Nature or Science: What Google Trends says

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Abstract: *Nature* and *Science* are two major multidisciplinary journals, well-known among the general public and highly-cited by scholarly communities. This article presents Google Trends, a web service providing detailed information on the Google search behavior of Internet users from all countries during the period 2004-2019 and illustrates the preference between *Nature* and *Science*. The research shows a general decrease of the demand for both journals and reveals a substantial growth in demand for *Nature* in some geographic regions and a decline of the interest to *Science* in many regions. We also found a better affinity to *Nature* by the general audience and a better affinity to *Science* in former USSR scholarly allies. This situation is explained on one hand by the editorial policy of the two journals and on the other hand by the influence of the cold war and its aftermath on worldwide scientific societies and the ongoing interest in research areas in different geographic regions.

Keywords: Google Trends, Nature journal, Science journal

Introduction

For years, *Nature* (1869-present) and *Science* (1880-present) have played a central role in the development and enhancement of scientific discoveries (Kaneiwa, et al., 1988; Reich, 2013). They continually publish highly influential research publications introducing several Nobel Prize winning discoveries (Harzing, 2013; Van Noorden, Maher, & Nuzzo, 2014) and involving outstanding contributions to science areas (Van Noorden, Maher, & Nuzzo, 2014), particularly multidisciplinary ones (Solomon, Carley, & Porter, 2016; Ioannidis, 2006). The interesting publications are not restricted to research articles. In fact, *Nature* and *Science* editorials have also contributed to the evolution of scientific policies and behaviors by highlighting the main challenges, limitations and matters in scientific research over the years (Waaijer, van Bochove, & van Eck, 2010; Waaijer, van Bochove, & van Eck, 2011; Waaijer, 2013). *Nature* and *Science* also publish highly cited letters to the editor providing novel discoveries or innovative future directions for research efforts through the integration and discussion of the outcomes of research publications (Turki, Hadj Taieb, & Ben Aouicha, 2018). An example of such a letter is the one by Hans Selye introducing stress research and published in *Nature* in 1936 (Selye, 1936; Szabo, Tache, & Somogyi, 2012). Currently, *Nature* and *Science* are among the most prestigious journals in the world (Ioannidis, 2006). Authors of publications in the two journals are considered as Nobel-class scientists (Reich, 2013) and most institutions

publishing in these journals are usually considered as top-level research organizations (Liu, Cheng, & Liu, 2005). This situation urged several institutions to massively recruit highly cited scientists (Turki, Ben Aouicha, & Hadj Taieb, 2019) or to provide exceptional rewards for successful publishing in *Nature* or *Science* (Fuyuno & Cyranoski, 2006; Quan, Chen, & Shu, 2017) to ameliorate their representation in the two journals. *Nature* and *Science* are often criticized for their editorial process that has opposed many groundbreaking scientific findings (Campanario M. , 1993; Campanario J. M., 2009), especially for their relatively low acceptance rates (Sugimoto, Larivière, Ni, & Cronin, 2013) and their quest for branding rather than scientific quality (Schekman, 2013; Emmer, 2019).

The unique situation of these major periodicals has encouraged scientific communities for years to analyze the reasons, circumstances and effects of the general and scholarly interest in *Nature* and *Science* using classical techniques. Statistical analysis of bibliographic metadata of *Nature* and *Science* publications allowed the assessment of the evolution of topic coverage (Arkhipov, 1999), the types (Kalita, 2016) and the geographical distribution (Bornmann, Leydesdorff, Walch-Solimena, & Ettl, 2011; Kato & Ando, 2017) of the publications of the two journals. Applying Natural Language Processing techniques on the full texts and descriptive data of the publications of the two journals were also useful to identify the topic dynamics of *Nature* and *Science* publications and then to quantify the contributions of issued topics to scientific knowledge and policies (Waaijer, van Bochove, & van Eck, 2011; Waaijer, 2013). Citation analysis of *Nature* and *Science* papers or authors permitted the analysis of the development of the impact of the two journals (Liang & Rousseau, 2008; Kalita, 2016) and the study of the factors behind the impact of published works such as editorial delay (Shen, Rousseau, Wang, Zhu, Liu, & Liu, 2015; Lin, Hou, & Wu, 2016), adopted research areas (Gates, Ke, Varol, & Barabási, 2019), multidisciplinarity (Solomon, Carley, & Porter, 2016), and author careers (Emmer, 2019).

By the internet age, new alternative metrics (so-called *Altmetrics*) have emerged to assess the general and scientific attention to research outputs (Piwowar, 2013). These metrics include mentions and interactions in social media and downloads of metadata and full texts among other measures and have the advantages to be tracked in real time and to be analyzed by category of users and region (Piwowar, 2013; Trueger, Thoma, Hsu, Sullivan, Peters, & Lin, 2015). That is why they can be useful when coupled to bibliometrics and citation analysis to explain the features of scientific behaviors (Piwowar, 2013; Trueger, Thoma, Hsu, Sullivan, Peters, & Lin, 2015), particularly the interest in *Nature* and *Science*. Effectively, scientific tweets are effective to assess how readers interpret research publications issued by *Nature*, *Science* and other journals (Thelwall, Tsou, Weingart, Holmberg, & Haustein, 2013). As well, the dynamic timely analysis of the download rates for *Nature* publications is efficient highlight the correlation between the attention received by Nature papers and their publication patterns (Wang, Mao, Xu, & Zhang, 2014). Also, mentions of *Nature* articles in social networks are useful to study the social interest in *Nature* and the impact of social media mentions on the citedness of the publications of the journal (Xia, Su, Wang, Zhang, Ning, & Lee, 2016).

In this article, we analyze the Google search statistics of *Nature* and *Science* between 2004 and 2019 as provided by Google Trends to relatively assess the development of general and scientific interest and affinity to the two journals over the years.

Methods

Google Trends (https://trends.google.com) is a web service launched in 2006 to visualize Google search statistics for terms based on queries entered into Google search engine (Vaughan & Chen, 2015). These statistics include the evolution of relative search volume for the period over time, the interest to the term by region and the mostly used related search queries and can be refined by restricting the report to a specific period (Hours, days, months or years), category of users (Health, science…) or region (Country or city) as shown in Fig. 1 (Vaughan & Chen, 2015). The website can also generate a comparative analysis of the Google search data of two to five terms under the same settings (Vaughan & Chen, 2015).
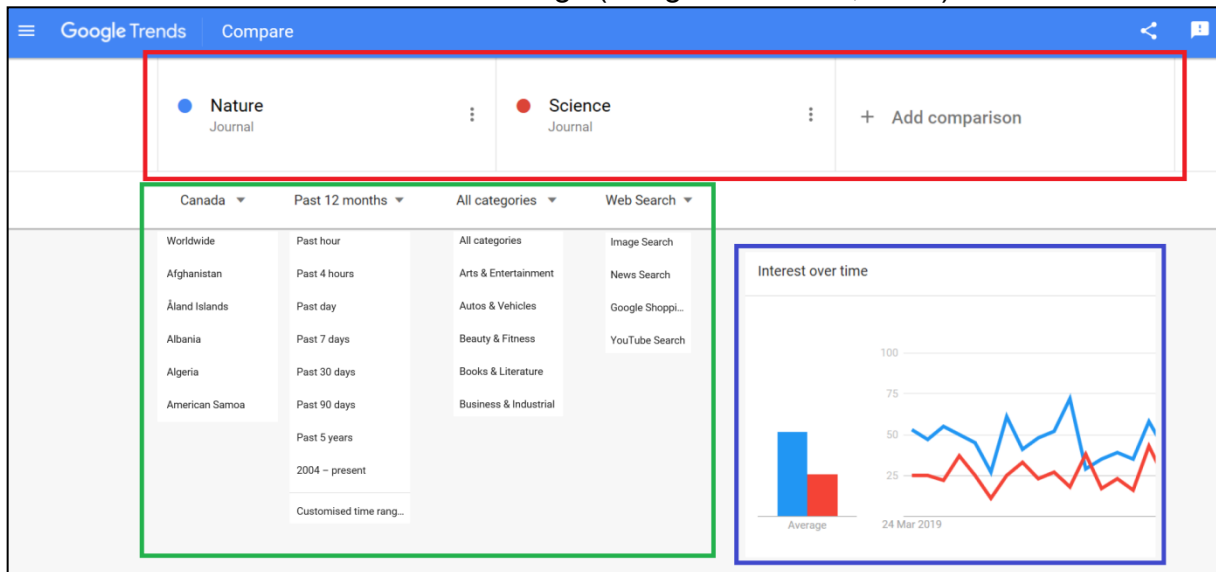

Figure 1: Web interface of Google Trends (https://trends.google.com): Compared terms (in red) and Filters (in green)

These features allowed Google analytics tool to have useful applications in many fields including data science, medicine, economics and politics (Jun, Yoo, & Choi, 2018). In Scientometrics, Google Trends has been proved as efficient to rank research institutions for the global attention to them (Vaughan & Chen, 2015), to compare the worldwide interest to the different scientific disciplines (Papavlasopoulos, 2019), to study the emerging trends and the evolution of a scientific field or a research area (Omar, Mehmood, Choi, & Park, 2017), and to identify and study sleeping beauties in science (Zhang, Xu, & Zhao, 2017).

This research retrieved the Google search statistics of *Nature* and *Science* journals between 2004 and 2019 from Google Trends on October 9, 2019. We used "All categories" filter to have information about the general interest to the two journals. Then, we restricted the statistics to "Science" category to analyze the interest of scientific communities to the two periodicals (Table 1). For each studied category, the obtained data consists of the plot of the evolution of the rate of Google search queries for each journal over time and geographical maps highlighting the rates of Google search queries related to each journal for all countries and the compared breakdown of the Google queries for each journal by nation. We also extracted the geographical maps of interest for each journal and the ones of the comparative interest to the two journals for the periods 2004-2008, 2009-2013 and 2014-2019 to study in-depth the regional dynamics of the interest of general and scientific audience for *Nature* and *Science*. Google Trends statistics are built upon the Google Knowledge Graph technology to avoid the consideration of odd search queries and are based on the computation of the quotient of the number of Google search queries

related to the studied item divided by the overall number of Google search queries for each time slot, region and category of users (Siliverstovs & Wochner, 2018). All the statistics returned by Google Trends in this study for each country are consequently relative to the extent of usage of Google search engine and are not volumes of Google searches related to *Nature* and *Science* journals.

Table 1 : Used Google Trends queries to assess the interest of Internet users to *Nature* and *Science*

Target audience		General audience	Scientific audience
Compared entities	Entity 1	🔵 Nature Journal	
	Entity 2	🔴 Science Journal	
Filters	Country	Worldwide	
	Period	2004-present	
	Category	All categories	Science
	Google property	Web search	

Results and discussion

Since 2004, the rate of Google search queries related to *Nature* and *Science* has significantly and continually decreased as shown in Fig. 2. This can be explained by the fall of the obsession of general audience and scholarly communities to read and get published in the two journals due to the boycott and criticism led by several Nobel prize winners and highly cited scientists against *Nature* and *Science* to protest the editorial process of the two journals (Sample, 2013; Schekman, 2013) and the appearance of new trendy research journals such as *Science Advances* and *PLoS One* having extremely short editorial delays, providing open access option for a low cost and taking the quality of submitted papers instead of their predicted impact as a criterion for publication (Björk, 2015). In fact, the two journals are blamed for resisting Nobel-class discoveries for years (Campanario M. , 1993; Campanario J. M., 2009) and for working to promote their brands and subscription sales instead of trying to enhance science (Schekman, 2013). Despite the fall of interest to the two journals, there are several peaks of interest to the two journals that occur in each October and to a lesser extent in each March-April as shown in Fig. 2. The October peak corresponds to the beginning of the scholarly year where research scientists have to decide their research project and the March-April peak corresponds to the beginning of the last term of the scholarly year where scientists should manage to publish the outcomes of their works to close their research projects (University of Oxford, 2019).
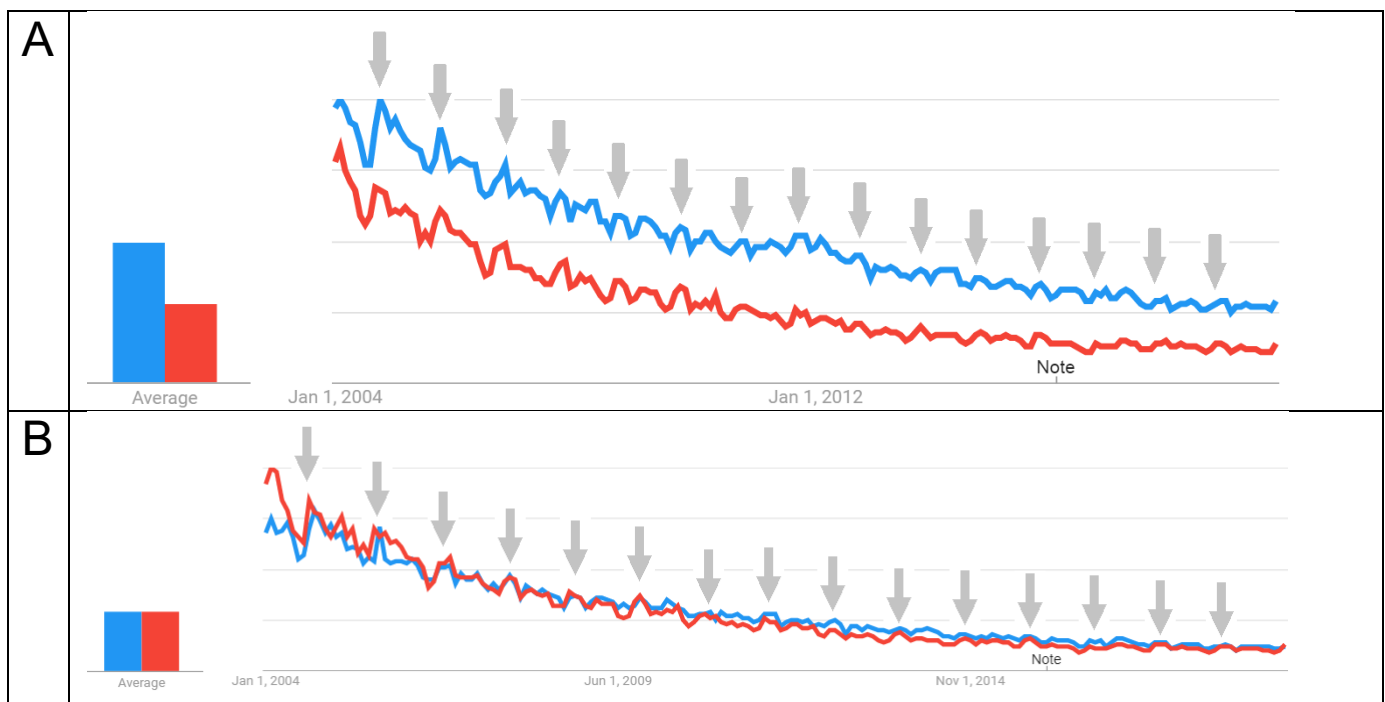
Figure 2: Interest over time to *Nature* (in blue) and *Science* (in red) from 2004 to present according to Google Trends for all IP addresses (A) and for the IP addresses of scientific institutions (B). Gray arrows correspond to peaks of interest to *Nature* and *Science* occurring every October.

The interest to *Nature* by scientific communities seems to be similar to the one to *Science* (Fig. 2B). However, general audience does not have this neutral behavior and shows more interest to *Nature* (Fig. 2A). This higher attention to *Nature* by Google users is mainly explained by the higher interest of Internet users to medicine and biological sciences. In fact, people using Google search engine are more interested in searching Medicine and Biological sciences (Papavlasopoulos, 2019); quite all the best mentioned *Nature* publications in social media like Facebook and Twitter are related to Biological Sciences (Xia, Su, Wang, Zhang, Ning, & Lee, 2016), and most of the best tweeted research publications deal with medical and biological issues (Vainio & Holmberg, 2017).

Although the two journals have quite the same disciplinary distribution in the past (Kaneiwa, et al., 1988), *Nature* has significantly increased its proportion of human biology-related and biomedicine-related publications since the 1960s and has reduced its space allocated to several basic sciences such as Inorganic Chemistry (Arkhipov, 1999; Gates, Ke, Varol, & Barabási, 2019; Monastersky & Van Noorden, 2019). Nowadays, 53% of Nature publications are about Biochemistry, Genetics, Medicine and Molecular Biology (Kalita, 2016). As well, *Nature* currently includes a significantly larger number of citations and highly cited papers than *Science* in Microbiology, Molecular biology and Genetics while *Science* involves a significantly higher number of citations and highly cited papers than *Nature* in Cognitive Science, Chemistry, Multidisciplinary fields and Plant and Animal Science (Ioannidis, 2006; Solomon, Carley, & Porter, 2016).

Preference between Nature and Science

The analysis of the preference between the two journals among the general audience by region confirms the findings shown in Fig. 2A and revealed that people in most countries tend to search for *Nature* more than *Science* (Fig. 3). In fact, as shown in Fig. 3, only Italy and a few countries in Eastern Europe (except Russian Federation,

Turkey, the Balkans, Latvia and Belarus), Eastern Africa and Central and South America still have a better affinity for *Science*. In the mid-2000s, more countries from these regions as well as China, Libya, Yemen, Botswana, Zimbabwe, South Korea, Namibia and Uzbekistan were more interested in *Science*. However, most of these countries have gradually shifted their attention from *Science* to *Nature* in the last years (Fig. 3). The reportedly increasing interest to *Nature* since 2014 in China should be considered with care as Google Trends data badly reflects the tendencies of Chinese people due to Google censorship in this nation (Yang, 2016). In Libya and Yemen, the situation is different as the fall of general interest in *Science* was not correlated by a raise of the limited general interest to *Nature* (Fig. 3).
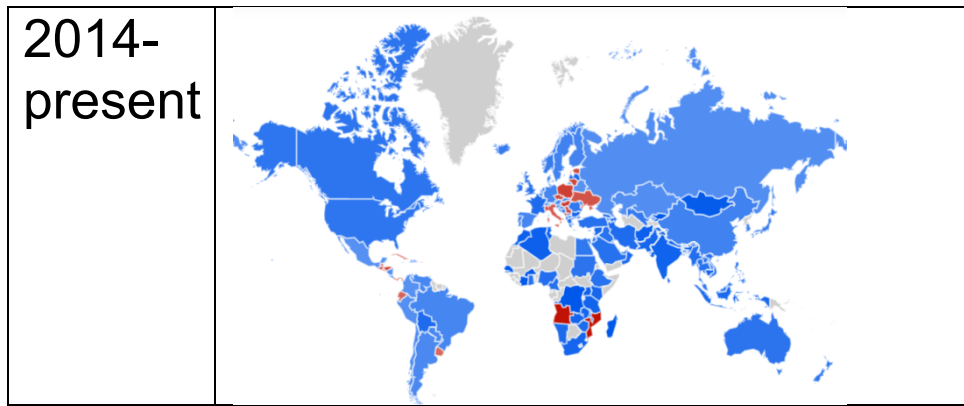
	All categories (All IPs)
2004-present	
2004-2008	
2009-2013	
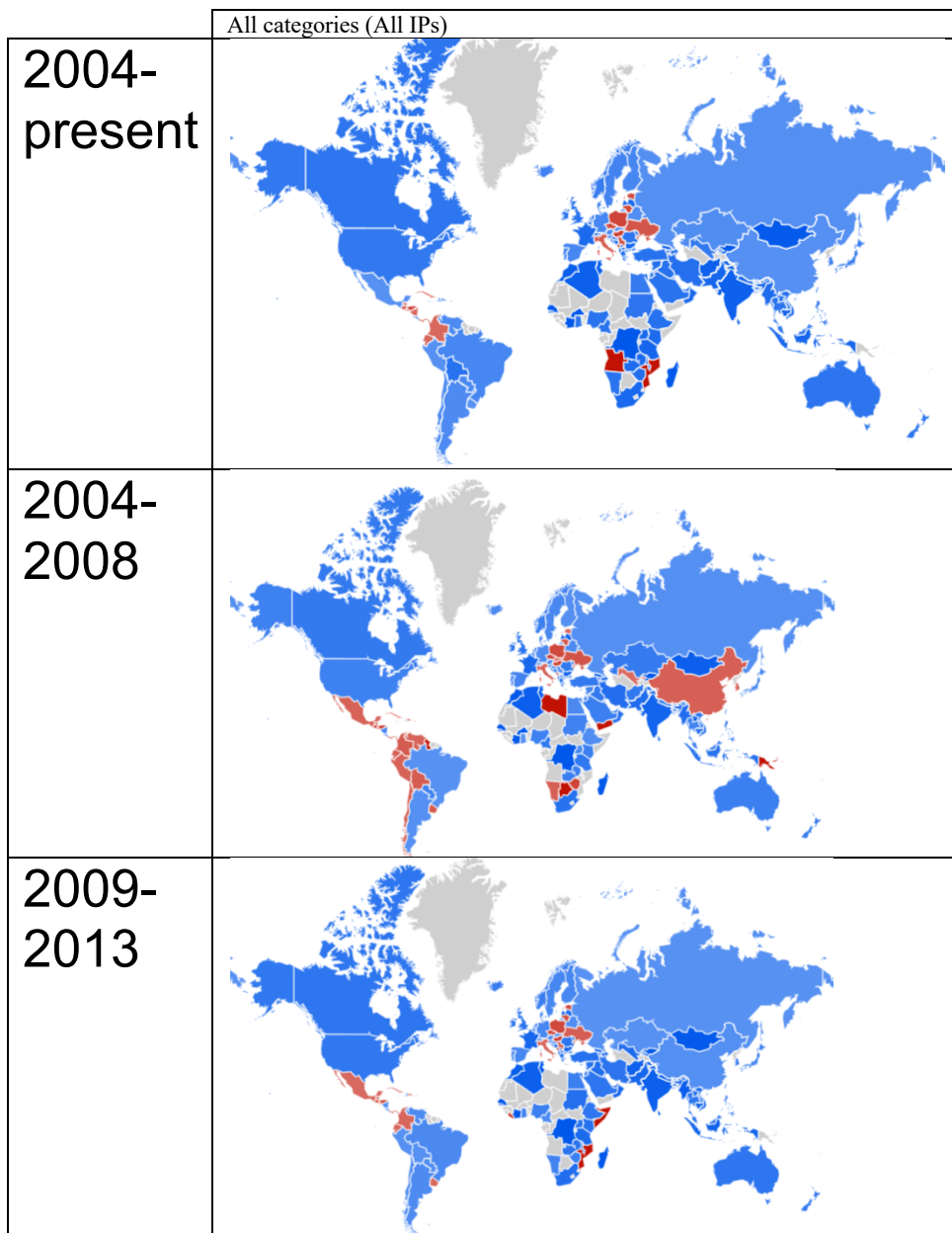
Figure 3 : Evolution over time of compared breakdown of the interest of Google users to the two journals by region for all IP addresses: _Nature_ (in blue), _Science_ (in red). Color intensity represents percentage of searches. The analyzed periods are 2004-present, 2004-2008, 2009-2013, and 2014-present.

The assessment of the choice between the two journals among the scholarly audience by region confirms the findings shown in Fig. 2B and recognizes the existence of a balanced geographical distribution of the preference of _Nature_ and the preference of _Science_ (Fig. 5). This equilibrium of the distribution of the preference of Science and Nature by the scientific communities is explained by country-level publishing behaviors in the two journals as illustrated in Fig. 4 (Clarivate Analytics, 2020).
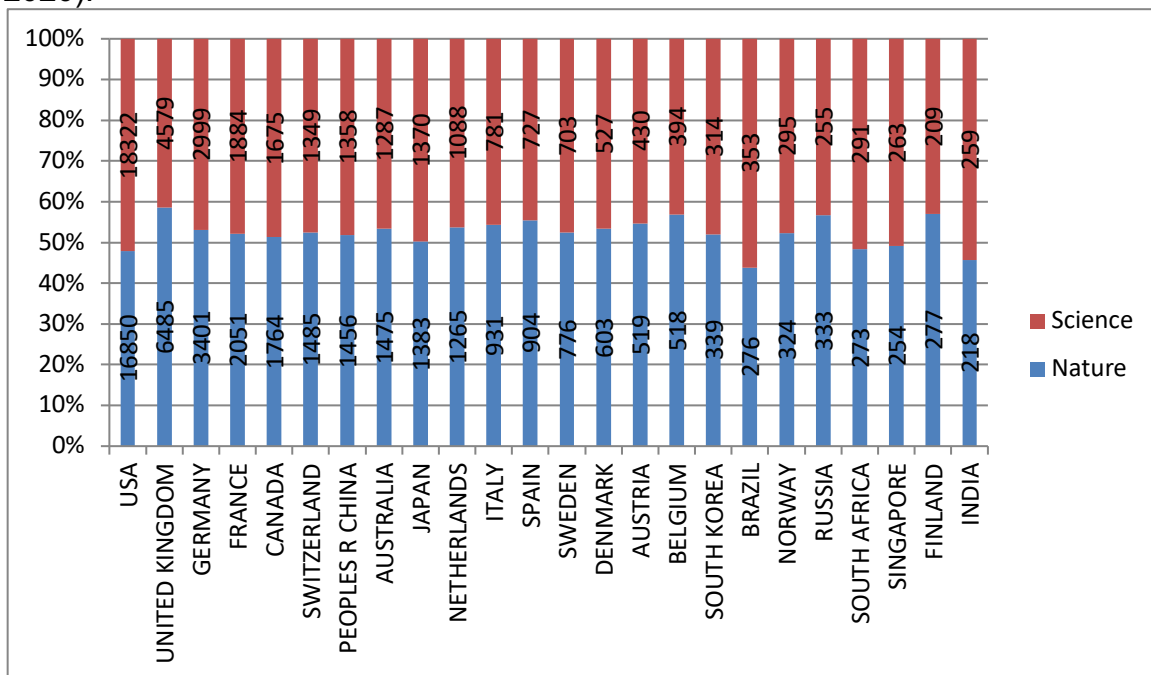

Figure 4: Journal distribution of the publications of several countries that mostly publish research papers in _Nature_ and _Science_ between 2004 and 2019 (Clarivate Analytics, 2020).

In this distribution (Fig. 5), _Science_ surprisingly seems to be more than _Nature_ in former USSR and its historical scholarly allies (mainly Eastern Europe, South and Central America) although the journal is edited in the United States. It is also more regarded than _Nature_ by scientific communities in Germany, Italy, Spain, Portugal, Switzerland, Iceland, Sweden and Finland (Fig. 5). _Nature_ seems to be more important than _Science_ for the scholarly communities in Western Europe (particularly France, United Kingdom, Norway, Netherlands, Belgium and Denmark), the Balkans, Australia, New Zealand, United States and Canada. In Asia except former USSR and Africa, _Science_ gradually lost ground to _Nature_ and it currently attracts a major

interest by scientific communities only in some countries like Papua New Guinea, Yemen, Mozambique and Angola (Fig. 5). This reported loss of ground of *Science* to *Nature* since 2014 should be adopted with prudence in China <mark>as it was mainly caused by the Google ban in the country</mark> (Yang, 2016).

Although the major attention of general audience to *Nature* can be explained by the better rate of biological research publications in this journal and the more significant interest to medical and biological matters by people in all the regions, the geographical distribution of the better interest to *Nature* or *Science* is rather explained by the influence of the cold war and its aftermath on science systems and research policies all over the world with the exception of Germany, Italy, Spain, Portugal, Switzerland, Iceland, Sweden and Finland where their scholarly interest to Science is not explained by a lack of interest in life sciences (representing more than 43% of the research output of each country in the 1980s as mentioned by Schubert et al. in 1989 and more than 30% of the research output of each countries between 2004 and 2019 as shown in Fig. 6) and has rather been due to their centrality in the fields that are best supported by this journal (Physics, Chemistry and Cognitive Science) since the 1980s (Schubert, Glänzel, & Braun, 1989) and till nowadays (Csomós, 2018).
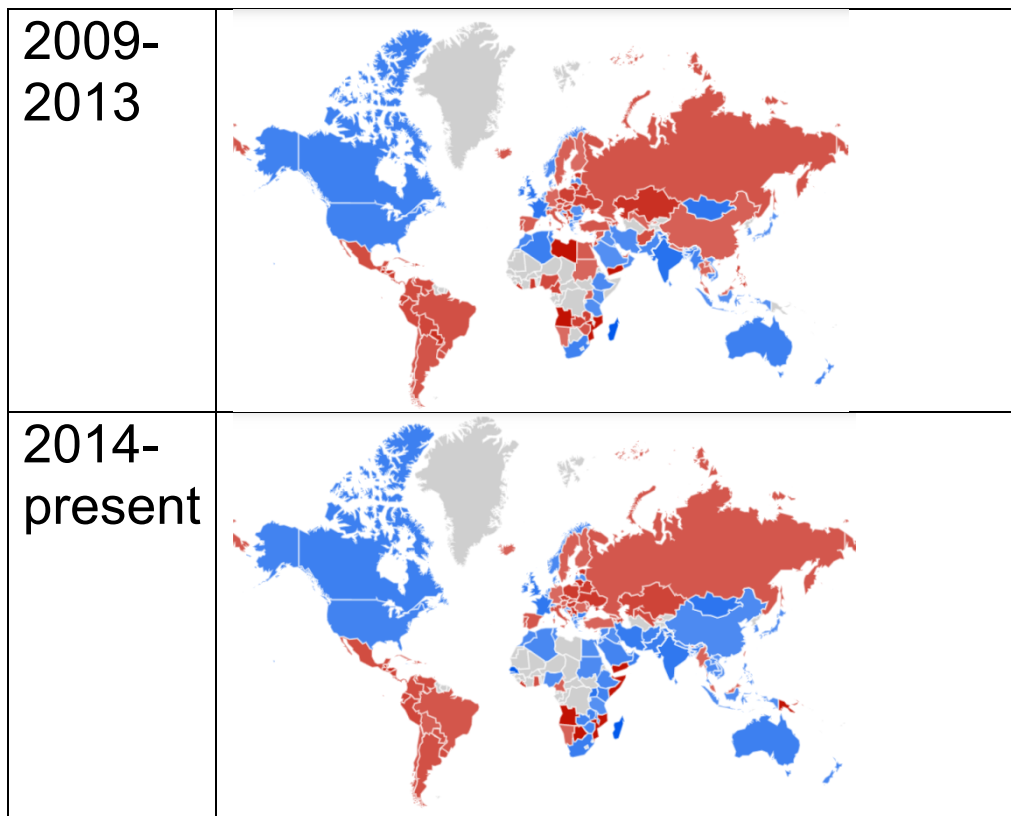
	Science category (Scholarly IPs)
2004-present	
2004-2008	
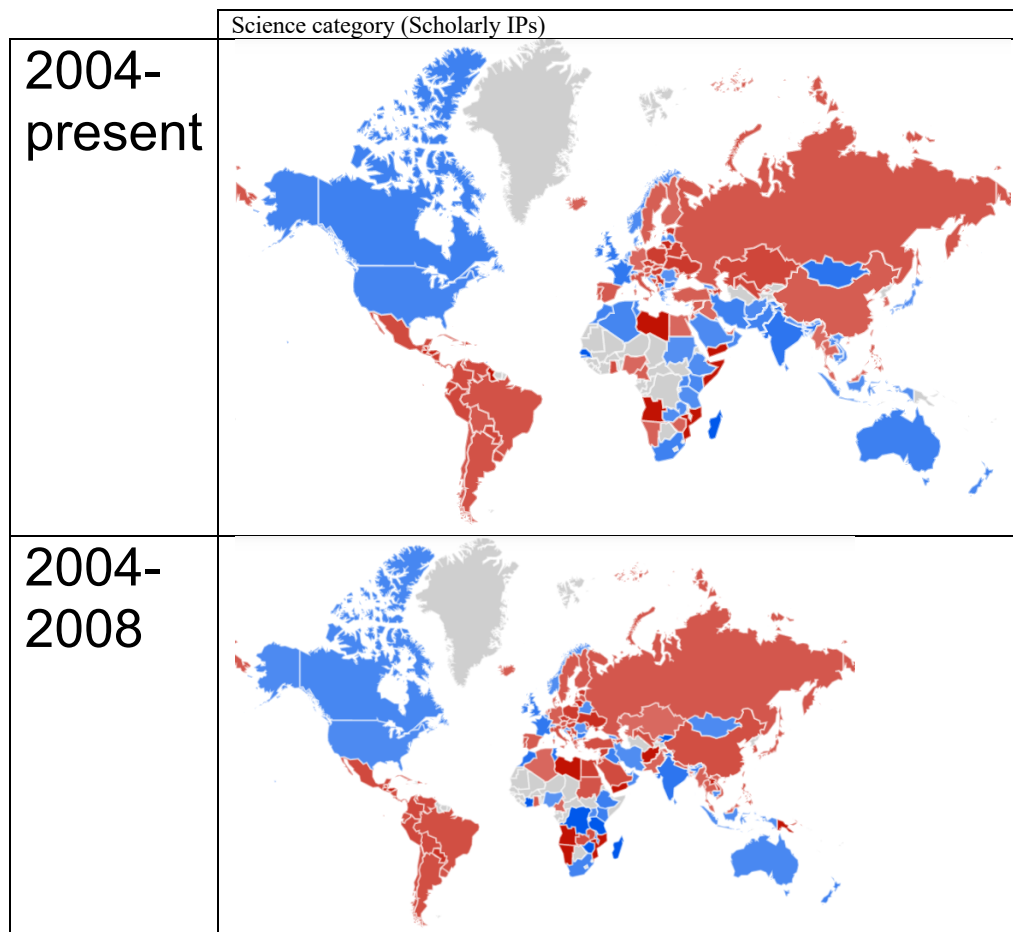
Figure 5 : Evolution over time of compared breakdown of the interest of Google users to the two journals by region for scholarly IP addresses: *Nature* **(in blue),** *Science* **(in red). Color intensity represents percentage of searches. The analyzed periods are 2004-present, 2004-2008, 2009-2013, and 2014-present.**

The political tensions during the cold war blocked the establishment of strong research collaborations between the United States and the USSR, the two main research nations between 1945 and 1993 (Lubrano, 1981). As a result, the global research network became split into two independent clusters of research nations. The first one consists of the United States and its scholarly allies collaborating together at large scale. The second cluster is a less collaborative one and is composed of the USSR and its scholarly allies including China and other countries from Eastern Europe, Asia and Latin America (Schubert & Braun, 1990). As shown in Table 2, the pro-US cluster gives an important value to biological and medical research requiring generous R&D funding whereas the pro-USSR research cluster gives less attention to life sciences and emphasizes technology-driven research and works on Engineering and Basic sciences (mainly Physics) that require less R&D expenses but return novel technologies for the development of industries particularly defense-related ones (Schubert, Glänzel, & Braun, 1989; Davies & Amann, 1969). This tendency hasn't changed till nowadays (Cimini, Gabrielli, & Labini, 2014) and is behind the better affinity of scientific communities in former socialist countries of Eastern Europe, South America, Asia and Africa to *Science* that issues a higher rate of technology-driven and basic research publications during the last years (Fig. 5).

Table 2 : Disciplinary distribution of the research output of the five pro-US and pro-USSR major research nations between 1981 and 1985 (Schubert, Glänzel, & Braun, 1989)

Cluster	Country	Life sciences	Physics	Chemistry	Engineering	Mathematics
Pro-US	United States	60.4%	18.0%	8.0%	10.8%	2.8%
	United Kingdom	65.4%	14.6%	9.5%	8.4%	2.0%

	Japan	45.2%	18.9%	20.9%	13.2%	1.8%
	West Germany	50.3%	20.2%	16.0%	10.7%	2.8%
	France	52.4%	22.4%	14.3%	7.3%	3.6%
Pro-USSR	USSR	25.5%	33.8%	29.8%	10.2%	0.8%
	India	33.7%	24.1%	26.4%	12.5%	3.2%
	Poland	28.0%	27.0%	25.4%	16.1%	3.4%
	East Germany	43.3%	19.3%	21.4%	13.3%	2.8%
	Czechoslovakia	44.5%	15.9%	29.2%	8.9%	1.5%

After the collapse of the USSR, Russian Federation and some of its scholarly allies like China did not change their tendency to give more importance to research efforts about Physics, Chemistry and Engineering although they became more open to research collaborations with Western Europe and the United States (Shasnov & Kotsemir, 2018; Markusova, Jansz, Libkind, Libkind, & Varshavsky, 2009). This is confirmed by the disciplinary distribution of the most productive research nations between 2004 and 2019 as retrieved from *Web of Science Core Collection* as shown in Fig. 6 where China and Russia are the only major research nations to have a reduced rate of biomedical and biological research (Clarivate Analytics, 2020). However, many countries especially African and Asian ones changed their Soviet-like science system into a US-like science system following the fall of their socialist political system due to civil wars or uprisings (e.g. Libya, Yemen, Afghanistan) (Walter, 2017) or to ameliorate their research competitiveness by broadening their areas of interest that were only restricted to Basic sciences and Engineering so that these areas include life sciences (e.g. Medicine, Biochemistry, Agriculture and Dentistry) and by participating in international research collaborations (Shasnov & Kotsemir, 2018; Moin, Mahmoudi, & Rezaei, 2005; Gonzalez-Brambila, Reyes-Gonzalez, Veloso, & Prerez Angón, 2016). This situation explains the decline of the preference to *Science* and the attractive evolution of the scholarly attention to *Nature* in Africa and Asia during the last fifteen years (Fig. 5).
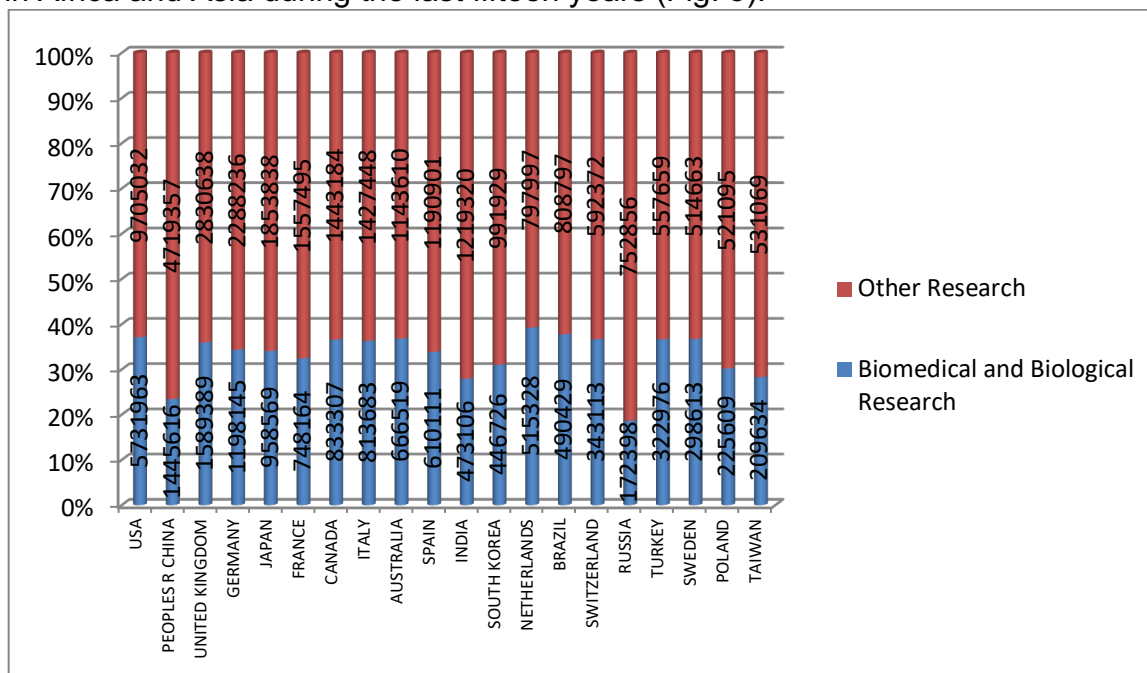

Figure 6 : Disciplinary distribution of the research output of the twenty most productive nations as returned by Web of Science Core Collection, Access Date: March 18, 2020

Interest to Nature and Science

Although the interest for the two journals by Google users decreased over the years, the attention to *Nature* and *Science* exists all over the world except in Sub-Saharan Africa, North Korea, Tajikistan and Turkmenistan as shown in Fig. 7. The poor rate of Google search queries related to the two journals in the mentioned regions is mainly explained by the lack of internet penetration (Nyirenda-Jere & Biru, 2015; Kunavut, Okuda, & Lee, 2018) and research efforts (Scimago Lab, 2018) in the region.
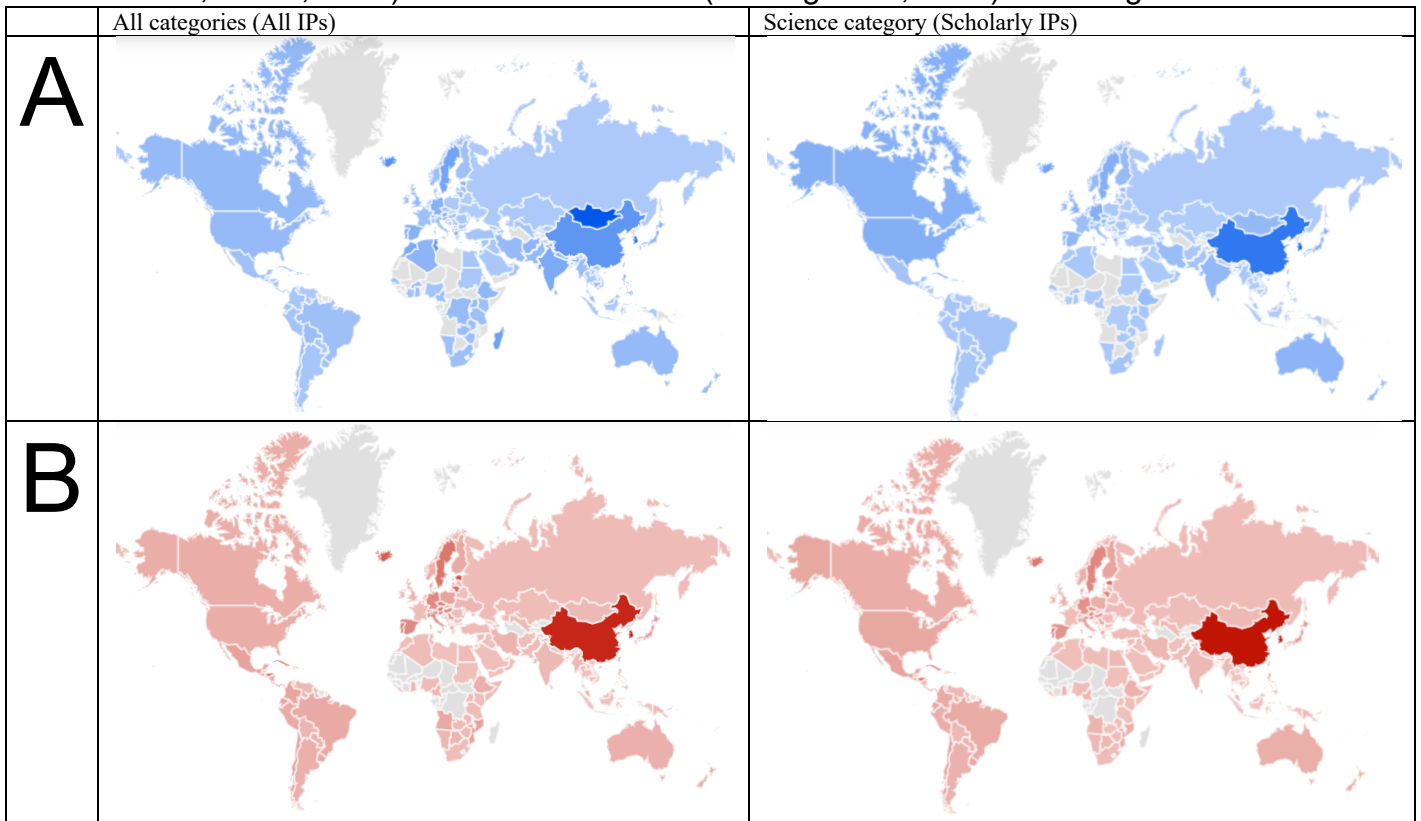

Figure 7 : Interest to *Nature* (A) and *Science* (B) by region for all and scholarly IP addresses. Color intensity represents the rate of Google search queries related to each journal.

This scholarly and general interest to *Nature* and *Science* is particularly high (Fig. 7 and Table 3) and growing over the years (Figs. 8 and 9) in China, Hong Kong, South Korea, Sweden, Germany, Italy, Spain, Iceland, Estonia, Bhutan, Lithuania and Slovenia. This is due to the research policies in these nations based on giving rewards to scientists publishing in the two journals (Fuyuno & Cyranoski, 2006; Quan, Chen, & Shu, 2017) and on providing important R&D facilities and funds to local researchers (Cao, 2004; Rodríguez-Pose, 2001; Wang, Liu, Ding, & Wang, 2012). This can be also explained for China, South Korea, Sweden, Italy and Spain by their prestigious positions among the best published and cited research nations (Scimago Lab, 2018; Schubert, Glänzel, & Braun, 1989) and by their sustainable contributions to the two journals (Braun, Glänzel, & Schubert, 1989; Kaneiwa, et al., 1988; Arkhipov, 1999; Kalita, 2016; Bornmann, Leydesdorff, Walch-Solimena, & Ettl, 2011; Liu, Lin, Xu, Shan, & Sheng, 2018). This increase of interest to *Nature* and *Science* should be verified for China with data from other search engines like *Baidu* as Google Trends data for this country can be influenced by the Chinese Google ban of 2014 (Yang, 2016).

However, this is surprisingly not applicable to other prestigious research countries (Scimago Lab, 2018; Schubert, Glänzel, & Braun, 1989; King, 2004) such as France, United Kingdom and United States, Canada, Australia, Switzerland, Russian Federation, Taiwan, Netherlands, Japan and Australia and to fast growing research nations except China and Myanmar (ASEAN[1] (Hassan, Haddawy, Kuinkel, Degelsegger, & Blasy, 2012), BRICS[2] (Shasnov & Kotsemir, 2018), CIVETS[3] (Yi, Qi, & Wu, 2013) and D-8[4] (Moin, Mahmoudi, & Rezaei, 2005; Hossain, Moon, Kang, Lee, & Choe, 2012; Bajwa & Yaldram, 2013) countries) where interest for the two journals is moderate (Fig. 7) and seems to be stable or slightly decreasing[5] from 2004 to present (Fig. 8 and 9).

Table 3: List of five countries showing the highest rates of Google search queries related to each journal for the periods 2004-2008, 2009-2013, 2014-2019 and 2004-2019 and the categories "All categories" and "Science"

Category	Journal	2004-2008	2009-2013	2014-2019	2004-2019
All categories	*Nature*	1. Mongolia 2. South Korea 3. Tunisia 4. India 5. Morocco	1. Mongolia 2. South Korea 3. Sri Lanka 4. Tunisia 5. Bhutan	1. China 2. Mongolia 3. South Korea 4. Slovenia 5. Bhutan	1. Mongolia 2. South Korea 3. Iceland 4. Tunisia 5. China
	Science	1. South Korea 2. Taiwan 3. Hong Kong 4. Puerto Rico 5. Estonia	1. South Korea 2. Hong Kong 3. Estonia 4. China 5. Puerto Rico	1. China 2. South Korea 3. Hong Kong 4. Slovenia 5. Estonia	1. South Korea 2. Hong Kong 3. China 4. Cuba 5. Estonia
Science category	*Nature*	1. Bhutan 2. South Korea 3. Malawi 4. India 5. Cambodia	1. South Korea 2. Cuba 3. China 4. Bhutan 5. Taiwan	1. China 2. South Korea 3. Switzerland 4. Singapore 5. Hong Kong	1. South Korea 2. China 3. Cuba 4. Switzerland 5. Hong Kong
	Science	1. South Korea 2. Northern Mariana Islands 3. Bhutan 4. Honduras 5. Papua New Guinea	1. Northern Mariana Islands 2. South Korea 3. Cuba 4. Hong Kong 5. China	1. China 2. South Korea 3. Hong Kong 4. Slovenia 5. Estonia	1. South Korea 2. China 3. Cuba 4. Northern Mariana Islands 5. Hong Kong

In Eastern Europe and Central and South America, the interest to *Nature* and *Science* is average (Fig. 7) and did not increase between 2004 and 2019 (Figs. 8 and 9) except in former Yugoslavia, Poland, Czech Republic, Slovakia, Hungary, Austria, Honduras and Puerto Rico where the interest to *Science* by general and scholarly audience is significant and has evolved in the last fifteen years (Fig. 9) and in Cuba where the scientific attention to *Nature* and *Science* is important and increases over the years (Figs. 8 and 9 and Table 3). Although several countries in these regions are known for the development of high-scale and valuable research efforts such as Brazil (Bornmann, Wagner, & Leydesdorff, 2015), they failed to show significantly high interest to the two journals (Fig. 7, 8 and 9). The particular situation of Cuba is mainly explained by the efforts of Cuban government since the 1980s to provide a high-level R&D environment for local scientists in governmental industries and research institutions (Mola, Silva, Acevedo, Boxadó, Aguilera, & Herrera, 2006; Castellacci & Pons, 2016). This environment allowed Cuban scientists working on important research areas such as Biotechnology and Engineering to raise their awareness

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[1]ASEAN: Association of Southeast Asian Nations. Its members are Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam.

[2]BRICS: Brazil, Russian Federation, India, China and South Africa.

[3]CIVETS: Colombia, Indonesia, Vietnam, Egypt, Turkey and South Africa.

[4]D-8: D-8 Organization for Economic Cooperation (Developing-8). Its members are Bangladesh, Egypt, Nigeria, Indonesia, Iran, Malaysia, Pakistan and Turkey.

[5] The rate of Google search queries related to the two journals have mainly decreased from quite important to averagefrom 2004 to present in Iran, Russian Federation, India and Pakistan.

about outstanding contributions to science and technology including the ones published in *Nature* and *Science*. As for Puerto Rico and the Eastern European countries that have an important attention to *Science*, this behavior can be explained by the better affinity of the Soviet-like R&D and Education systems in these countries to Exact sciences and Technology-driven scientific fields rather than Biological sciences (Schubert, Glänzel, & Braun, 1989; Zagrovic & Dikic, 2008).

In other regions, there is a significant number of countries where the general audience shows an exceptionally high interest (Tunisia, Algeria, Morocco, Sri Lanka, Bhutan, Mongolia, and Myanmar) or an average interest (Western and Eastern Africa, Armenia, Georgia, Azerbaijan, Kazakhstan, Uzbekistan, Kirghizstan, and several Arab countries[6]) to *Nature* (Table 3 and Fig. 7). The interest of these countries to *Nature* is mainly due to their research policy that encourages industry-driven R&D efforts in Biology and Biotechnology (Erdle, 2011; Sooryamoorthy, 2018). Generally, this overall interest to *Nature* seems to be stable over the years and is coupled with a medium scholarly interest to *Nature* and an extinguishing attention to *Science* (Figs. 8 and 9). However, there are exceptions in some nations. In Tunisia, Algeria, Morocco and Mongolia, the general interest to *Nature* was stable in the 2004-2008 and 2009-2013 periods before slightly decreasing in the 2014-2019 period (Fig. 8). For Tunisia, Algeria and Morocco, this is probably due to a negative effect of Arab spring on local science (Ibrahim, 2018).
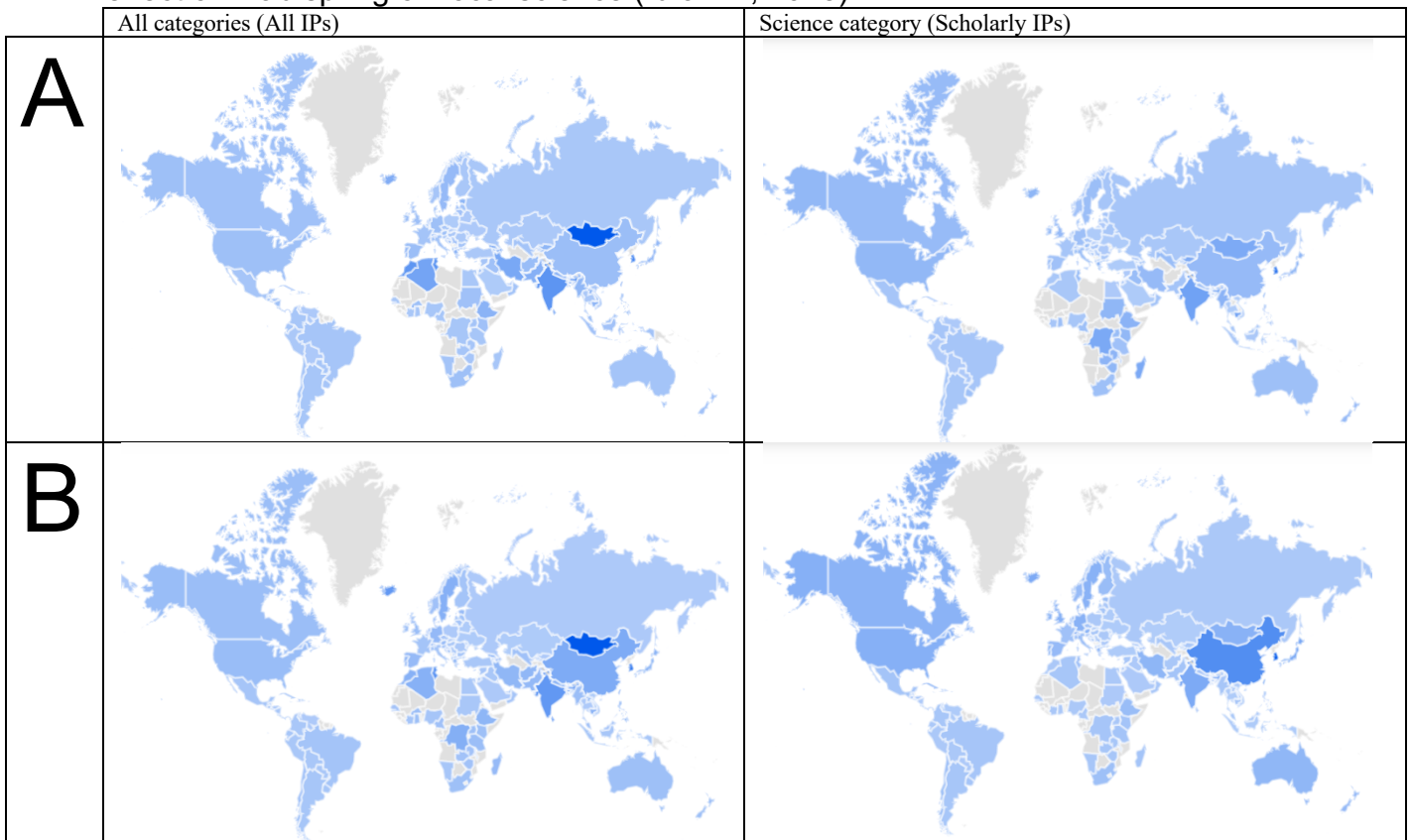
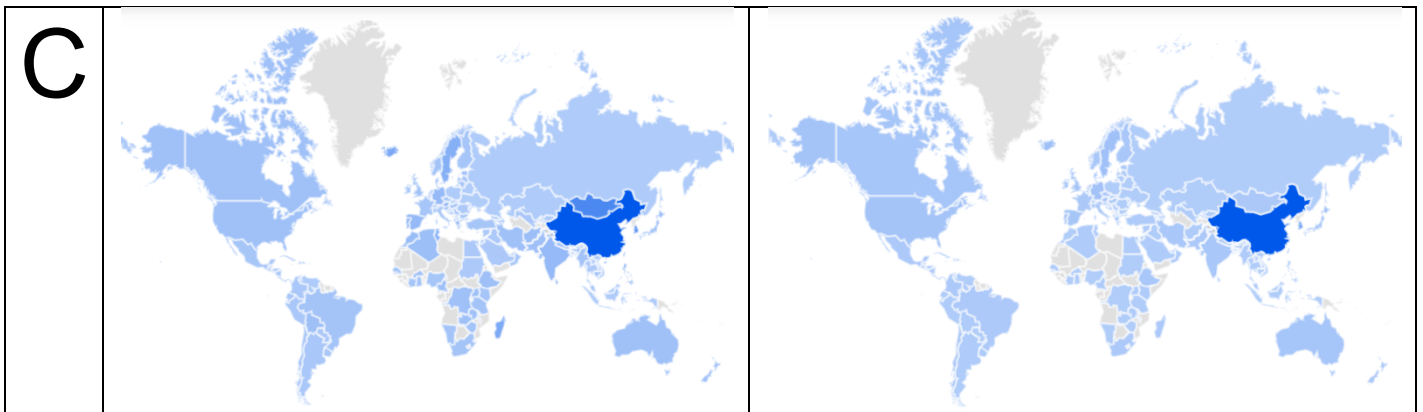| All categories (All IPs)	Science category (Scholarly IPs)
A	
B	

Figure 8 : Evolution over time of the interest to Nature by region for all and scholarly IP addresses. Color intensity represents the rate of Google search queries related to Nature. The analyzed periods are 2004-2008 (A), 2009-2013 (B), and 2014-present (C).

In Saudi Arabia, Qatar and United Arab Emirates, the scholarly attention to Science has been significant in the last fifteen years and the general interest to *Science* increased to become moderate in 2019 and comparable to the one of *Nature* after being quite absent in 2004-2009 period (Fig. 9). This fact is mainly explained by the research policy of these three countries to increase their publication rate in *Nature* and *Science* and consequently their number of highly cited publications and scientists to achieve best standings in world university rankings (Bhattacharjee, 2011) through the mass recruitment of highly cited scientists, the establishment of high-scale research collaborations, the allocation of interesting R&D funding and facilities and the installation of branch campuses of the best universities worldwide (Turki, Ben Aouicha, & Hadj Taieb, 2019). This research policy can be confirmed by the timely distribution of the contributions of these three emerging nations to Nature and Science as shown in Table 4 (Clarivate Analytics, 2020).

Table 4: Timely distribution of the contributions of Saudi Arabia, Qatar and United Arab Emirates to *Nature* and *Science* as returned by Web of Science Core Collection, Access Date: March 18, 2020 (Clarivate Analytics, 2020)

Country	Nature			Science		
	2004-2008	2009-2013	2014-2019	2004-2008	2009-2013	2014-2019
Saudi Arabia	0	20	63	3	28	79
Qatar	0	3	12	1	3	4
UAE	2	2	22	1	14	10

In Yemen, Libya, Somalia, Mozambique and Afghanistan, the situation is different as the interest to *Science* in these nations was high in the 2004-2008 period before dramatically falling and finally disappearing in the 2014-2019 period (Figs. 7 and 9). The important attention to *Science* in these countries during the early 2000s is mainly explained by the adoption of a Soviet-like scholarly system that gives more interest to Basic sciences and Engineering and that does not support biological research (Alexiev, 1983). The absolute loss of this significant interest to Science in these countries is mainly due to the occurrence of civil wars in these countries (e.g. Arab spring, Afghanistan war) causing political and social instabilities and consequently altering the interest of local people to scientific topics and works (Walter, 2017). In all these countries except Afghanistan, no interest has been shown for the last fifteen years to *Nature* (Figs. 7 and 8) due to the lack of interest of people to biological research that is more represented in *Nature* than *Science*. This is surprising as there has been a quantitative and qualitative growth of biomedical and biological research output since 2004 in Libya (Ahmed, Daw, & van Velkinburgh, 2017), Somalia

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(Ibrahim, 2018) and Mozambique (Pouris, 2010). This can be simply explained by this growth of biomedical and biological research has not been associated with a high-scale development of efficient educational programs in life and biomedical sciences for these three countries (Benamer & Bakoush, 2009; Eno, Eno, & Mweseli, 2015). However, in Afghanistan, the attention to *Nature* has increased from scratch in the 2004-2008 period to become moderate in the 2014-2019 period (Fig. 8). This is mainly due to the adoption of a US-like science system in the 2000s (Tobenkin, 2014) that favors interest in biomedical knowledge and research (Alberts, Kirschner, Tilghman, & Varmus, 2014). Effectively, despite having a research output dominated by Basic Sciences in the 1980s (Schubert, Glänzel, & Braun, 1989), Afghanistan has issued 899 publications related to biomedical and biological research between 2004 and 2019 and 260 publications related to other sciences in the same period as indexed by *Web of Science Core Collection* (Clarivate Analytics, 2020).
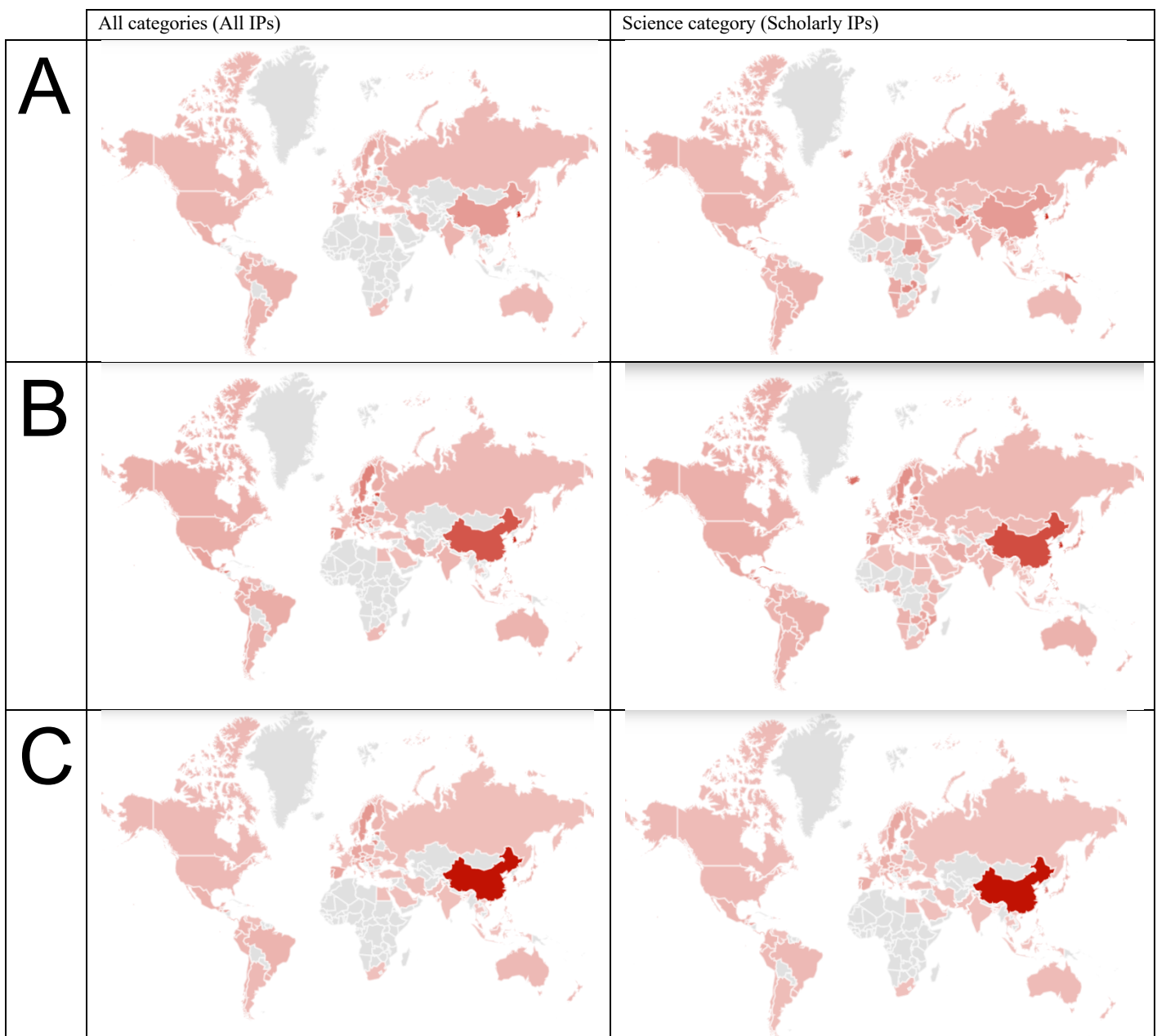

Figure 9 : Evolution over time of the interest to *Science* by region for all and scholarly IP addresses. Color intensity represents the rate of Google search queries related to *Science*. The analyzed periods are 2004-2008 (A), 2009-2013 (B), and 2014-present (C).

Conclusion

In this article, we retrieved the Google search statistics of *Nature* and *Science* from 2004 to 2019 using Google Trends to assess the status and development of the relative interests of the general audience and scientific communities. We found that the two journals have lost attention during the last fifteen years due to several competing research journals and their selective and controversial editorial policies. We also found that the general audience increasingly shows more interest to *Nature* than *Science* due to its focus on medical and biological issues. Finally, we found that the scientific communities in former USSR and scholarly allies have a better affinity to *Science.* Some countries in Africa and Asia have changed their preference to *Nature* during the last years while the United States and scholarly allies show more interest towards *Nature*. This is mainly due to the disciplinary distribution of *Nature* and *Science* publications and to the influence of the cold war and its consequences on science policies. This situation can also be explained by the current disciplinary distribution of the research interests, outputs and institutions all over the world. These findings confirm and explain in part major scholarly works in these two journals and scientific research including scientometric publications, behavioral studies and political analyses. That is why *Nature* and *Science* publications are of major significance for researchers and specialists in making scientific policies as they provide a considerable contribution to our understanding of the main mechanisms behind the global reach of scientific publications. Hope these findings could provide some insights for the editorial boards of the two periodicals particularly *Science* to solve their deficiencies and achieve a higher readership and impact in the coming years.

As a future direction of this work, we propose to analyze the statistics of search queries of Google News, Google Images and YouTube as provided by Google Trends to find in-depth explanations of how the dynamics of the general and scholarly interests for the two journals works can be influenced by social media and scientific news and rumors. We also look forward to studying the influence of the rate of Google search volumes performed by scholarly IP addresses for each country and of Internet policies across regions such as the effect of Internet censorship in China (Yang, 2016) on the accuracy of the outcomes of the science-related data provided by Google Trends.

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