new kind of risk for firms: "geopolitical risk", which have garnered increased attention from business consulting firms after the Covid-19 pandemic. McKinsey wrote, in 2021: "The challenges that geopolitical risks create will get worse. In the next two decades, competition for global influence is likely to reach its highest level since the Cold War"[24]. ControlRisks evidences rising fears for American and US firms of " greater scrutiny of the national security implications of sourcing technology"[25], as well as rising pressures to securitize

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[21] Ivanova, N. and Z. A. Mamedyarov (2019) "*R&D and innovation:competition is growing*" World Economy and International Relations

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supply chains. There is no doubt that the coming "securitization" of private companies, and their increased instrumentalization in national geoeconomics plans could change the game of IP competition. Our findings may indicate that in-depth research about IP competition in the Indo-Pacific will need to account for governmental proxy usage of private companies to elaborate any kind of future Indo-Pacific Intellectual property strategy.