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30 Years in Science

Secular Movements in Knowledge Creation

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Summary

This Discussion Paper examines the relationship between geopolitical factors and scientific activity based on publication data from a 30-year period (1980 to 2009). Using bibliometric methods, the analysis concentrates on large-scale, secular movements in the geopolitics of knowledge creation. First, the evolution of the scientific outputs of the countries of the former USSR and Eastern Bloc is examined followed by that of the Middle East. The paper then looks at how the global map of science has been reshaped in Asia's favour.

Most of the Warsaw Pact countries' scientific production was majorly impacted one way or another by the collapse of the Soviet Union in 1991. Whereas most of the republics that used to constitute the USSR saw their scientific production falter, many satellite countries, such as Poland, immediately increased their contributions to world science, as did the ex-Soviet republics Lithuania and Estonia.

Overall, growth in the Middle East has been rapid (nearly four times faster than at the world level), with Iran and Turkey leading the pack. In particular, Iran embarked on one of the fastest build-ups of scientific capabilities the world witnessed during the last two decades, and the evidence on growth and emphasis on specific, strategic subfields suggests that this may be the result of Iran's controversial nuclear technology development program.

On a global scale, several "hot zones" of scientific production have emerged, by far the most notable of these being Asia. Over the last 30 years, Asia's share of world scientific output grew by 155% and, as of 2009, surpassed that of Northern America. China, in particular, has shown spectacular progress—its scientific output grew more than five times faster than that of the US, and it is set to meet the US level of output in 2015 (and surpass the US in the natural sciences in 2010). While, Northern America's rate of growth has been considerably slower than that at the world level, Europe has managed to maintain its hold of the greatest share—over one-third—of the world scientific output.

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Introduction

This Discussion Paper presents insights into the relationship between geopolitical factors and scientific activity, based on information extracted from the Web of Science (Thomson Reuters) database of scientific publications spanning the last 30 years (1980 to 2009). These data are extremely powerful when used for mapping global and historical trends in the scientific landscape and examining the effects of geopolitical change on scientific activity. This paper concentrates on a few momentous events that shaped the world during the last 30 years, as well as some of the secular movements that began during that time and that are sure to shape the next 30 years.

We will start with perhaps the most important geopolitical event of the last three decades—the fall of the Berlin Wall—and examine how the collapse of the Soviet Union affected the scientific output of Russia, other Warsaw Pact countries, and Yugoslavia. The data show that while Russia stumbled, the unshackled satellite states strived to reassume their positions on the world's scientific stage.

The last 30 years have also been marked by the near constant tensions in the Middle East, including the conflicts that have opposed Iraq against Iran, Kuwait, and US-led coalitions. We will see that shattering events have had tremendously different effects on all three Middle Eastern countries' scientific systems and their recovery. Whereas Kuwait's level of activity has returned to its previous height, the strong growth that took place during the 1980s never returned. Iraq's scientific system progressively collapsed, and not until recently has it displayed any signs of recovery. In contrast, the last two decades have seen Iran display one of the fastest rates of growth in scientific production that the world has witnessed; evidence from the analysis of its growth in specific subfields suggests that this increase may, at least in part, be due to Iran's controversial nuclear technology development program.

Finally, we will examine how the global map of science is currently being reshaped, as a result, most notably, of Asia's stupendous growth as a scientific power. In the meantime, Europe has managed to hold on to its position, while North America is losing ground—to Asia and Latin America.

The fall of the Berlin Wall and the collapse of the USSR

Figure 1 shows the contribution of the USSR and former Soviet republics to world science over the last 30 years (fractional counting is used here, meaning that if authors from several countries contribute to a paper, each country receives a corresponding fraction). Here, the term "historical USSR" is used to indicate what the now independent ex-Soviet republics have contributed together over the 30-year period in question (the same applies to "historical Yugoslavia" and "historical Czechoslovakia"). Figure 1 clearly illustrates that the dissolution of the USSR in 1991 resulted in a sustained drop in scientific production in nearly all former Soviet republics. Indeed, their annual contribution to science dropped by 23% from 1980–1991 to 1992–2009, and it is only since 2006 that this slide has stopped. Turkmenistan's almost non-existent scientific output during the Soviet era was completely decimated following the collapse of the USSR. Likewise, scientific output in Tajikistan's and Kyrgyzstan is even less healthy today than during the Soviet era. In 2006–2007, Azerbaijan and Kazakhstan were still at less than 40% of their level of scientific output from the early 1980s. Likewise, in 2006–2007, the Ukraine, once a sizeable contributor, was publishing only half as many papers as in 1982–1983.

Only two of the countries that were once in the USSR's empire have truly benefitted from the breakup: Lithuania and Estonia. Both countries' rates of growth have actually been faster than the world rate. Both countries became members of the European Union (EU) in 2004, and both were subsequently hit very hard by the 2008–2009 economic recession. However, only Lithuania's scientific output took an immediate and very visible plunge (Figure 2). The other ex-USSR country that joined the EU, Latvia, has not yet fully recovered from the turmoil of the post-Soviet era.

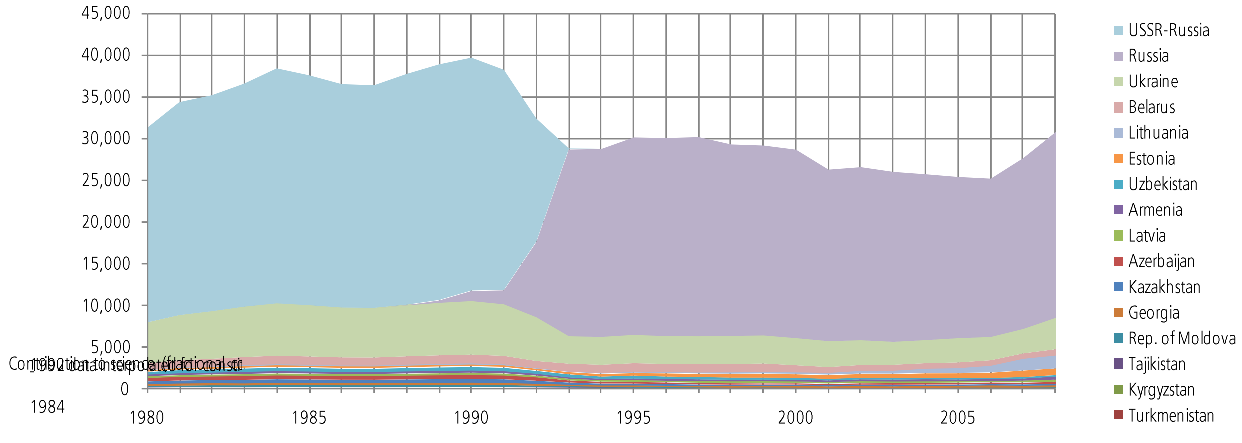

Figure 1 **Contribution of the historical USSR to world science, 1980–2008**

Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

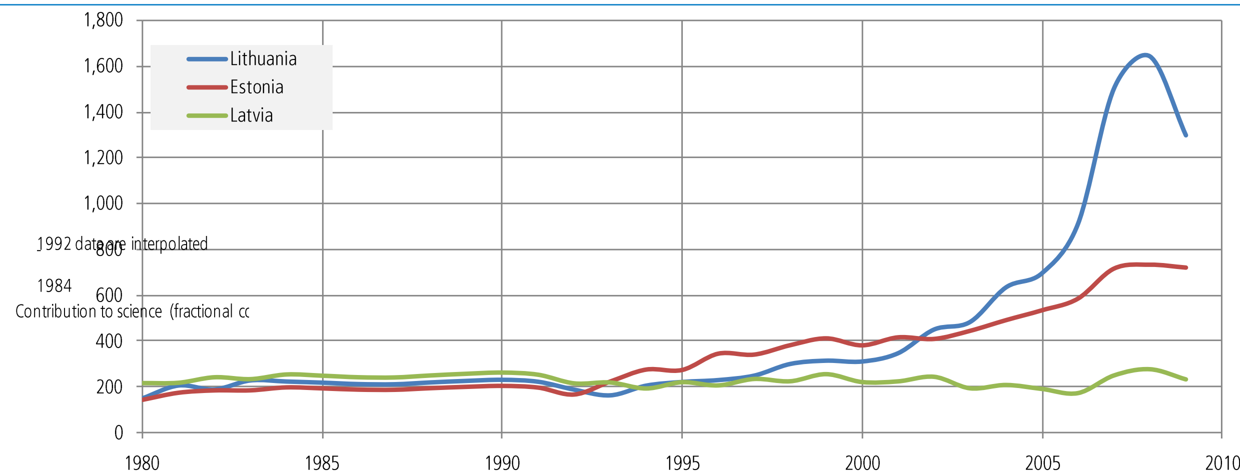

Figure 2 **Contribution of the Baltic Tigers to world science, 1980–2009**

Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

Contrasting trends in the USSR and Eastern Bloc countries (shown in Figure 3) suggest that the former Soviet republics are taking longer to recover than the satellite states in terms of scientific activity. Indeed, while the historical USSR contributed to far fewer papers after 1991 than before its dissolution, other Warsaw Pact members began to increase their contributions to world science almost immediately after the fall of the Iron Curtain (taking into account the time-lag of about two years that exists between a change in the science system and measurable changes in scientific output). Historical Yugoslavia's contribution increased less rapidly, perhaps because of the conflicts and geopolitical changes that occurred throughout the 1990s. Nonetheless, all entities experienced a boost in the growth of their contributions around 2006.

Patterns in contributions to world science by individual Warsaw Pact members (excluding the USSR and the German Democratic Republic) and historical Yugoslavia, as shown in Figure 4, suggest that scientific activity was stable—or even decreasing—prior to the end of the Cold War, but that after 1991, individual countries ramped up their contributions to varying degrees. For example, Poland rapidly emerged from a period of stable scientific output, whereas historical Czechoslovakia, historical Yugoslavia, and Romania only began to increase their contributions in the mid-2000s. In contrast, Hungary gradually re-entered the scene relatively early (mid-1990s), whereas Bulgaria's modest contributions to world science have remained stable throughout the last 30 years.

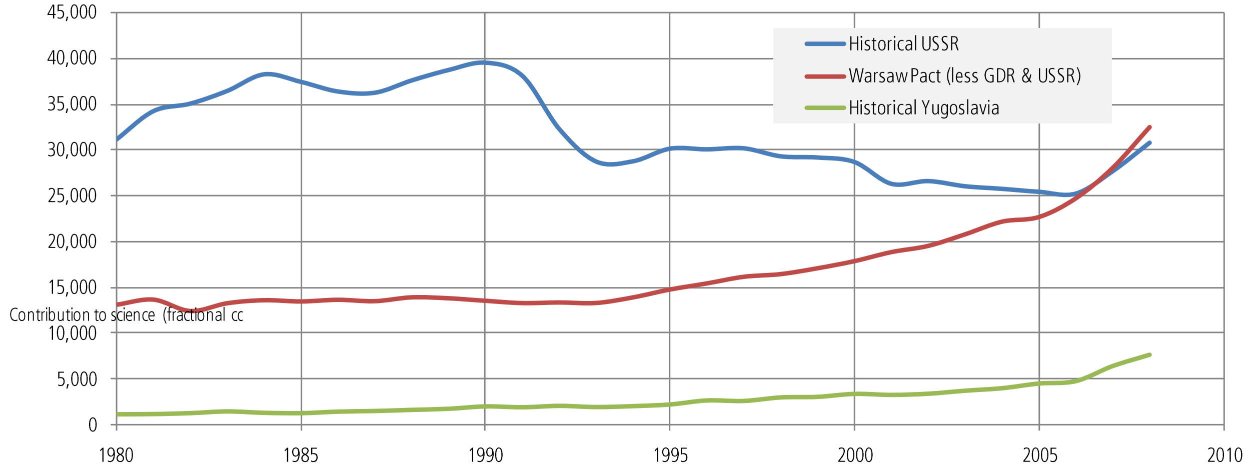

Figure 3 **Contribution of the historical Eastern Bloc (excluding the German Democratic Republic) to world science, 1980–2008**

Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

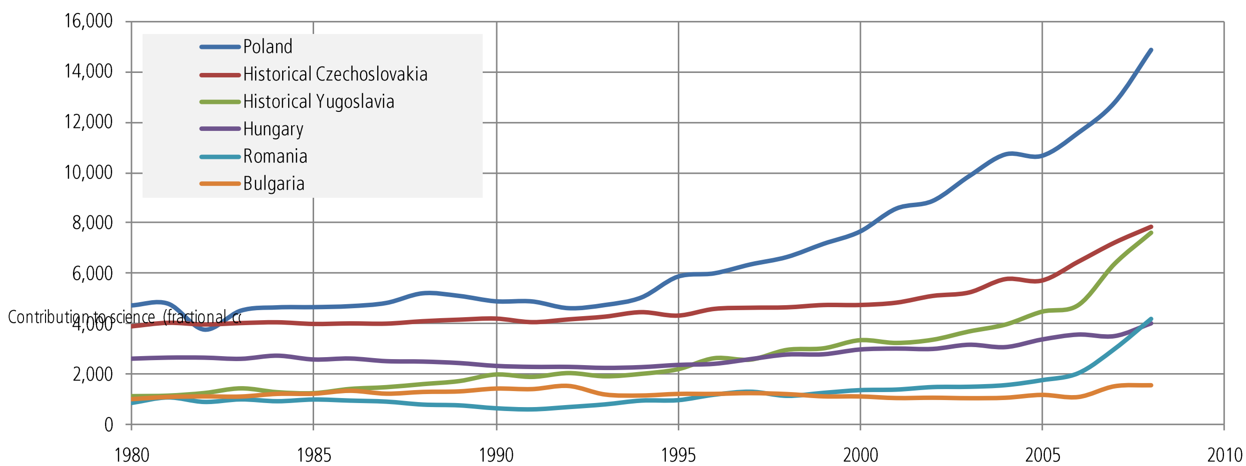

Figure 4 **Contribution of ex-Warsaw Pact members (excluding GDR and USSR) and historical Yugoslavia to world science, 1980–2008**

Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

Behind these secular movements in knowledge creation, several factors are at play. One can notably see the effect of geography: countries bordering Western Europe certainly showed faster rates of recovery and growth. Moreover, ethno-linguistic and religious factors may have shaped recovery, and one can note, without necessarily implying causality, that several of the countries whose scientific systems recovered faster had closer links with Protestant and Germanic traditions.

GROWTH IN THE MIDDLE EAST

Although the region we know as "the Middle East" has never been given that designation officially, it constitutes a very interesting unit of analysis for science. Many fields of knowledge have deep roots in Arabic science, but both the historical and contemporary contributions of Middle Eastern countries are often overlooked. Figure 5 reveals that although growth has been very uneven across countries, the overall growth of the region has been rapid: scientific output grew nearly four times faster in the Middle East than at the world level.

Notably, most of the growth is in two countries (see Figure 5): growth rates (Growth Index, or GI in the figure) in Iran and Turkey increased 11 and 5.5 times faster, respectively, than output at the world level from 1980–1994 to 1995–2009. Fast growth was also experienced in Cyprus, Oman, and the United Arab Emirates (UAE). Only the scientific outputs of Saudi Arabia, Israel, and Iraq have grown at a slower pace than that observed at the world level. However, many countries—namely Bahrain, Kuwait, and Egypt—are at a standstill. Given this portrait, it would be interesting to examine more closely how three of the countries that have been at the centre of large-scale conflicts have fared and how their scientific output has been shaped by these conflicts.

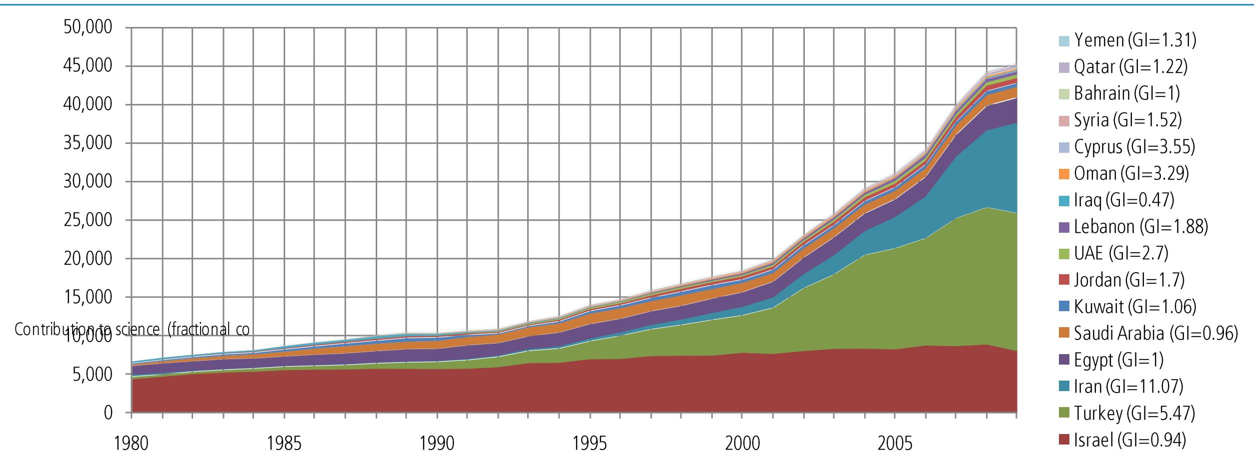

Figure 5 Contribution of Middle East countries to world science, 1980–2009
Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

In 1980, Iraq invaded Iran, beginning one of the bloodiest wars to occur after World War II. Shortly after the Iraq–Iran war ended, Iraq turned its turrets towards Kuwait. As one can see in Figure 6, the three countries present as many different response models to these armed conflicts. Iraq's system floundered as it began its second conflict, positioning itself against Kuwait and a Western-led coalition. Not unexpectedly, sustained economic sanctions and an increasingly isolated dictatorial government continued to stultify the publishing of scientific knowledge throughout the 1990s. Just as the country was starting to show its first signs of recovery, a third conflict in as many decades brought the scientific system back to the abyss. Presently, some signs can be seen that Iraqi science has bounced back, but scientific output is not yet at the level it was in the 1980s. Kuwait is another witness to the adverse effect of war on scientific production. As Figure 6 shows, Kuwait experienced fairly steady growth in scientific output during the 1980s. However, this level of production plunged significantly after the Iraqi invasion.[1] Kuwait eventually returned to its previous rate of scientific output but not its previous rate of growth.

[1] Considering that there is usually a lag observed between changes in research activity and changes in publication patterns, it is not impossible that the observed fall in Kuwaiti scientific output began even before the Iraqi invasion. This fall might have been due to the financial pressures that accrued as a result of the mounting financial weight of the Kingdom's support of Iraq against Iran. This might have decreased the amount of

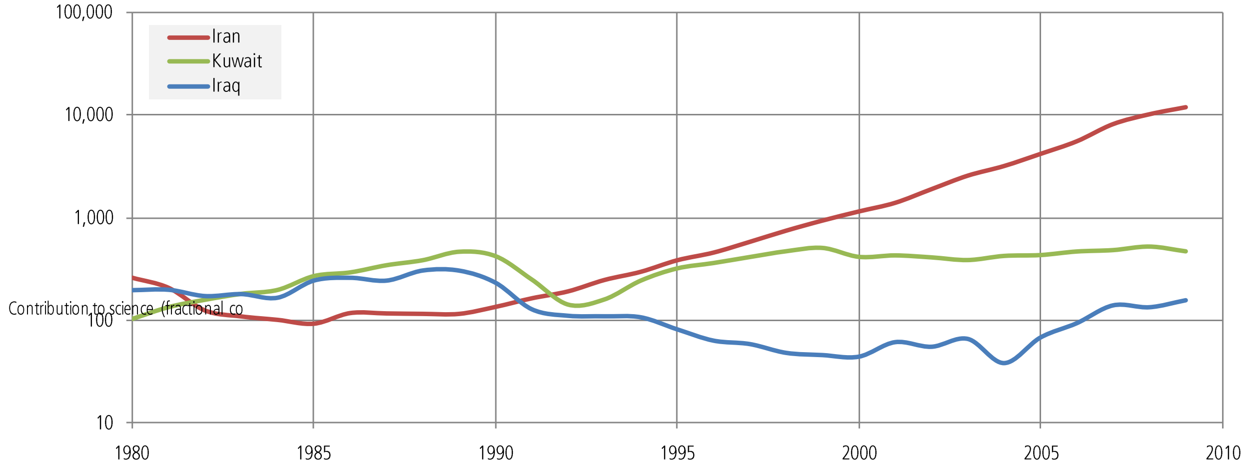

Figure 6 **Contribution of Iran, Kuwait, and Iraq to world science, 1980–2009**
Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

The response of Iran is radically different—after the Iraq–Iran war, the Islamic Republic experienced rapid growth in scientific production. In fact, Iran has demonstrated the fastest rate of growth of any country, including Brazil, Russia, India and China (the BRIC countries). One has to look back to its conflict with Iraq to see what may have led to Iran's intense pursuit of scientific research. During the conflict, Iraq had a major technological advantage, making extensive use of chemical warfare. Not only did the war cost Iran an estimated one million casualties, killed or wounded, but the country must have come to realize that it had few allies: more than 10 countries lent their support to Iraq, but only a handful to Iran.

An examination of the scientific specialties that experienced the strongest growth (Table I) suggests that Iran mobilized its scientists towards the development of nuclear technologies: growth in many of the relevant specialties was several folds faster than that at the world level. Moreover, the specialization indexes of Iran in these fields point to the fact that Iran has devoted a greater proportion of its research to the many fields of science that are instrumental to the development of nuclear technologies.

When examining the growth of research that has been conducted since 1990 at the Iran and world levels in inorganic and nuclear chemistry, nuclear and particle physics, and nuclear technology (engineering), the image becomes even clearer. Whereas output in these fields has increased by only 34% at the world level between 1990 and 2009, Iran's scientific output has increased 84 times (Figure 7).

It is important to note, however, that significant growth has also been seen in public health research (Table I), and a range of fields including obstetrics & gynaecology, immunology, psychology, fertility, information & library science, optics, gastroenterology, ophthalmology, dairy & animal science, marine biology & hydrobiology and biology generally, haematology, otorhinolaryngology, and environmental sciences have also experienced growth (data not shown). The subfield of science studies is the only area where growth has been slower in Iran than at the world level. Hence, although the growth of science in Iran may be a cause for concern for the world, it has some positive signs for the Iranian population. In particular, Iranians' quality of life may increase, if the knowledge that is being produced can be harnessed in astute and constructive ways.

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funds available to conduct research as early as 1989. However, this hypothesis could not be verified, as UNESCO does not publish Gross Expenditures on R&D data for Kuwait prior to 1997.

Table I **Specialties that have experienced the most growth in Iran, 1990–2009 vs. 1980–1989**

Field	Subfield	Papers 1980-1989	Papers 1990-2009	Specialization Index	Growth Index*
Chemistry	Analytical Chemistry	30	1,805	2.87	22.5
Chemistry	Applied Chemistry	7	208	1.71	13.2
Chemistry	General Chemistry	36	2,016	1.76	26.4
Chemistry	Inorganic & Nucl Chm	24	1,248	3.01	19.4
Chemistry	Physical Chemistry	25	2,173	1.37	25.1
Chemistry	Polymers	15	1,053	1.88	21.2
Chemistry Total		*200*	*10,326*	*1.93*	*18.3*
Engineering & Tech	Chemical Engineering	8	705	1.87	28.8
Engineering & Tech	Materials Science	16	1,236	1.37	13.0
Engineering & Tech	Mechanical Engineer	19	717	1.80	12.5
Engineering & Tech	Metals & Metallurgy	10	611	1.53	26.4
Health Sciences	Public Health	2	341	1.97	36.5
Mathematics	Applied Mathematics	14	953	2.99	14.1
Physics	Chemical Physics	6	595	1.05	35.9
Physics	Fluids & Plasmas	1	188	1.17	95.8
Physics	General Physics	16	1,903	1.04	37.1
Physics	Nucl & Particle Phys	10	845	1.32	25.6
Total		**1,346**	**53,817**		**12.9**

*The growth index is obtained by dividing papers in each specialty in 1990–2009 by those published in 1980–1989 in Iran and dividing this ratio by the same fraction at the world level.
Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

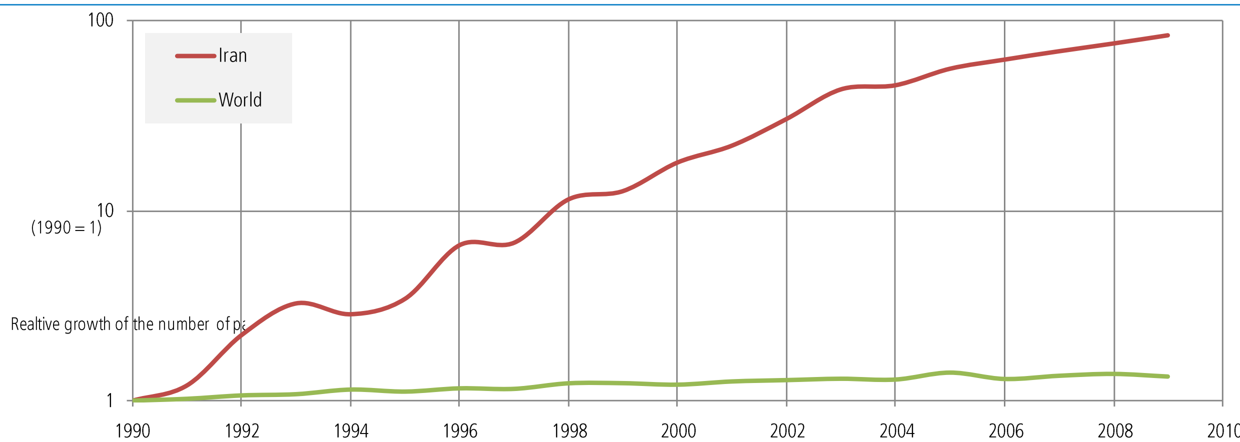

Figure 7 **Growth of nuclear S&T papers produced by Iran and the world (1990=1), 1990–2009**
Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

Secular shift of scientific activity from Northern American towards Asian countries

In contrast to a widely held belief that we are witnessing a simple shift from the West to the East, data on scientific production suggests that European attitudes towards collaboration are bearing fruit and that the old continent is holding its own while Northern American countries are losing their strategic, central place in the science system.

Asia's ascendency in the scientific landscape is demonstrated not only by an increase in the number of published papers, but also by its spectacular rise in the share of the world's papers. The two figures that follow show that Asia's growing contribution to world science has been to the detriment of Northern American countries, whose share has decreased dramatically since 1980. In fact, Asia's contribution to the world's scientific output surpassed that of Northern America in 2009, due in part to a marked slow-down in Northern American countries' contribution to world science from 1996 onward.

In contrast, Europe's contribution grew steadily over this period (albeit at a rate somewhat lower than the world average), allowing it to hold on to the greatest share, over one-third, of the world scientific output. Meanwhile, Latin America and the Caribbean have increased their shares of the world's scientific output many times over, though the region remains a relatively small player on the world scale. The share of world science representing Africa's and Oceania's contributions has remained fairly stable, and modest, over the last 30 years.

Figure 8 shows the contribution of six major geographical regions expressed as a percentage (or share) of the world's scientific output. Whereas Asia contributed to barely 11% of the world's scientific output in 1980, its contribution now stands at 29% (this exceeds by one percentage point the share currently held by Northern America). In fact, while Asia's contribution grew by 155% over the last 30 years, that of Northern America dropped by 35% (from 43% in 1980 to 28% in 2009). In other regions, the contribution to world science of Latin America and the Caribbean as a whole grew at an extremely high rate (240%, from a 1% to 4% share), while Europe's contribution has remained fairly stable (41% in 1980, compared to 36% in 2009). Similarly, the contributions of Africa and Oceania have shown little change over the last 30 years, at approximately 1% and 3% of the world scientific output, respectively.

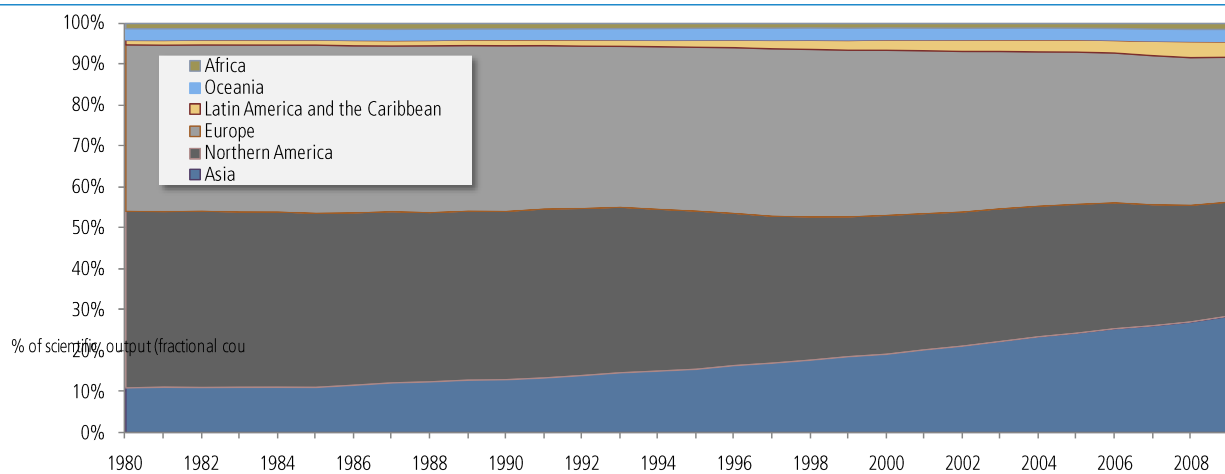

Figure 8 **Contribution to world science by region, expressed as percentage, 1980–2009**

Note: Major geographical regions are based on United Nations definitions; note that Northern America includes Bermuda, Canada, Greenland, Saint-Pierre-et-Miquelon, and the US.

Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

Figure 9 presents the same data as in Figure 8, but expressed as paper counts rather than as a percentage of the world's scientific output. Asia's dramatic rise began in the early 1990s and increased at an even greater rate after 2000, with Asia contributing to more papers than Northern America for the first time in 2009. Europe and Northern America ran a close race in the 1980s and up to 1994, after which Europe gained velocity; in contrast, Northern American countries began to stagnate in 1996. Meanwhile, Latin America and the Caribbean contributed to a rapidly increasing number of papers, especially since the early 1990s, overtaking Oceania around 2002. However, like Africa and Oceania, this region remains a relatively modest player on the world science stage.

Interestingly, countries that are "catching up" typically have done so by compressing the technological, intellectual, and scientific advances made in Western countries over the last 150 years. In this fast-paced world, this approach is not one of leapfrogging development stages; rather, it involves passing through stages with extreme rapidity. Whereas the development of steelmaking and shipbuilding capabilities took several decades in the West, Asian countries such as Japan, the Republic of Korea, and now China acquired relevant knowledge and skills increasingly quickly. The development of an electronics industry took about eight decades in the US, six in Japan, four in South Korea, and two in China. While industrializing countries are reaching the technological frontier in less time, they are also being required to build their elite scientific workforces more rapidly.

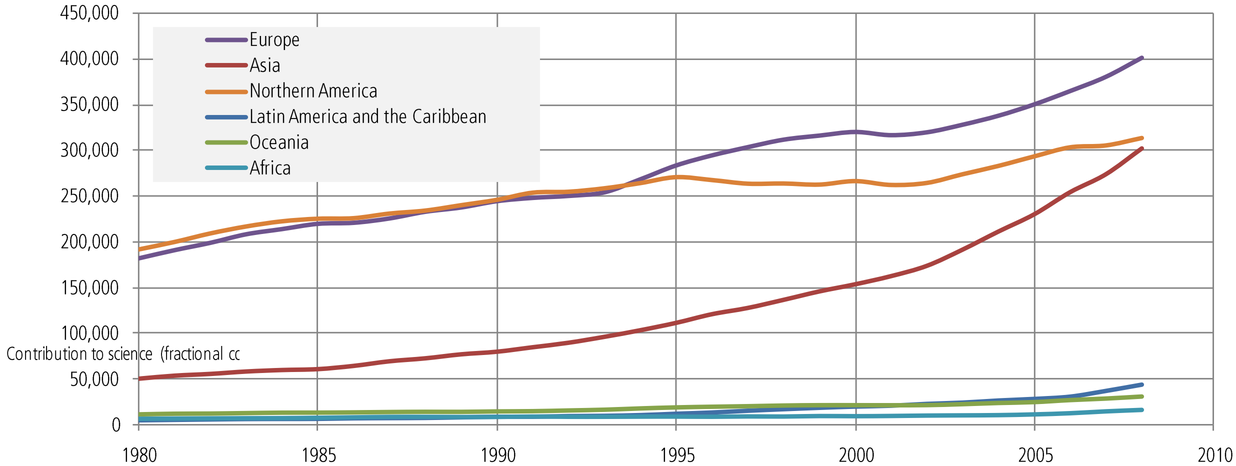

Figure 9 **Contribution to world science by region, in number of papers, 1980–2008**

Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

Take the example of the Republic of Korea. In 1960, it was a deeply destroyed country that was struggling to survive as a backward, agricultural economy. It is now undisputedly one of the global leaders in the production of electronic goods, particularly, the increasingly dense memory chips used in computers. This great exporting country, which was once called the "Hermit Nation," also plays an important role in the development and manufacture of non-volatile flash memory, used in cameras, portable music players, and solid state disks (which will replace electromechanical computer hard disk drives in the coming decade). These technologies are increasingly built on research and development (R&D), and it would be a mistake to think that basic research and creativity are not part of their development and that of other high-tech goods manufactured in South Korea. Moreover, as the economies of countries such as the Republic of Korea become more complex, a workforce with skills from different fields—including health care, management, marketing and finance—becomes increasingly necessary.

Figure 10 shows the presence of several "hot zones" (in red and orange) where science has grown at a faster rate than the baseline, as measured by growth in the Web of Science (the most recent 15 years versus the previous 15 years). At the continental level, Latin America and the Caribbean have seen the most rapid growth (GI: 2.1), followed by Asia (1.75). Oceania, Europe, and Africa have not moved much in either direction (with GIs of 1.07, 0.95, and 0.93, respectively). Only in Northern America has growth (GI of 0.78) been considerably slower than that at the world level.

At the country level, Iran has experienced the fastest growth (GI of 14.4), followed by the Republic of Korea (9.8), Turkey (7.8), Cyprus (5.2), China (5.1), and Oman (4.8). In Latin America, the highest growth was in Colombia and Brazil (2.9), and Uruguay, Mexico, and Ecuador (2.4). Europe's strongest growth was in Portugal (3.9), Estonia (3.4), Luxembourg (2.3), Greece (2.1), Spain (1.9), and Iceland (1.8). In Africa, growth was strongest in the Maghreb countries—Tunisia (3.2), Morocco (2.8), and Algeria (2.7)—although Libya's output shrank (0.5) and Mauritania's scientific output is still too low to make it possible to calculate growth. Botswana is the Sub-Saharan African country with the most tangible growth (GI of 2.6). In contrast, the UK (0.86), Canada (0.82), and the US (0.77) have all grown at a slower pace than the world rate.

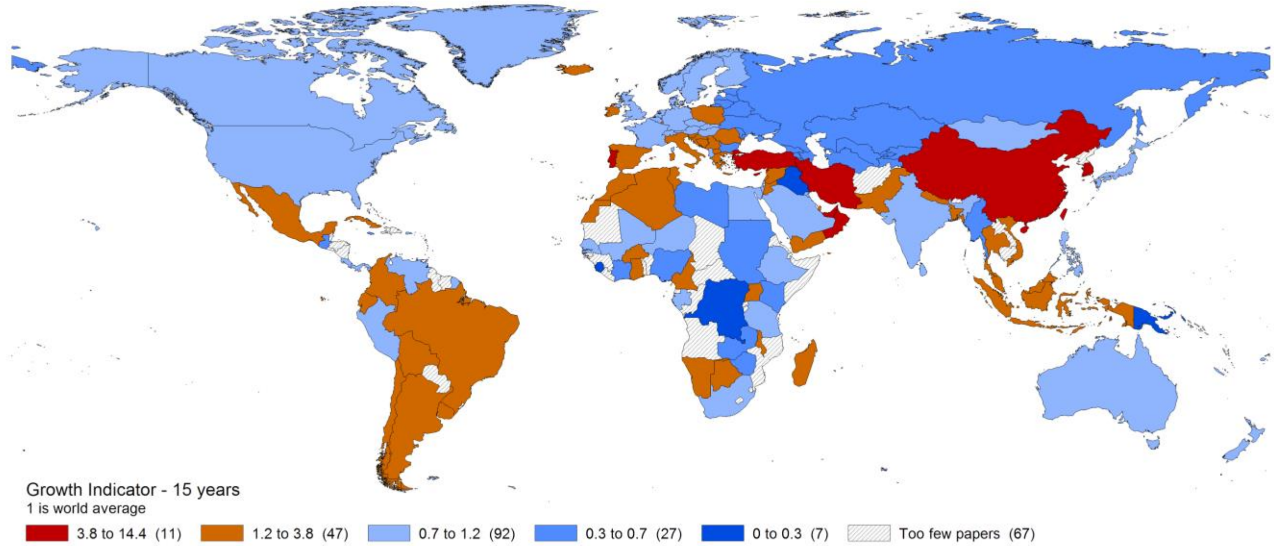

Figure 10 **Growth mapped at the country level, 1995–2009 vs. 1980–1994**
Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

Although growth in scientific output by the Republic of Korea has been spectacular in relative terms, in absolute terms the rising Asian superpower is clearly China. China is on target to meet the US level of scientific output (measured in peer-reviewed papers) in 2015 (Figure 11). The rapid convergence of the production of these two heavyweights is explained by the fact that China's output grew more than five times faster than that of the US.

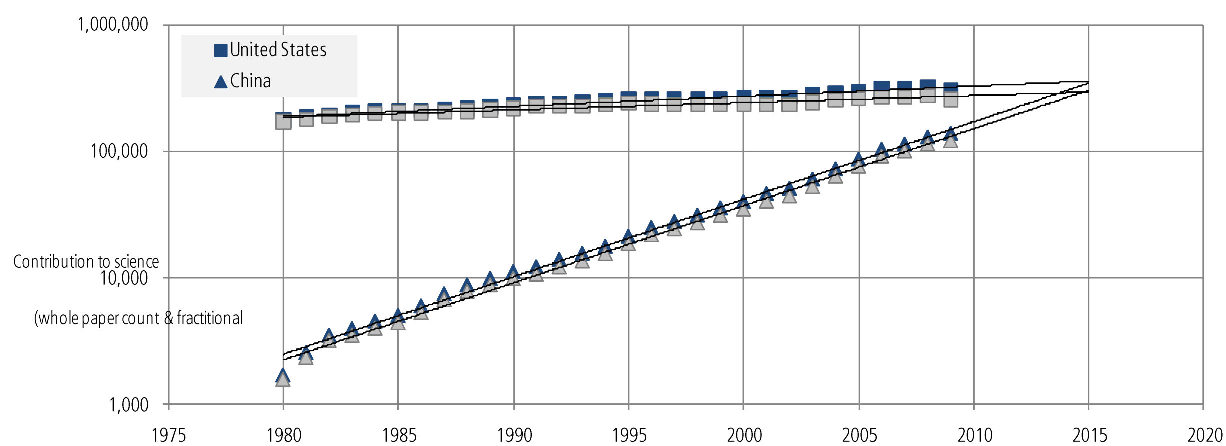

Figure 11 **Papers by China and the US, whole and fractional counts, 1980–2009**
Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

Figure 12 shows that China's scientific production has increased especially rapidly in the natural sciences & engineering (4.4 times faster than the world growth rate), and will overtake US output in this area during 2010. However, China's progress in the life sciences (GI_{LS}=3.97) and in social sciences & the humanities (GI_{SSH}=4.15) is still slower than US production levels. However, US scientific output in these three areas has been relatively modest over the last 30 years, and since growth has been slower than the world average, the US has been losing ground (GI_{NSE}=0.73; GI_{LS}=0.87; GI_{SSH}=0.79). If current trends persist in the US and China, China will overtake the US in life sciences scientific output around 2027 and in the social sciences & humanities around 2032. Of course, much could happen on both sides to affect these growth patterns.

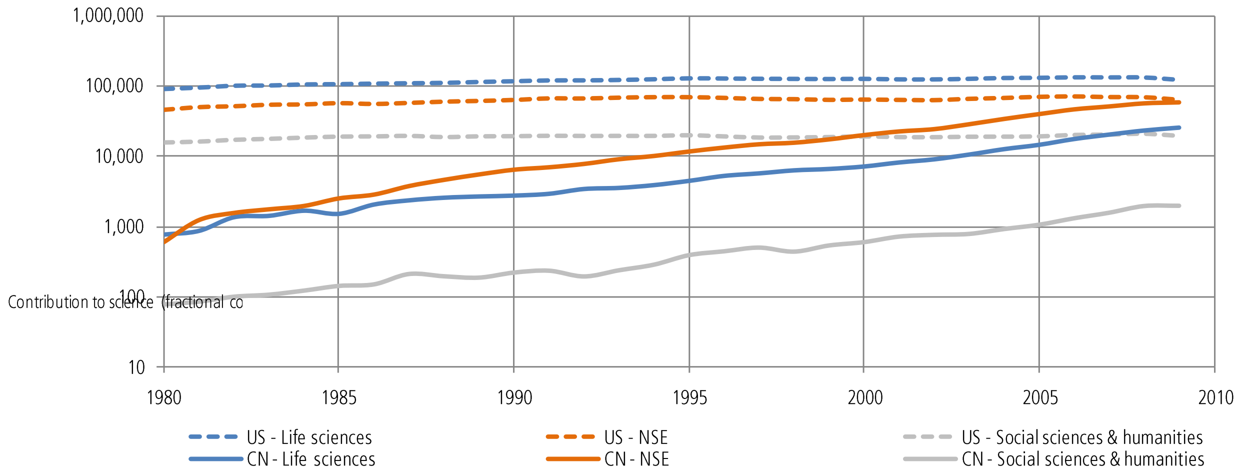

Figure 12 **Presence of China and the US in life sciences, NSE and SSH, 1980–2009**

Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

China already publishes more papers than the US in chemistry and certain specialties of engineering, physics, and mathematics (data not shown) and its output in materials science, polymers research, and metals and metallurgy research overtook that of the US in the mid 2000s. These subfields are the areas of science and technology in which developing countries most commonly catch up with the more developed nations by repeating—in an accelerated manner—the industrial and scientific evolution of Western countries (Figure 13).

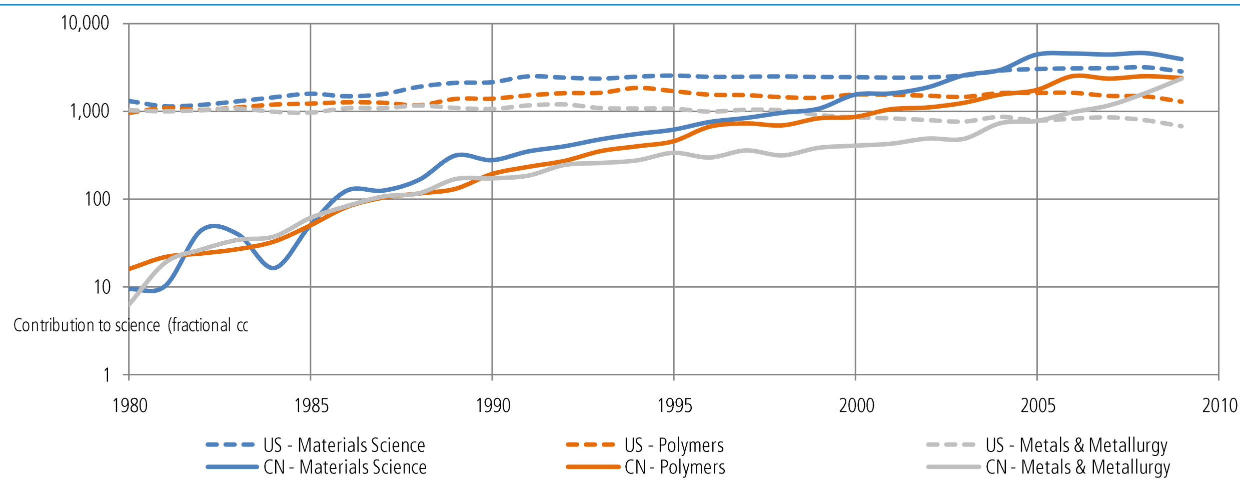

Figure 13 **Presence of China and the US in materials sciences, polymers and metals & metallurgy, 1980–2009**

Source: Calculated by Science-Metrix using the Web of Science (Thomson Reuters)

UNDERSTANDING THE POLITICS OF SCIENCE AND SCIENCE POLICY

Geopolitical changes often coincide with the end of armed conflict or, in the case of the Cold War, the end of an arms race. What effects of these changes can be seen in science? The availability of 30 years' worth of highly detailed data provided a valuable opportunity to study the interaction between geopolitical shifts and scientific activity. For example, the dissolution of the USSR in 1991 was one of the most significant historical events of the 1980–2009 period, and yet few studies have examined the effect of this event and its aftermath on scientific activity in Russia and the former Soviet republics, or indeed other members of the Warsaw Pact. This paper also studied the interaction between war and science in three countries that were involved in armed conflict in the last 30 years: Iraq, Iran and Kuwait. It also looked at the effect of the armed conflict in the former Yugoslavia.

The science system has been shaped in very different manners in all these regions. In the former USSR and Iraq, the collapse of the economic system meant the collapse of the scientific system. However, if one excludes the USSR, most of the ex-Warsaw countries' scientific systems started burgeoning only a few years after the fall of the Berlin Wall. This was also the case of the ex-USSR republics of Lithuania and Estonia. Certainly, the entry of these countries in the European Union, or the accession process, may have played an important role in the development of these countries' scientific capability.

Cultural, ethnolinguistic, geographic, and historical factors also play an important role in the development of scientific systems. Certainly, these factors affect how well a country's scientists integrate in the world scientific community. Having access to a large group of collaborators such as the EU not only helps to bolster economic performance but also increases scientific impact and the speed of knowledge diffusion in a country. This may have played an important role in the development of the Lithuanian and Estonian scientific systems and, likewise, now that Latvia is part of the EU, it will have a unique opportunity to modernize its scientific system which is still producing at the rate it was in the Soviet era. Nevertheless, one should not be blinded by the potential effects of being a scientifically developed nation. For instance, Turkey, which is exceedingly keen to join the EU, has managed to increase its scientific output nearly eight times faster than the world average—the third fastest rate of growth observed among large countries in the last 30 years. Despite this momentous development, other European nations are still relatively reluctant to welcome Turkey into the European fold.

There is clearly a need to understand how national scientific systems are shaped by the politics of science and science policy. In this respect, two particularly important cases to study are those of the Middle East and Asia. In the Middle East, the development of national scientific systems appears to be primarily shaped by politics. For example, Iraq's system grew and fell because of politics. The astronomic growth of the Iranian system may have been the result of a reaction to the isolation that the country experienced during the Iraq–Iran war. Indeed, the fact that so many countries sided with Iraq at the time may have incited the Persian republic to mobilize its scientists to develop nuclear capabilities. This response seems paradoxical, since it only seems to translate into greater isolation for Iran.

In contrast to the Middle East where science appears to be a political tool, Asia has embraced science in its thirst for further development. Certainly, science is appreciated for its instrumental and utilitarian capacity to propel technological and economic growth. However, even if the application of the highly derided linear model is helping Japan, China, and the Asian Tigers become the most advanced technological countries on the globe, there is no doubt that science is also shaping these countries in ways that may not be as controlled as some of them might want. While they are the poor cousins of the more applied sciences, the seemingly less utilitarian social sciences are also developing and shaping these countries' education, governance and social structures. In this context, there is a need to start studying science policy once again, in order for us to understand not only how the sciences, including the life sciences, social sciences & humanities, are shaped by periodic and secular geopolitical changes, but also how they in turn shape the very fabric of modern and modernizing societies.

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