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China's Rise as a Global S&T Power and China–EU Cooperation

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SUMMARY

In recent years, China has made noticeable progress in its quest to become a global science and technology (S&T) power. EU leaders see China as both a competitor and as a partner for scientific cooperation. The European Union benefits immensely from cooperating with China and has expectations regarding access to Chinese markets, knowledge, personnel and funding opportunities. However, China–EU S&T cooperation has also met a number of challenges, including the infringement of intellectual property rights (IPR), increasing competition from the Chinese high-tech sector, limited market access for European companies, and Chinese “indigenous innovation” measures. In addition, some analysts have raised concerns about the potential security impact of European technology transfers to China. While Europeans need to develop a greater awareness of potential security implications of their cooperation with China, this cooperation will be essential if the EU wants to maintain its position as a global S&T leader. The best way to stay ahead in the global S&T race is not to follow a strategy of “scientific containment,” but to strengthen Europe’s own innovative capabilities.

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INTRODUCTION

In recent years, China has made noticeable progress in its quest to become a global science and technology (S&T) power. The Chinese leadership has stepped up its efforts to promote indigenous innovation and to foster its domestic high-tech industry. This has sparked increasing concerns about the West losing its edge in S&T. Americans have approached the issue mainly from a national security perspective, trying to limit scientific cooperation with China in order to avoid the transfer of technologies with potential military or dual-use applications. As a result, S&T cooperation between these two important global players remains limited. This forms a striking contrast to the European approach: Scientific cooperation has become an essential component of the EU's overall engagement policy that aims at promoting European economic interests and influencing social and economic development of China. Today it is one of the pillars of the so-called strategic partnership that was established between the two sides back in 2003.

Since technological innovation can only thrive under conditions of international cooperation, both China and the EU are benefitting tremendously from scientific collaboration. However, in Europe there are growing concerns about increasing international competition from the Chinese high-tech sector, for example in green energy, telecommunications, and space technology. Security is also an issue: Some analysts fear that China-EU S&T cooperation might contribute to China's military modernization efforts. U.S. critics are especially worried that the Europeans might lift their arms embargo on China. So should Europe move towards a more restrictive approach on S&T cooperation with China?

CHINA: AN EMERGING GLOBAL S&T POWER

Chinese leaders see scientific and technological progress as essential for finding solutions to the economic and social problems facing China today, such as social stability, environmental degradation, and energy security. S&T further plays a vital role in modernizing the People's Liberation

Army (PLA) through civil-military integration and the construction of a defense and dual-use science, technology, and industrial base.

In recent years, Beijing has introduced a number of ambitious policy measures to move China further up on the global S&T value chain and to lessen the country's dependence on high-technology exports from overseas by promoting "indigenous innovation." One example is the Medium- to Long-term Program on Technological and Scientific Development 2006-2020 (MLP). The MLP aims at turning China into an "innovation-oriented society" by the year 2020, and into a global S&T leader by 2050. The plan's targets include increasing investment in R&D from 1.34 percent of China's GDP in 2005 to 2.5 percent in 2020 and reducing the share of imported technology to no more than 30 percent from an estimated 60 percent in 2006. Other targets include drastically increasing the frequency of international citations of Chinese-authored scientific papers and establishing several world-class universities and research institutes. These highly ambitious goals have also been stated in recent policy documents, such as the 12th Five-Year Plan (2011-2015), which was approved in March 2011.

These political declarations are accompanied by massive financial investments. In 2010, China spent 1.75 percent of GDP on R&D and the central government plans to spend 194.41 billion RMB (€ 20.14 billion) on S&T in 2011, up 12.5 percent from 2010. So while the ongoing global economic and financial crisis leads to painful spending cuts in the West, Beijing keeps raising its S&T budget.

China's efforts to become a global leader on innovation seem to be paying off. For example, China's output of research publications has grown more than four-fold between 1998 and 2008, from just over 20,000 papers to more than 112,000 papers. Globally, China ranks second only to the United States by the measure of annual output. The number of patents registered in China has also risen considerably, with an average total volume annual growth rate of 26.1 percent between 2003 and 2009. Thomson Reuters expects that Chinese patent filings will overtake Japan and the United States in 2011 (having surpassed Europe in 2005), making China the "global innovation leader."

Despite these impressive numbers, many foreign analysts remain skeptical. A recent article in the *Wall Street Journal* calls Chinese innovation a “paper tiger” and points to the fact that most Chinese patents only make tiny changes to existing technologies. Others doubt that China’s rigid Communist bureaucracy can provide a stimulating environment for creative minds, or as a recent report from the U.S. Chamber of Commerce put it: “Soviet planning cannot replicate the Silicon Valley.” The current troubles with China’s showcase high-speed railway link between Beijing and Shanghai illustrate the problems that China is facing on the fast track to global S&T leadership—where success is measured by quantities and not the quality of new technologies.

However, China’s leaders seem determined to continue their strategy of combining massive financial investments, state-led megaprojects, technology transfers from overseas, and a stronger focus on indigenous innovation in order to transform China into a global S&T powerhouse.

EUROPE: STRUGGLING TO STAY AHEAD

The European Union on the other hand is struggling to maintain its global leadership position on S&T in the wake of the global economic crisis and also in the face of growing competition from China. The European Commission has identified “smart growth” as the way to make the EU emerge stronger from its economic troubles. By promoting knowledge and innovation, the EU wants to tackle European and global challenges, such as rising unemployment, climate change, and resource scarcity. “Smart growth” is one component of the EU’s “Europe 2020 Strategy,” which was rolled out in March 2010. The strategy calls on EU member states to raise R&D expenditures to 3 percent of GDP, improve the quality of education, strengthen research performance, and promote innovation and knowledge transfers within Europe. One of seven so-called flagship initiatives under Europe 2020 framework is the “Innovation Union,” a set of policies that aims to “re-focus R&D and innovation policy on the challenges facing our society, such as climate change, energy and resource efficiency, health, and demographic

change.” This will be achieved by tearing down existing barriers between the EU’s 27 separate innovation systems, by improving framework conditions for private companies to innovate, and by strengthening academic–industrial linkages. Ending the fragmentation of Europe’s innovation systems into national fiefdoms will be essential in achieving the Commission’s ambitious goals.

The EU expects the benefits of a successful implementation of its innovation policies to be enormous. By one estimate, raising EU GERD to 3 percent by 2020 could create 3.7 million jobs and increase the EU’s annual GDP by around 800 billion Euros by 2025. However, the EU still has a long way to go in order to achieve this target. EU GERD stagnated at around 2 percent in 2010, still far below the 3 percent target. In addition, there exists a huge gap between European innovation leaders, such as Finland (3.96 percent in 2009) and member states on the other end of the spectrum, such as Cyprus (0.46). These internal disparities will have to be overcome in order for the EU to achieve its ambitious S&T policy goals.

One of the factors driving the new European focus on innovation is China’s S&T rise. Both Europe 2020 and the Innovation Union specifically mention Chinese “leapfrogging” efforts. But EU policymakers do not just see China as a competitor. They also see great opportunities in Sino-European S&T cooperation. Therefore, the EU is intensifying its efforts to attract Chinese talent and to further deepen its collaboration with China. As a result, EU–China S&T cooperation activities, which first started in the early 1980s, have mushroomed. Chinese researchers have been invited to take part in projects that are funded by the EU’s “Framework Programs for Research and Technological Development.” By November 2010 there were 181 Chinese research teams participating in 134 projects funded by the current 7th Framework Program, and they have already received €23.7 million in EU funding. Chinese students are also flocking to Europe: The total number of Chinese students in the EU in 2010 was between 118,700 and 120,000—about six times more than in 2000 and only slightly lower than the number studying in the United States (around 128,000 in 2010). In addition, there are numerous cooperation projects and funding programs at the member-state and lo-

cal levels, and in the private sector. There have been some complaints about the lack of reciprocity from the Chinese side, especially in view of China's rapidly rising R&D spending. But generally these exchanges are seen as a success on both sides.

THE BENEFITS OF SINO-EUROPEAN S&T COOPERATION

Economic considerations are the major driving force behind the overall European strategy of engagement with China, and not just in the S&T field. China is now the EU's second largest trading partner, behind the United States, and the EU is China's No. 1 trading partner. The financial crisis has further magnified this economic interdependence, with successful export-oriented economies such as Germany becoming increasingly dependent on the Chinese market. Simultaneously, Beijing is lending a helping hand to debt-stricken Southern European EU member states such as Greece, Spain, and Portugal in an effort to stabilize the Euro Zone economy—China's largest export market.

However, it is not just about European economic interests. EU leaders believe that by engaging China on a broad range of issues, they can help to influence its social and economic development in a direction that is desirable to both sides. The EU's policy of dialogue and engagement has undoubtedly suffered some setbacks—for example, on human rights issues. But in other areas this policy has been quite successful. Economically, EU companies have reaped great financial benefits, despite ongoing problems with regard to IPR protection, forced technology transfers, and market access for European companies.

EU-China S&T cooperation is another success story and there are multiple benefits that motivate both sides to collaborate. Gaining access to and adapting products for the Chinese market remains the No. 1 motivation for Europeans. In addition, European researchers are keen to benefit from rising Chinese spending on R&D. While researchers in EU countries have been hit by austerity measures and spending cuts, Chinese R&D expenditure grew by an impressive 22 percent on aver-

age annually between 2006 and 2010. European companies and research institutions also want to tap into the Chinese S&T personnel pool, which is rapidly growing both in quantity and quality. According to the Chinese Ministry of Science and Technology, the number of Chinese researchers has nearly doubled from 1.05 million in 2008 to 2 million in 2010. Last but not least, Europeans see S&T cooperation as a part of their overall strategy of engaging China and expect scientific collaboration to make technological developments within China more transparent to the outside world.

For Beijing, the main motivation has always been to acquire high technology that is essential for China's economic development—in terms of hardware as well as know-how. China strives hard to lessen its dependence on technologies from abroad by strengthening its indigenous innovation capacities. However, for the time being, transfers of foreign technology remain essential for China's economic modernization efforts. Europe is a vital source of such technology. According to the Chinese Ministry of Commerce, the EU accounted for 30 percent of China's overall technology imports in 2009, making it China's "largest source of technology imports."

In the future, China's engagement might become increasingly driven by market access considerations as Chinese high-tech companies, such as the telecom equipment giants Huawei and ZTE, expand their activities in European markets.

CHALLENGES OF COOPERATING WITH CHINA

Despite the benefits, S&T cooperation with China poses a number of challenges for European partners, including IPR infringement, increasing competition from the Chinese high-tech sector, limited market access for European companies, and Chinese "indigenous innovation" measures.

European companies operating in China have long complained about IPR infringement, either through forced technology transfers or technology theft. The fact that Chinese companies often compete against their former European partners with their own (sometimes slightly altered) technology has caused a stir among European businesses,

politicians, the media, and the public. In some industries, Chinese companies have already overtaken their European counterparts. One example is renewable energy, where the EU continues to provide assistance to China, with the goal of helping to reduce its emissions level. However, this does not seem to stop EU companies from doing research in China: The 2010 Business Confidence Survey of the EU Chamber of Commerce in China (EUCCC) found that more than one-quarter of European companies have established R&D centers on the Chinese mainland. Profit from the Chinese market still seems to outweigh the losses caused by IPR infringement.

China limiting European companies' access to the Chinese market—one of the major motivations for the European side—has been a highly contentious issue in recent years. One example of such limited market access is the Chinese government procurement market. Industries that are considered “strategic” by Beijing remain closed to European bidders and China has yet to sign the World Trade Organization's Agreement on General Procurement, which deals with public procurement. This has provoked strong protests from European companies and the EUCCC. The latter has further lodged several protests against Chinese “indigenous innovation policies,” which promote the development, commercialization, and purchase of Chinese products and technologies. Some of these measures were linked to public procurement and led to complaints by the EUCCC and other foreign business associations that saw them as discriminatory against foreign companies. While the Chinese central leadership has agreed to revise some of these measures, the same policies continue to be implemented at the pro-vincial and local levels.

POTENTIAL SECURITY RISKS

In addition to these economic challenges, there are growing concerns that technology transfers from the EU might contribute to China's military modernization efforts. U.S. analysts fear that European technology with military applications might contribute to China's growing military strength. They are afraid that the Europeans might even lift

the EU arms embargo that was imposed on China in the wake of the 1989 Tiananmen crackdown. However, the embargo does not seem to have any limiting effect on scientific cooperation between the two sides, and European companies that work with dual-use technologies seem to avoid China, fearing that they might lose out on the more important U.S. market. Nevertheless, security concerns have become part of the European debate. Even though the EU and its member states are only marginal players when it comes to hard security challenges in the Asia-Pacific region, military conflicts in flashpoints such as the Taiwan Strait would eventually also affect Europe—both economically and politically.

Security concerns contributed to the breakdown of collaboration on the EU's Galileo global navigation satellite system, once hailed as a flagship project of Sino-European S&T cooperation. A mixture of security issues and fear that European technology might be siphoned off to Beijing's competing Beidou (or COMPASS) system finally led to China's exclusion from the project in July 2008, less than five years after Beijing had agreed to contribute €200 million to Galileo.

SOME POLICY RECOMMENDATIONS

1. Europe needs to continue working with China. Innovation does not happen in a black box and requires international exchanges. The benefits of cooperation for Europe are huge, be it with regard to markets, knowledge, personnel, or funding opportunities. However, European openness requires reciprocity on the part of China, which needs to ensure IPR protection and non-discriminatory public procurement.
2. Europeans need to develop a greater awareness of potential security implications of their cooperation with China. As Beijing continues the modernization of its military, Europeans should take seriously the concerns voiced by China's neighbors and the United States, but without adapting the “scientific containment” mindset that limits Sino-American exchanges.

3. The EU needs to strengthen its own innovative capabilities. This is the most promising way for Europe to maintain its role as a global leader in science and to rise to the challenge of Chinese high-tech competition. Therefore the EU needs to provide the necessary financial resources, even in economically tough times. And it needs to end the fragmentation of Europe's innovation systems into national fiefdoms. Only by

putting its own house in order will the EU be able to achieve "smart growth" and to emerge stronger from the financial crisis.

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