Sino-German Innovation Platform
Policy Briefs 2019 by the German expert group
Sino-German Innovation Platform

How can the EU work towards a levelled playing field with China?

Levelling the playing field - Catchword or concept for EU-China relations?

The Quest for Efficiency in Science, Technology and Innovation Systems: Comparing Policies in China and Selected OECD Countries

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With these “Policy Briefs” the experts of the Sino-German Innovation Platform (SGIP) would like to contribute to informing and sensitizing for the current trends and developments in the Chinese innovation landscape.

For Germany China is a strong and important partner in science and innovation. On its path to becoming one of the leading scientific nations in the world, China is systematically and rapidly expanding its research and innovation capabilities. At the same time the German-Chinese science cooperation has intensified during the past years. However, the cooperation with China does not only offer opportunities, but also poses challenges at times. In order to build up a sustainable and successful cooperation with China, it is necessary to closely monitor, analyze and understand its science and innovation policy as well as the frame conditions for cooperation. The SGIP expert group’s policy briefs are meant to contribute to this.

The expert group has been appointed as an independent working group by the German Federal Ministry of Science and Education (BMBF) in spring 2017. Their task is to connect the China expertise within Germany and at the same time contribute with their expertise in the innovation dialogue between Germany and China. The expert group is supposed to give impulses for the development of the science and innovation cooperation with China, to pool relevant knowledge on China’s innovation development and contribute to its dissemination. The expert group consists of Prof. Dr. Doris Fischer (University of Würzburg, Head of the expert group), Prof. Dr. Michael Dowling (University of Regensburg), Dr. Rainer Frietsch (Fraunhofer ISI), Dr. Thomas Pattloch (TaylorWessing), Prof. Dr. Ulrike Reisach (University of Applied Sciences Neu-Ulm), Dr. Margot Schüller (GIGA Hamburg), Dr. Kristin Shi-Kupfer (MERICS), Friedolin Strack (BDI) und Prof. Dr. Markus Taube (University of Duisburg-Essen).

The DLR Project Management Agency has been the organizational office of the SGIP since April 2014 and is also responsible for the support of the expert group and their work.

The expert group of the SGIP points out that the expressed positions do not necessarily reflect the positions of the Federal Ministry of Science and Education or the DLR Project Management Agency.
How can the EU work towards a levelled playing field with China?

Since the Trump administration took office in January 2017, the tone in dealing with China and with market distortions caused by China’s state-led economy has changed fundamentally. This does not only hold true for the US, but also for other players. Behind the shift was an increased concern over market distortions caused by the state-influence within the Chinese economy. Significant reference works have helped to describe and document the unlevel playing field for Western companies when competing in China and with Chinese companies: the December 2017, 465-page “European Commission Staff Working Document on significant distortions in the economy of the People’s Republic of China” (EU COM 2017) and the 215-page USTR-Report on “China’s Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation” of March 2018 (USTR 2018).

For this policy brief, three publications are taken as an indication on how to deal with systemic market distortions through state-intervention:
- the BDI-China document of January 2019 (BDI 2019)
- the China-Communication of the European Commission in March 2019 (EU COM 2019)
- the MERICS/Rhodium study “Beyond investment screening” published by the Bertelsmann Stiftung in October 2019 (Huotari/Kratz 2019)

The intention of this policy brief is to present the key points of these three documents in relation to levelling the playing field for European companies in the EU internal market.

**BDI: China - Partner and Systemic Competitor**

On 10 January 2019, the BDI published a policy paper with the aim of strengthening the competitiveness of German industry while continuing our partnership with China. The process leading to this document had been started in January 2018 and picked up speed in a joint working programme of the think tank Bertelsmann Stiftung and BDI. It involved several meetings and rounds of consultation within BDI’s membership throughout the year 2018. One of the basic questions was: How should Germany and the EU deal with a China that would not develop into a Western-style market economy in the foreseeable future and that would stick to the strong state control of the domestic economy? In the process of drafting the document, two points should be highlighted: First, the consensus within the German business community regarding the analysis and the recommendations of the BDI-paper was surprisingly strong. Second, the closer the paper came to its finalisation, the more European was the design of the recommendations.

On industrial policy, the BDI-document argues that it would be pointless to follow the dirigiste approach of Chinese industrial policy. Tight government regulations on research funding may work in China. In an environment in which entrepreneurs are accustomed to deciding independently on investments in future technologies, they would be counterproductive. According to the BDI, an actively interventionist industrial policy would have a negative impact on the corporate landscape.

Overall, the BDI-China document was a wake-up call for a stronger Europe. It bore a clear message: There is only one way left between the political poles of the USA and China to avoid becoming the playing field of other major powers, namely to promote EU integration and align foreign, security and trade policy even more consistently with EU interests. The measures that BDI called for in order to strengthen the EU in general, ranged from a structural shift towards a growth-oriented and higher EU-budget, to more support for research and development and new technologies, new initiatives towards a pan-European infrastructure for transport, energy and digital networks as well as the setting of long-term goals such as a comprehensive Europe-wide 5G network by 2025 or enabling a European hydrogen economy. The document did not call for new and strong EU industrial policy. BDI highlighted the efficiency advantages of the market economy to be exploited to a greater extent through a modern, technology-open European and cross-border industrial policy. Instead, promoting research and development, intensifying competition, promoting new technologies and keeping markets open or opening them further should be focal points.

In its calls for action, BDI focused on the following ten issues in order to level the playing field vis-à-vis Chinese competitors with a focus on EU-markets and elements of competition policy:
1. New instrument against distortions of competition in takeovers. The BDI-document argued in favour of introducing a new instrument to control subsidies for foreign investments. This should aim to ensure that Germany and the EU remain an open investment location. If a state-subsidised takeover is suspected, subsidy control should be applied regardless of the investor’s country of origin. In such cases, adequately staffed inspection bodies should be able to rely on transparent information on the investor’s company accounts (based on international accounting standards), on evidence in the ownership structure and on evidence on the sources of financing for the takeover. The BDI called for the design of instruments to safeguard a competitive level playing field at EU level and for the consistent application of existing instruments. 

2. Establish new criteria for assessing market power with coordinated action. A risk posed by takeovers from any state-driven economy is seen in the possibility of building up a dominant market position. Such market power could be built up by formally legally independent investors who, however, act in a coordinated manner within the framework of the Chinese government’s central economic planning (especially state-owned enterprises). In such a case, German and European competition authorities find it difficult to diagnose and combat market power. The competition law instruments should be adapted to the new global challenges.

3. Reappraising merger control. While in China large corpora-
tions are forged by government interventions on a global scale (e.g. in the railway sector with the formation of the large corpora-
tion CRRC in 2015), the competition authorities in the EU mostly consider the European internal market as the relevant market for European mergers. Taking a more global view on markets, BDI suggested allowing the market-driven formation of European champions.

4. Strengthen anti-subsidy instrument. In contrast to the anti-
dumping instrument, the anti-subsidy instrument is less effective in view of overcapacities on global markets and trade. Too often, companies cannot provide the necessary evidence of “material injury”. The central problem here, especially in connection with China, is the lack of official transparency. As a result, it is often very difficult to give a precise figure for the possible subsidy margin. The BDI argued for tightening up the anti-subsidy instrument including improving subsidy notifications, defining state enterprises more precisely and recording trade-distorting subsidies more accurately.

5. EU state aid rules to subsidies outside the EU should be applied. EU state aid law also needs to be adapted in view of systemic competition and the resilience of our market economy. While state aid is relatively strongly regulated within the EU and subject to high transparency requirements, there are no instruments to restrict state aid outside the EU that have an impact on the EU market. A first step towards greater equality of competition would be to anchor and effectively develop so-called “matching clauses” (clauses that allow state aid to be used where state aid abroad distorts competition) in EU state aid law. In addition, consideration should be given to the possibility of extending EU state aid rules to aid granted outside the Union.

6. Strictly observe transparency requirements when awarding contracts in the EU and effectively enforce EU law. The transparency requirements applicable to public contracts under the EU Treaty and the EU Directives must be strictly observed. This means, in particular, that public contracts subject to tendering requirements may not be concluded through inadmissible “direct awards”. Effective enforcement of EU public procurement law also requires that infringements of EU public procurement rules should be consistently pursued by the Commission. The prioritisation of infringement procedures announced by the Commission must not lead to a reduction in the use of this key instrument of EU law enforcement.

7. Prevent dumping prices when awarding contracts in the EU. Following the model of EU anti-dumping investigations into trade in goods, companies should also be given an effective tool to insist on an effective review of abnormally low bid prices in the case of public procurement. EU companies must be protected against dumping offers from subsidised companies from third countries. This applies to all procurement procedures in the EU, but particularly to those awarded in the context of projects directly funded by EU-institutions.

8. Improve mutual access to public procurement. In principle, the International Procurement Instrument (IPI) proposed by the EU Commission pursues the right objective of enforcing the principle of balanced reciprocal market access enshrined in the Government Procurement Agreement (GPA). The aim of the IPI, for example, is to enable the Commission to investigate discrimination against EU companies in connection with public contracts in third countries. According to BDI, the latest draft legislation of the IPI at the time of the publication of the BDI-document required further revision in order to avoid negative effects. It must be ensured that counterproductive effects, additional costs for companies and legal uncertainties for EU companies as well as awarding authorities in the EU are avoided. The principle of reciprocity enshrined in the GPA should be maintained.

9. Prevent dumping of services. So far, in the EU no effective instruments against dumping in trade in services exist. There are gaps in both WTO and EU law. Although the EU Commission has made it possible to take labour and environmental standards into account in the methodological renewal of the basic anti-dumping regulation, it is questionable to what extent this can be used to tackle distortions of competition in the increasingly important service sector. The creation of new instruments should be considered here.

10. Adjust European Export Credit Schemes. In order to reduce existing disadvantages, Germany and the other EU states should make full use of the existing scope of the OECD consensus with regard to export financing. In Germany, the national scheme of export credit insurance should be adjusted accordingly.

The BDI policy paper on China triggered an EU-wide debate on a policy shift towards China. The BDI being probably the first influential business association of an industrialised country raising its voice on systemic problems stemming from the negative influence of state-led economies on Western markets, attracted a strong global attention to this document and influenced a debate on how to re-adjust national and EU policy instruments.

\footnote{On Chinese FDI in Germany and the position of German industry also see Strack 2017}
European Commission: “EU – China: A Strategic Outlook”

In March 2019 the European Commission under the auspices of the European External Action Service issued a recommendation to the European Parliament and the European Council calling for a shift in the EU China policy. On the one hand, the report recommended the deepening of the EU’s engagement with China in a number of crucial fields from the defence of multilateralism to fighting climate change. On the other hand, it called for a proactive approach to strengthen the economic competitiveness of the EU and ensure a level playing field vis-à-vis Chinese companies with a strong focus on competition within the EU internal market.

The establishment of a single market for public procurement is seen as one of the key achievements of the internal market. EU-wide publication of tenders ensures transparency and creates opportunities for companies across the EU. Better implementation of the EU’s public procurement directives would ensure quality and security at all stages of the process, value-for-money, and the sustainability of projects. Considering that a substantial part of public investment in the EU economy is spent through public procurement (EUR 2 trillion yearly, representing 14 % of EU GDP) the Commission argued towards a more strategic approach. A new approach to the EU’s procurement framework should help to identify and address obstacles and loopholes that impede a level playing field in practice. The rules should be revised or their application strengthened in order to ensure that procurement procedures conducted in the EU on the basis of international agreements comply with the Treaty principles of transparency and equal treatment. Further, public procurement for projects benefitting from EU funding should guarantee a high standard of quality, security, sustainability and social responsibility.

To ensure that not only price but also high levels of labour and environmental standards are taken into account, the Commission announced that it would publish guidance on the participation of foreign bidders and goods in the EU procurement market, taking into account EU and international rules on procurement, including on abnormally low tenders. The Commission, together with Member States, would conduct an overview of the implementation of the current framework to identify shortcomings before the end of 2019 (action point 7 of the China communication).

In its recommendation, the Commission also stated that EU policy tools do not fully address the effects of subsidies granted by foreign governments within the EU internal market. EU competition policy instruments apply without discrimination to all economic operators, irrespective of their origin. Yet, EU state aid rules only cover aid granted by member states, not subsidies granted by the governments of third countries to their companies bidding in the EU. Further, EU merger control does not allow the Commission to intervene against the acquisition of a European company solely on the grounds that the buyer benefitted from foreign subsidies. Trade defence instruments address subsidies that affect the price of products imported into the EU. However, these instruments do not cover all potential effects of unfair subsidies or support by third countries.

To close this gap, the Commission finds it necessary to identify how the EU could appropriately deal with the distortive effects of foreign state ownership and state financing of foreign companies on the EU internal market. To fully address the distortive effects of foreign state ownership and state financing in the internal market, the Commission will identify measures how to fill existing gaps in EU law before the end of 2019 (action point 8 of the China communication).2

In the context of the renewed industrial policy strategy, the Commission announced that it would foster industrial cross border cooperation, with strong European players, around strategic value chains that are key to EU industrial competitiveness and strategic autonomy. Among the fields of increased EU coordination in industrial policy, artificial intelligence and manufacturing of batteries are seen as priorities. The action should focus on increasing investment, making more data available and fostering talent.

The European Council adopted this recommendation on 22 March 2019, despite Brexit-related issues taking up most attention and pushing European debates on any other issues into the background. In continuing their joint working programme, Bertelsmann Stiftung and BDI sought how to deliver more substantial input into the Commission work programme on levelling the playing field with state-driven economies. The idea of a study on loopholes in competition and anti-subsidy policy instruments in the EU vis-à-vis foreign actors was discussed first among Bertelsmann Stiftung, BDI, the Rhodium Group and MERICS as early as October 2018. The intention was to substantiate the recommendations of the BDI-document that was drafted in parallel at that time.

Bertelsmann Stiftung / MERICS / Rhodium Group: Beyond Investment Screening

The final report was released in mid-October 2019, and takes stock of the defensive instruments available to EU member states and institutions to address the distortions stemming from China’s economic model that have the potential to harm EU consumers and companies. The instruments are categorised into three baskets: The first basket looks into existing instruments and practices that could be used or deployed more thoroughly, hence with a strengthened impact on the EU-China playing field. The second basket proposes avenues to further develop, amend, and even reform existing instruments, in ways that might better address China-related distortions. The third basket finally identifies instruments that do not exist today, but might be worth considering in the future.

Strengthen the implementation of existing instruments:

The BertelsmannStiftung/MERICS/RhodiumGroup report states that the EU could be much more effective in levelling the playing field vis-à-vis Chinese competitors with more assertive and integrated practices, aligned with European industrial policy priorities. This would include the EU more actively voicing concerns about Chinese practices, taking more and higher profile measures against Chinese infringements, increasing intra-EU coordination about such cases, mobilizing business and member states further, and doubling down on compliance cases.

2 The results were already published by the European Commission on 24. July 2019, “New guidance on the participation of third country bidders in the EU procurement market”: https://ec.europa.eu/growth/content/new-guidance-participation-third-country-bidders-eu-procurement-market_en
DG Competition, DG Trade and other relevant EU institutions could become more proactive in signalling concerns to Chinese counterparts, including through public statements and language on procedural fairness and due process in China and outside of the country. The authors suggest that DG Competition and DG Trade could publicly file a few exemplary cases around Chinese state-owned enterprises or state-funding giving evidence to non-market behaviour in the EU internal market.

The EU would also need to make more intensive use of existing instruments, including the public procurement directives and the newly reformed anti-subsidies trade defence instrument. Both of these tools can tackle distortions created by subsidized or state-backed trade and public procurement activities on the part of Chinese players. They could easily be used more intensively at minimal extra cost.

Both at the EU and member state level, existing regulatory compliance regimes (General Data Protection Regulation, anti-money laundering, accounting, etc.) could be applied more comprehensively to seek greater transparency about Chinese corporates’ financing and ownership structures. In particular, EU member states could launch increased court actions against Chinese companies’ wrongful behaviour, as national courts can force transparency on foreign players.

Finally, the report suggests EU institutions and member states could also adopt intensified remedies. In many cases fines of punishment imposed are simply too limited to force behavioural change.

**Amending existing instruments:**

The report also suggests a few ways how existing instruments could be amended or extended, in order to better deal with Chinese distortions. In antidumping and anti-subsidies cases, for example, more forward-looking elements could be introduced in EU rules, and greater scrutiny of abusive practices by non-dominant players could be encouraged.

Merger review conditions could be relaxed to allow for greater European market concentration, and hence strengthen the competitiveness of EU companies. Public authorities could also be allowed to broaden the scope for “legitimate interests” in merger reviews, for example to cover the protection of innovation capacity and critical values chains relevant for the long-term viability of the European industrial base. Huotari/Kratz also point to the possibility, for EU stakeholders, to adopt a more expansive single-economic-entity approach beyond formal aspects of state-control regarding the engagement of Chinese corporate networks in the EU internal market.

The report highlights remaining avenues to strengthen and facilitate the application of EU trade defence instruments, especially in the case of subsidization. Options would range from improving procedures, knowledge gathering and information sharing on Chinese subsidies (to facilitate case filing by European industries and prove material injury) to more drastic solutions such as allowing DG Trade to initiate cases, or even shifting the burden of proof on to Chinese state-owned firms. In the field of state aid, the report explains that the EU could make a more intense use of exemptions to state aid rules. This could include block exemptions, exemptions in the framework of the Strategic Forum for Important Projects of Common European Interest (IPCEI), and the matching clause, as is foreseen in the GPA-agreement of the WTO and principally also allowed under certain circumstances in the OECD-guidelines on development finance and export credit insurance.

Huotari/Kratz also see options in strengthening WTO subsidy notification requirements as laid down in the WTO Agreement on Subsidies and Countervailing Measures. Counter-notifications and penalties could be used more extensively, and a general rebuttable presumption that non-notified or counter-notified subsidies presumed hurtful might be introduced. Also with regard to the WTO Agreement on Subsidies and Countervailing measures, the broadening of the definition of “public body” to cover state-owned enterprises (SOEs) could be supported further, as this could guarantee that subsidies disbursed by SOEs also be taken into account. In addition, the scope of contestable subsidies covered under this agreement could be broadened to include indirect subsidies, and subsidies to upstream industries.

**Creating new instruments:**

Finally, the authors present a few instruments that could be created or adopted in order to deal with China-related distortions. The International Procurement Instrument of the EU (IPI) is seen as an important new instrument to level the playing field vis-à-vis Chinese companies with regard to public procurement. The current draft legislation indicates that the IPI will be the first EU instrument incorporating the principle of reciprocity.

Concerning foreign direct investment, Huotari/Kratz note that the EU (through its member states) could also choose to introduce a “net benefit” test for foreign investment, following the example of Canada. In short, EU member states could expand existing investment approval schemes to include narrow-defined economic criteria such as an investment’s impact on innovation and productivity, Europe’s industrial base and policies, or effect on global competitiveness.

New (competition) instruments could be designed and adopted to restrict market power for digital giants and platforms. This option would involve a greater emphasis on theories of harm associated with ecosystem-specific distortions rather than traditional market definition; access to data as an important criterion for measuring market power; and greater scrutiny of acquisitions of small start-ups by dominant platforms.

The playing field for European companies could also be levelled through the extra-EU application of the EU’s state aid regime, which would thus be covering state aid granted by non-EU governments to their companies operating on the EU market. It could target Chinese subsidized takeovers of EU companies, or operations of Chinese companies on EU soil.

Another option is seen in the introduction of a new EU competitive neutrality instrument based on the Australian model. The instrument would be implemented for both domestic and foreign SOEs operating on member state territory. Complaints could be lodged with a dedicated agency in cases where SOE-behaviour is found to distort “neutral” competition. The introduction of a “Section 301”-like instrument might also be considered to extend the EU’s policy toolbox, creating greater leverage for EU negotiators.

Finally, the EU could opt for a completely new plurilateral agreement on government-driven competitive distortions. The agreement
would address competitive neutrality principles and SOE discipline but could also target specific forms of non-market-oriented behaviour such as “government price driving”, state aid, and procurement provision. It would only include market-driven economies in its membership.

All in all, the BertelsmannStiftung/MERICS/RhodiumGroup study argues for a more systemic and holistic approach to tackle “the China problem”. Tackling market-distorting effects of non-market players should be moved to the core of EU’s China policy-making. State ownership or influence should be taken into consideration systematically, across all policy areas, and not just on a case by case basis. This holistic approach should hence focus on all kinds of “government-induced market distortions” that effect EU firms and consumers. It would require additional action within the EU and its member states, as well as a coordinated international agenda that goes well beyond WTO reform.

What next?

The EU should follow three guiding principles in order to keep its international credibility and reliability in economic foreign policy at the current high level:

Open Markets: The levelling of the playing field for competition must clearly avoid any protectionist measures. Open markets for trade and investment must remain basic principles of European market economies.

National Treatment: We are committed to the principle of national treatment. According to national treatment, foreign companies are treated the same way as national companies. This is what we expect in China: We would like to see that German and European investors in China have the same rights and obligations compared to local Chinese companies. We should avoid any “lex China” in economic policy. We should ensure that all SOEs from all countries are treated the same way, irrespective of their country of origin. The same holds true as well for EU SOEs.

Social Market Economy: While there is a consensus that the EU needs a more active industrial policy at EU level, we must avoid allowing EU governments to interfere into markets in an unnecessary manner. We can’t beat China in creating a European state-driven economy. Our strength is the dynamism of a market-driven economy. The same holds true for innovation: While we encourage the EU to strengthen the framework for innovation, we continue to see an advantage in leaving the application of innovation foremost in the hands of entrepreneurs.

From all the suggestions and recommendations in the documents covered in this policy brief, a global alliance of like-minded countries to manage systemic competition in the decades ahead seems to be the most difficult task. Multilateralism is not the trend, rather the contrary. Nevertheless, there is a clear need to tackle the issue of competitive neutrality in the long run and the work on how to organise a policy process towards such a new instrument, for example in the OECD, should start now.

China is our partner, not our enemy. We should not decouple, but continue dialogue at all levels, ensure further market opening and advocate for more speed in economic reform in China. The EUCCC Position Papier 2019/2020 with analysis on competitive neutrality is an important landmark to call for further and more rapid reform of the SOE-sector in China.

Finally, we should look into the future with a bright Euro-optimism. There is no need for Euro-pessimism. The EU-institutions and member states are dealing quite well with the challenges ahead. One example is the strong unanimity of member states negotiating with Great Britain in the Brexit issue. Other examples are the excellent work of the European Commission to draft a new anti-dumping legislation with the termination of China’s Market Economy Status in the WTO-accession protocol. Similarly the smooth transition towards a new methodology in anti-dumping that was adopted by the European institutions in 2017 as well as the EU instrument for the screening of investments from non-EU-countries that was adopted by the Council of the EU in March 2019. Proceeding with the ten action points of the March-China-Communication of the European Commission must be among the top-agenda items of the new Commission starting its work in December this year.

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Levelling the playing field - Catchword or concept for EU-China relations?

In recent years, “to level the playing field” and “reciprocity” have become catchwords in the debates about US-China as well as EU-China relations. More recently, the “European Business in China Position Paper” (EU Chamber 2019) has emphasized the importance of “competitive neutrality”. These terms are not identical but interrelated. This policy brief discusses the concepts behind these catchwords and the likelihood that demands towards China related to these concepts will succeed.

1. Background

The demand to “level the playing field” elicits associations with field sports, insinuating that the playing field is tilted to the advantage of one team. In general terms the demand aims to establish fairness and to take away advantages that favour the competitor. Transferred to the realm of international economic relations, levelling of the playing fields is a government task, though the governments involved do not necessarily agree on the scope of the problem, the necessity to level the playing field nor the best measures to achieve the goal.

In the past, in the context of EU China relations, the playing field in mind has usually been the Chinese market, and the demand to level the playing field pertained to equal investment and doing business conditions for foreign firms investing in China. Arguably, the debate whether foreign firms compete on an equal footing with Chinese firms is as old as the policy of reform and opening-up. For example, until major tax reforms in 2008, foreign firms enjoyed considerable preferential treatment in taxation, much to the envy of their Chinese competitors. At the same time, foreign firms complained about limitations of market access and preferential treatment of Chinese firms in the process of many policies’ implementation. With China’s accession to the WTO in 2001, market entry conditions for foreign firms improved considerably in many industries, but investment restrictions for specific industries, defined by investment catalogues or - more recently - the so-called negative lists, continued to exist (Leal-Arcas 2010, Hanemann and Rosen 2016). Presently, with stronger competition from successful Chinese firms, less rosy growth perspectives and a growing nationalist environment, foreign firms generally seem to feel less welcome in China than before (GCC 2019).

As a result, they have become more sensitive to market entry barriers and to the perceived preferential treatment of Chinese firms, especially state-owned firms (BDI 2019).

Against this background, the essential trigger for the debate about levelling the playing field has been the tremendous uptake of Chinese outbound investments since the 2000s, and especially the fast expansion of mergers and acquisitions in the US and Europe in the years prior to 2017 (Figure 1). This rise in outbound investment of Chinese firms put a spotlight onto the tilted state of investment regimes: Whereas Chinese firms in general profited from open access to markets and non-discrimination of investors in the US and European market, limits to investment of foreign firms in selected Chinese industries persisted.

2. The scope of the playing field

As straightforward as the request to level the playing field may sound, the demand is often vague about the scope of the playing field taken into account. First, following the above, the demand to level the playing field can refer to fair competition within the Chinese market. In this case, the focus is on national treatment of foreign investors within China. This could, for example, include the request of non-discrimination of foreign (-invested) firms in public procurement or full access (no joint venture requirements) to so far restricted markets. It could also mean that foreign firms are included in policy support for specific industries. The benchmark in this case are the market conditions for Chinese firms in their home market. In practice, because of the special role of state-owned enterprises, the benchmark of equal treatment often are Chinese private firms.

However, as many restrictions faced by foreign-invested companies equally apply to Chinese private firms, the preferential treatment of state-owned and state-backed firms is actually the more contentious issue regarding fair competition in China. To address this concern, a levelled playing field would require equal conditions for competition among foreign, Chinese private and state-owned firms, as suggested by the notion of “competitive neutrality” (EU Chamber 2019)."
To this end, the Chinese government would have to allow for far more substantial changes of the Chinese economic system: While it is, technically speaking, possible to establish an environment where no preferences are given to State-Owned-Enterprises (SOEs), this would in essence contradict the formal definition of the Chinese economic system and the role attributed to SOE (RMRB 29.11.2018).

Second, the request to level the playing field can also imply that treatment of foreign firms in China should equal treatment of Chinese firms in foreign markets, namely in Europe, where market access is, generally speaking, open and non-discriminatory. For example, if Chinese firms do not face any limitations to greenfield investment and M&A in Europe, according to the level playing field argument, foreign firms investing in China should not face such limitations either. In this variety, the level playing field reflects the principle of reciprocity known from international trade and investment negotiations.

Third, the request to level the playing field partly extends to third markets. This occurs when foreign firms complain about difficulties to join Chinese projects along the Belt and Road Initiative. While China is officially portraying the initiative as inclusive, complaints that the projects are usually focused on supporting Chinese firms abound.

The last aspect highlights an additional dimension of the relevant market for the playing field debate: While the focus in the public debate often seems to be on market entry and joint venture regulations, equal (or discriminatory) treatment of foreign businesses in practice can go beyond market access. Unfair competition is not only defined by rules of market entry, but can result from numerous forms of discrimination, including public procurement, access to support for R&D, environmental regulation or market exit, to name just a few. Simply put, if foreign companies are allowed to enter a market but are then discriminated against in other areas relevant to business success, the value of easier market access is limited. However, if the call for a level playing field is extended beyond market entry and investment rules to all government treatment of businesses, the scope of possible conflicts also increases.

The importance to delineate the playing field and the benchmark for non-discrimination becomes obvious when possible demands in government negotiations are taken into consideration. For example, a call for unlimited access of foreign firms to the Chinese automobile market implies that the Chinese government should scrap the joint venture requirements for Original-Equipment-Manufacturer (OEMs). Although this is a contentious issue in China, it still is a much less demanding request than more general calls for competitive neutrality or equal treatment of foreign firms compared to Chinese private firms and SOEs. While the former touches upon Chinese strategies to develop a specific sector, the latter addresses a core rationale of the Chinese economic system.

The Chinese government has recently allowed single hundred percent ownership to single OEMs but has not yet made this a general rule.

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**Figure 1: Total investment dropped but spanned across a wider range of sectors**

Chinese FDI transactions in the EU by sector, EUR Million

![Chart showing Chinese FDI transactions in the EU by sector](source: Rhodium Group)
In contrast, the idea to level the investment regimes of China and the EU by merely demanding a further opening of the Chinese market for foreign investors neglects the crucial question of ownership. Even if the Chinese government acknowledged requests for non-discriminatory market entry of foreign firms, this would not automatically entail a general reduction of preferential treatment for state-owned or state-backed Chinese enterprises. These would still be able to enter the European market and profit from the Chinese state’s backing. Therefore, the playing field would still be tilted towards Chinese state firms. In addition, there are—in comparison—few European state firms that do and could invest in China.

It should be noted, that the different benchmarks, that is either a comparison of treatment within the Chinese market or comparison of the investment regimes of the European and the Chinese market in determining the playing field, can lead to contradicting results: For example, if European firms enjoyed as much governmental support in the Chinese market as their private and state Chinese competitors do because they also profit from industrial policies of the government, how would this influence (the perception of) these European companies’ business activities in Europe? How would government support in China that is non-discriminatory regarding nationality, but different from the support given to firms in Europe influence European competitors that have not expanded to China and therefore do not profit from Chinese industrial policies? How would these firms view the competitive edge of China-engaged multinationals in European markets? This seemingly far-fetched argument becomes highly relevant if (low) levels of regulation are included in the definition of preferential treatment. A level playing field with deliberately low levels of environmental or data privacy regulation for all companies within the Chinese market then translates into substantial Chinese government support for these companies—Chinese and non-Chinese—in markets with more stringent, though non-discriminatory regulation. In this case, the level playing field within China tilts the playing field toward firms engaged in China and to the detriment of firms not engaged in China.

3. Recent progress and recommendations

The above elaborations suffice to highlight some intricacies that come with simplistic calls for a level playing field. The US approach of 2018, to use tariffs to pressure China into radical changes of its economic system never appeared promising to arrive at a level playing field, not least because the Chinese perspective on US-China economic relations is not that the playing field had earlier been severely tilted to the advantage of Chinese side.

The European reaction to the wave of investments from China has been somewhat different. First, the European Union has introduced a screening mechanism for foreign investments. While this new policy obviously came in reaction to the uptake in M&A by Chinese investors, it sticks to the principle of non-discrimination based on nationality and focusses on the issue of ownership instead. It also reflects the understanding that European countries need more coordination in their reaction to increased Chinese firms’ global expansion. In addition, the European Union has ongoing negotiations with China for a bilateral investment agreement. These negotiations started way before the fast increase of Chinese investments in Europe and are by now in their seventh year. Obviously, the issues at hand have proven to be complicated, not least because of some of the issues raised above.

The main Chinese reaction to recent calls to level the playing field has been the revision of the Foreign Investment Law in early 2019 which will come into force in 2020. More recently, the Chinese State Council has again published a document on “Further steps to improve the use of foreign investment” (State Council 2019). The essence of these documents is to further ease market access for foreign firms, open additional industries (especially the financial sector), improve the protection of their legal rights and restrict discrimination against foreign firms in public procurement. If implemented, the situation of foreign-invested firms would obviously improve.

These policy steps are an improvement into the direction of levelling the playing field within the Chinese market. They are, however, neither an indication that the Chinese government seeks a complete overhaul of its economic system (which is in the short term unlikely to happen, regardless the pressure from the US in that direction), nor is it guaranteed that the policy steps will fully achieve the described goals. One issue that is often overlooked in the debates of China and with China is the fact that the central government which sits at the negotiation table, is limited in its capacity to steer the concrete actions and the legal protection of firms’ rights across all administration and all regions within China. These steps also do not solve the issue of Chinese state-owned or state-backed firms in third markets. While the EU should welcome moves in the direction of levelling the playing field within China, it should still have in mind the repercussions of state-ownership and state-backing of companies and industries in China for competition within Europe. This, in some cases, can even mean the support that foreign firms receive in China and which increases their competitive edge in Europe.

References


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The Quest for Efficiency in Science, Technology and Innovation Systems: Comparing Policies in China and Selected OECD Countries

When analysing China's governance of its science, technology and innovation (STI) system in 2007, the OECD saw a strong need for better coordination between the Chinese Ministry of Science and Technology (MoST) and other ministerial-level agencies regarding the design and implementation of STI policies. Due to the lack of a coordinating body, the OECD doubted in her review of China's innovation system that the governance structure was suitable for the successful implementation of the science and technology (S&T) medium- and long-term plan (MPL 2006–2020) (OECD 2007).

Since 2012, the governance of China's innovation policy has undergone substantial changes – with a strong focus on the improvement of the efficiency of the STI system. The overall goal of governance reform is to foster the transition to an innovation-driven growth model. This contribution shows that the quest for S&T efficiency is, however, not only an urgent topic in China but also in other technologically more advanced countries. China as well as many other countries is facing the challenge to effectively coordinate STI policies at the central level of government that help to overcome traditional interests and bureaucratic barriers.

1 Governance of Innovation Policies

While the term ‘governance’ relates in a broader sense to questions of how organisations or countries are managed or regulated, in the context of innovation policy it refers specifically to publicly-defined institutional set-ups. This includes incentive structures and norms, procedures and practices for agenda-setting as well as for the implementation of policies and policy learning. The governance of policies raises issues of coordination across different ministries and agencies, as well as ones of failures of such coordination (OECD 2012: 149).

For China to achieve its strategic goal of becoming an innovation powerhouse, major problems such as departmentalism had to be overcome with a ‘Whole of Government’ (WoG) approach. In order to make a more efficient use of public research and development (R&D) investment, the OECD emphasised in her 2007 review of China's innovation system and policy the need for better interagency coordination at the central level – especially between the MoST, the Chinese Academy of Sciences (CAS) and the Natural Science Foundation of China (NSFC), with the MoST to take a leading role (OECD 2007: 50).

The discussion of how to solve coordination problems on the horizontal level of government is by no means restricted to China. Disappointed by the results of the ‘New Public Management’ (NPM) approach, many governments turned to the WoG one instead. The main idea of the NPM was to introduce markets into bureaucratic contexts, and to allocate tasks and budgeting to specific ‘agents’.

The result of the ‘agency-ification’ process, however, was a fragmented state organisation that made horizontal coordination difficult. In contrast, WoG focuses on reform measures that aim at a coherent policy approach to specific targets. It may include, among other things, the design of policy frameworks, guiding policymaking, the setting up of intergovernmental policy councils, government committees and/or the centralisation of tasks by promoting a ‘lead agency’ (Schüller, Conlé and Shim 2012: 111–15).

This paper is structured as follows: Section 2 looks at the various reforms taking place in China’s innovation governance since 2012. Section 3 then compares these reforms with those undertaken in certain selected OECD countries. The closing Section 4 discusses whether reforms that have been successful in one country can be transferred to other countries elsewhere.

2 Development of China’s STI Governance

China's political leaders have been continuously strengthening their efforts to implement an innovation-driven growth model since 2012. Although there was much improvement in STI, the performance of the national innovation system (NIS) in terms of research breakthroughs and development of cutting-edge technologies would remain far below expectations. Therefore, the Chinese Communist Party Central Committee (CCPCC) and the State Council discussed necessary adjustments of innovation policies at the National Conference on Science, Technology and Innovation held in July 2012. In order to improve the governance of the innovation system...
and to make sure that the MLP’s goals could be achieved by 2020, the country’s political leaders decided to strengthen both policy guidelines and enforcement mechanisms to guarantee that policies are implemented. In addition to the already-existing Leading Group on Science, Technology and Education (LGSTE) at the State Council level, a new Leading Group of S&T System Reform and Innovation System Construction (LG of ST-System Reform and IS-Construction) was set up in September 2012 – headed by Liu Yandong, a member of the politburo of the CCPCC. Also in September of that year, the CCPCC and the State Council released the policy document ‘Opinions on Deepening the Reform of the S&T System and Accelerating the Construction of the National Innovation System’ – which set the tone for ambitious desired changes in the NIS (CPC Central Committee and State Council 2012).

Under the leadership of Xi Jinping (who became General Secretary of the CCPCC in October 2012 and President in March 2013) and Li Keqiang (Premier since March 2013), further national guidelines for achieving comprehensive and coordinated S&T reforms were released with the aim of overcoming institutional and structural barriers. Under the so-called top-level design approach, the reform of the STI system accelerated – including the research funding system and the academician system of the CAS as well as the Chinese Academy of Engineering (CAE) (Cao et al. 2018: 126–28). Top-level design entails a shift to a more top-down and tighter mode of rule, but also to more comprehensive information technology-based social governance and monitoring tools (among other policy measures). In the field of S&T policy, however, this approach has not only resulted in defining clearer target-based strategies (Ahlers 2019: 263) but also in the establishment of new coordinating bodies.

That the LGSTE – chaired by Premier Li after 2013 – failed to successfully coordinate S&T policies between central-level agencies is explained by Cao et al. (2013: 460–1). The authors ascribe it to the body’s weak position within the State Council, and the fact that it was not involved in the budgeting process. The same holds true for the coordinating role of the MoST, being only one ministry among others within the State Council. Although the MoST’s share of the S&T budget was traditionally the largest, many other ministries and ministry-level agencies were able to use budget allocations from the Ministry of Finance (MoF) to design their own R&D programmes. In addition to the lack of macro coordination by the LGSTE, various Chinese and foreign scholars pointed to governance problems with regard to research funding, distorted incentives for scholars and administrators, and to issues with performance evaluation (Cao et al. 2013; McCuang-Johnston and Zhang 2015: 36–37; Schüller and Schüller-Zhou 2017: 10; Schüller 2018).

Following the top-level design approach, the newly established LG of ST-System Reform and IS-Construction was assigned the paramount function of designing guidelines for all reform decisions and regulatory policy measures regarding STI. This group meets on an ad hoc basis, and consists of around 30 representatives from various government agencies – with Liu He, vice-premier and a member of the politburo as its head.

In the course of the STI reform, the LGSTE underwent restructuring and was renamed the State S&T Leading Group in 2018. Liu He became the vice-head of this group, second-in-command behind Li; for the coordination of the education policy, a separate leading group was set up. The State S&T Leading Group consists of 14 members from various ministries, including the MoST, the Military Commission and the National Development and Reform Commission (NDRC). The group is responsible for developing and evaluating S&T strategies, planning and policy measures, and for overseeing coordination between the ministries, central government departments and local governments (APRA Performance Monitoring 2019: 52–4).

In the reform of the public research funding system, top-level design plays a crucial role. Two policy documents of 2014 and 2015 (Guofa 11 and Guofa 64) gave overall guidelines on ‘Improving and Strengthening the Management of Scientific Research Projects and Funds Financed by the Central Budget’. Against the background of overlapping S&T programmes and competencies, fragmentation of funding and inefficient allocation, the reform goal was to change the rules and mechanisms through which the central government funds research. As the main coordinating body for planning and reviewing S&T programmes, the Interministerial Joint Council was hence set up. The MoST coordinates this Joint Council, supported by the NDRC and the MoF on the leadership level – with it having around 30 participating members drawn from various government agencies.

The Joint Council receives support from three pillars: The Strategic Advisory and Review Committee that provides consulting and evaluation, makes recommendations on STI development and programmes, participates in the development of R&D key programmes and examines important projects. Besides this committee, a number of professional project management agencies were established to manage research programmes and projects following the idea of a separation of funding, management and evaluation. The third pillar, meanwhile, includes the tasks of evaluation, inspection and adjustment, jointly executed by the MoST and MoF. Information about S&T projects, funding guidelines and similar are provided by the so-called National Science and Technology Information System. This platform also offers information on the new programmes and projects from the restructuring of the research funding programmes into five categories: basic research; major national S&T programmes; key national R&D programmes; special funds for technological innovation; and special funds for human resources and infrastructure (Cao et al. 2018: 130-1; Schüller and Schüller-Zhou 2017: 12).

Within the new S&T governance system, the MoST has emerged as the main STI policy coordinating body – with its mandate including the coordination of the public research funding system. That the leading basic-research funding agency NSFC and the State Administration of Foreign Experts Affairs (SAFEA) were placed under the ministry in 2018 also strengthened MoST’s position within the NIS. Overall S&T guidelines, however, remain strongly influenced by the long-term strategy of the political leadership to make China an innovation-driving country. In this strategy, the ‘leading groups’ play crucial roles as drivers and facilitators. Figure 1 below shows the new innovation governance structure in China as of the end of 2018.

3 Select Countries’ STI Policy Governance Reforms

This section looks at the experiences of Portugal and Austria with STI policy governance reforms in recent years. For both countries, comprehensive innovation policy reviews conducted by the OECD
are available and thus drawn on for the analysis here. Before we look at these country cases, an overview of the application of specific policy arrangements regarding STI coordination in various other countries is given first (OECD 2012: 150-2).

The data presented in the following is part of the results from the comprehensive OECD Science Technology and Industry Outlook 2012 policy questionnaire. With regard to the topic of STI policy coordination, participating countries were asked to rate the contribution of specific arrangements to the coordination of innovation policy in their country. Table 1 below shows that ‘national strategies and visions’ as well as the establishment of a ‘dedicated innovation agency or ministry’ were chosen as being the most important policy measures for STI coordination by nearly all of the countries that responded to the OECD questionnaire. Some variations among the countries’ ratings existed nevertheless: Belgium assessed ‘national strategies and visions’ as not being important at all, because of the strong role that the three regions which make it up play in the country’s STI policymaking; the United Kingdom rated this arrangement as a factor that contributed the least to such coordination. There was also variation with regard to the rating of policy coordination through a ‘dedicated innovation agency or ministry’. The survey revealed that some countries were about to introduce lead organisations for innovation policy. Italy and South Africa had established new agencies, while Australia, Denmark, the Netherlands and Turkey introduced some innovation functions into newly consolidated ministries. New Zealand and the Russian Federation, Switzerland and the United States did not have dedicated innovation agencies or ministries.

The coordination through ‘policy evaluation and reviews’ was also highly rated by most of the respondents, with the exception of Poland, the Russian Federation and Sweden. The ‘high-level policy council’ received a similar rating to that latter policy coordinating measure. Among those countries that had established a policy council, the institutional set-up greatly varied – with some councils playing a strong role in joint planning (Japan and the Republic of Korea), while most of them only had advisory functions. A number of respondent countries (New Zealand, Poland, the Slovak Republic, Spain and Sweden) rated the importance of these councils zero, while Israel and the UK assessed their policy function as contributing little to STI coordination. In contrast, the importance of ‘informal channels of communication’ was highly rated by countries that had a well-developed culture of inter-agency trust and communication, particularly by Canada, Finland, New Zealand, Sweden and the UK.

Policy coordination with the help of ‘inter-agency joint programming’ was not widespread among the countries participating in the questionnaire survey, but some had introduced single funding streams for STI (Ireland) or standardised procedures across agencies for funding or impact assessments (Canada, Denmark, Luxembourg). The coordination of innovation policy agendas and programmes through the ‘intervention of the president’s or prime minister’s office’ can be a powerful tool to bridge traditional interests and bureaucratic boundaries. Among the countries that rated this policy coordination measure as very important were Argentina, Australia, the People’s Republic of China, Ireland, the Russian Federation and Turkey. That the ‘job circulation of civil servants and stakeholders’ received the lowest rating was explained in the OECD report by the fact that there was no great incentive for inter-sectoral mobility, as civil servants prefer to stay within the same ministry for career reasons (OECD 2012: 150–1).
To summarise, the OECD 2012 survey demonstrated that most countries had introduced specific arrangements in order to support cross-government coordination in STI policy. They applied a mix of hierarchical-, market- and network-based interactions to horizontally coordinate ministries and vertically align delivery agencies with ministries. While the OECD 2012 survey offered information about the rating of the most common arrangements within STI policy by selected countries, it did not explain the reasons why these countries preferred one arrangement over the other. The following short case studies of innovation policy in Portugal and Austria show then what the challenges have been, and why certain policy arrangements are chosen.

In 2019, the OECD published its review of Portugal’s higher education, research and innovation system, covering changes up until the end of 2017. Comparing Portugal’s innovation policy with that of other member countries, the OECD observed the lack of a medium- and long-term vision and of a coherent national innovation strategy. The strong divide between strategies related to research and innovation reflected the ‘silos in which the ministries in charge of this policy fields operate, and each ministry has only limited monitoring, evaluation and foresight capacity to support the development of these strategies’ (OECD 2019: 24).

Without clear visions and strategies, the definition of national priorities, targeted funding and the setting up of a medium-term financial framework remains difficult. Insufficient coordination across the different branches of the Portuguese government was the main reason for these challenges being faced. Against this background, the OECD recommended the establishment of a high-level task force at the inter-ministerial level, bringing together the ministers for science, technology and higher education, economy, planning and infrastructure; the participation of the minister of finance was also seen as beneficial in the horizontal coordination of STI policy (OECD 2019: 26–8). Since 2018, Portugal has published a series of new national STI strategies, including the long-term ‘2018–2030 Innovation Strategy’ and sectoral strategies such as the ‘AI Portugal 2030, Portuguese National Strategy on Digital Skills’.

Although Austria’s innovation system was already performing much better than the average OECD country’s was, it still needed to transform its STI investment into stronger economic and social impacts. With regard to policy governance, the OECD recommended the country to have a single ‘Council for Science, Research and Innovation’ anchored at the highest political level in order to strengthen coordination, instead of having three different ones (OECD 2018: 12). These three councils included the Austrian Council for Research and Technology Development (RFTE), as the most important body within the country’s innovation system, and the Austrian Science Board, which served as an advisory body. The Austrian ERA Council Forum, third, also had an advisory function, but focused only on the minister for science and research concerning issues related to national and European innovation policies (OECD 2018: 41–2). In the meantime, the recommendation to merge the different councils into one has already been implemented in Austria (Wirtschaftskammer Österreich 2019).

### 4 Mutual Learning

The paper has shown that many countries are seeking to improve the efficiency of their STI coordination policy. The specific governance arrangements adopted depend on already-existing institutional settings on the one hand, but also form part of an ongoing learning process on the other. In the case of China, better horizontal co-

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**Table 1: Most Common Arrangements within STI Policy**

<table>
<thead>
<tr>
<th>STI Policy Arrangements</th>
<th>Rating</th>
<th>Country Examples (Policies)</th>
<th>STI Coordination</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘national strategies and visions’</td>
<td>5.3</td>
<td>Belgium, UK</td>
<td>no such institution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Canada, Germany, the Russian Federation, Switzerland, USA, Italy and South Africa (new STI agencies)</td>
<td>high importance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Australia, Denmark, the Netherlands, Turkey (innovation functions in consolidated ministries)</td>
<td>high importance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New Zealand, Russian Federation (reintegrated agencies back into ministries)</td>
<td>reversed NPM policy</td>
</tr>
<tr>
<td>‘dedicated innovation agency or ministry’</td>
<td>5.0</td>
<td>Japan and ROK (joint planning model)</td>
<td>high importance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New Zealand, Poland, the Slovak Republic, Spain, Sweden (innovation functions in consolidated ministries)</td>
<td>no such institution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Israel, UK</td>
<td>little importance</td>
</tr>
<tr>
<td>‘policy evaluations and reviews’</td>
<td>4.5</td>
<td>Poland, the Russian Federation, Sweden</td>
<td>high importance</td>
</tr>
<tr>
<td>‘high-level policy council’</td>
<td>4.5</td>
<td>Japan and ROK (joint planning model)</td>
<td>high importance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New Zealand, Poland, the Slovak Republic, Spain, Sweden</td>
<td>no such institution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(innovation functions in consolidated ministries)</td>
<td>little importance</td>
</tr>
<tr>
<td>‘informal channels of communication’</td>
<td>4.3</td>
<td>Canada, Finland, New Zealand, Sweden, UK</td>
<td>high importance</td>
</tr>
<tr>
<td>‘inter-agency joint programming’</td>
<td>4.0</td>
<td>Ireland, Canada, Denmark, Luxembourg</td>
<td>high importance</td>
</tr>
<tr>
<td>‘intervention of the president’s or prime minister’s office’</td>
<td>3.6</td>
<td>Argentina, Australia, the People’s Republic of China, Ireland, the Russian Federation, Turkey</td>
<td>high importance</td>
</tr>
<tr>
<td>‘job circulation of civil servants and stakeholders’</td>
<td>2.2</td>
<td>no data available</td>
<td>no data available</td>
</tr>
</tbody>
</table>

*Source: Country responses to the OECD Science, Technology and Outlook 2012 policy questionnaire (OECD 2012: 150). Notes: Participating countries included OECD members as well as emerging economies such as Argentina, Brazil, China, Columbia, Egypt, India, Indonesia, the Russian Federation and South Africa. Rating are based on individual countries’ own assessments.*
ordination was implemented by strengthening the role of the MoST and through the establishment of the earlier-mentioned Joint Council for overseeing coordination between ministries regarding the research funding system.

In order to tackle grand societal challenges such as climate change or the digital transformation, sound governance of the innovation system plays a crucial role. Without efficient coordination, the implementation of mission-oriented innovation policies (Kattel, Mazzucato (2018:7)) will not be possible. China’s progress in the development of new energy-efficient vehicles leads to the question of whether other countries can adopt similar challenge-driven innovation policies and achieve ‘system change’.

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Assessing the Role of State Guidance and Market-driven Entrepreneurship for China’s Innovation Dynamics

China’s formal innovation regime is characterized by heavy-handed state dirigisme. This system allows for highly focussed national innovation endeavours in which a multitude of actors are co-ordinated and directed towards a specific goal. At the same time significant costs and risks arise culminating in the danger that national endeavours are directed towards unrewarding goals resulting in massive waste of resources and delaying innovation forays into more productive areas. China’s informal innovation regime, mainly constituted by private entrepreneurs, is highly instrumental to extenuate these negative effects and identify new innovation trends. Private endeavours to innovation efforts are often directed at areas where they do not face competition by strong incumbents and can also operate “under the radar” of government policies and regulation. Successful private innovators are regularly integrated and absorbed in the formal innovation system and enrich the latter with their specific qualifications. It is suggested that European politics improves its knowledge about these “hidden” Chinese innovators in order to get an improved understanding of the overall innovation dynamics in China, design better informed European policies vis-à-vis China, ascertain potential new fields for R&D collaboration, and identify interesting business opportunities for European industry.

1. Introduction

Most (Western) schools of economic thought are united in their understanding of how to promote innovation: allow for liberal environments with little to no state involvement in which creative minds can experiment with new ideas, technologies, and organizational structures. Innovators should be invested with the freedom to “Schumpeter”-tear down old concepts, dogma and behavioural patterns rooted in tradition and lazy “its-always-been-like-that” thought patterns. The role of the state should be reduced to an absolute minimum in order to prevent any positive or negative filtering of ideas.

In China, the role of the state is perceived differently. Against the background of a strong state-business nexus and the positive results the latter has been able to achieve in the context of four decades of catching-up growth, Chinese academics and business leaders are willing to accept that the Chinese state and its government agencies have taken over a much more active role in the facilitation as well as discretionary determination, organisation and management of national innovation endeavours. As a matter of fact, the party-state and its agents are trusted to provide superior (explicit) guidance and select “worthwhile” innovation efforts.

In parallel to this heavy-handed state dirigisme, however, there also exists a realm of state neglect. In this latter realm, innovation endeavours and new business models develop not only without positive promotion or governmental incentive programmes, but also outside the framework of national oversight and regulation. Innovators are given free rein to experiment with new ideas, technologies and business models. It is here where private entrepreneurship excels and provides important impulses for the national innovation landscape.

Both regimes, the heavy-handed state dirigisme as well as the extreme laisser-faire approach, are alien to Western concepts of national innovation governance.

This paper will take a closer look at the way the Chinese state guides and governs innovation processes in China. It will highlight the positive as well as negative implications of the Chinese approach of heavy-handed state dirigisme to national innovation dynamics. Against this background, it will then assess the role left for market-driven entrepreneurship in this context. Finally, conclusions will be drawn, how European policies can and should deal with this Chinese approach to innovation in transnational innovation environments as well as concrete cooperative R&D arrangements.

2. Manifestations of State Guidance in the Chinese Innovation Environment

In its preparation for WTO accession during the 1990s, Chinese government became aware of the dramatic degree to which the country lagged behind the developed world in the areas of science and
technology. National innovation capacities were understood to be highly deficient. As a consequence, the 10th Five Year Plan (2001-2005) was designed in such a way as to advance the country’s science and technology capacity and promote innovation. The State Council called for urgency and resolve to place the strengthening of indigenous innovative capability at the core of economic restructuring, growth model change, and national competitiveness enhancement. Building an innovation-oriented country is therefore a major strategic choice for China’s future development” (NPC 2001).

Since then, the political commitment towards a strengthening of China’s science and technology sector as well as its innovation capacity has become only stronger. The approach chosen to attain these goals follows first of all the traditional ideals of strong state-guidance and control. As a consequence, a plethora of plans and programmes, implementation documents and catalogues has been issued to direct innovation efforts in specific directions. Complementary to this a comprehensive tool-set encompassing grants, subsidized loans, tax incentives, preferential access to licences, banking sector, capital market, data, etc. has been put in place to incentivize plan-abiding behaviour, promote specific innovation efforts or discourage unwanted activities.

In addition to this promotion of dedicated domestic agency and investment activity, discretionary action at the interface to the global economy is providing further stimulus to targeted national innovation activities. Such state-organized agency becomes manifest as a manipulation of the terms-of-trade of innovation-related goods. In this manner the importation of selected goods and resources is promoted (e.g. semiconductors for artificial intelligence (AI) applications), the import of goods competing with domestic solutions is restricted (e.g. specific machinery) and the exportation of innovative domestic products is promoted (e.g. 5G-telecommunication equipment).

The attraction of foreign inputs to the national innovation system goes beyond the goods sector but includes human resources as well. Dedicated programmes exist to mobilize overseas Chinese talent for national innovation programmes by means of powerful incentive programmes and calling on patriotic values (e.g. the 1,000-Talents Professorship programme). In addition, targeted outward foreign direct investment initiatives tap R&D resources abroad and leverage innovation capacities existing outside Chinese borders for national interests.

Furthermore, a Liszt-type infant industry protection policy tries to protect budding local markets and firms against overwhelmingly strong foreign competitors. Such protected domestic markets allow firms to quickly scale-up the marketization and production of innovative goods, thereby establish highly competitive cost-structures (depressed average cost functions) and generate revenue for further R&D investment.

The Chinese state planning elite has taken over command and sees itself as the mastermind of the national drive for innovation-leadership.

3. Potentially positive effects of Chinese state-guidance for innovation activities

The above sketched Chinese approach of heavy handed guidance to national innovation activities may actually create positive effects for stakeholders in some specific areas and stimulate innovation activity.

Public statements by high ranking Chinese CCP cadres and government officials concerning innovation goals and structures as well as corresponding planning documents and regulatory initiatives have an important signalling function. They communicate to decision makers at lower levels of the political system, cadres working in the R&D and academic education sector as well as the managers and entrepreneurs in the business sector, which technologies, industry sectors, and business models are destined to gain importance in the near future. The areas highlighted in such a way can be expected to receive substantial governmental support in terms of fiscal allocations as well as administrative and regulatory support.

As these communications are sent-out in a top-down fashion and are embedded in comprehensive strategic frameworks, they feature a sector overarching quality. As such, they are – ideally – catalysing interdependent developments in the whole fabric of relevant sub-fields ranging from the educational sector (HR development), banking sector and capital market (financial alimentation), supporting industries and technologies (material and operational inputs), to the spearheading innovation-driving R&D institutes and enterprises as well as administrative agencies tasked with the specification of regulatory governance and standardization provisions.

All this provides decentralized actors with a reliable guideline, in which areas they can expect to receive broad support of the “national system” and in which areas they can calculate with rising demand and sales opportunities. As a consequence, the transaction costs of engaging in these fields are significantly lowered and investments in corresponding fields are associated with – politically – reduced levels of risk.

On the personal level, individual actors are incentivized to commit additional effort to these areas as here exceptional career opportunities (in political as well as functional realms) will probably arise.

Seen in perspective, these national initiatives to advance certain technology fields and direct innovation endeavours in specific directions are less based on command-style directives, but are rather brought forward by setting corresponding incentive structures and manipulating absolute and relative transaction costs in order to induce the desired behaviour. Dedicated agency and investment in related areas are facilitated by creating high planning security for decision makers in all related sectors.

In this way, national innovation initiatives can generate significant impact. They create the framework for focussed, coordinated “national” action, spanning diverse domains of the education and R&D, industrial, financial, as well as regulatory realms. Importantly, the mobilization of actors goes beyond the directly state-controlled sector, but also reaches out to the private sector which is incentivized to participate in the endeavour.
4. Risks and negative side-effects of China’s heavy state interventions in innovation activities

The decisive role of the Chinese CCP and government elite for the direction of national innovation dynamics comes with significant risks and negative side-effects.

The top-down definition of innovation foci and the state-directed manipulation of relative transaction costs leads to the promotion of “easy” entrepreneurship and innovation-activity that relies on state-demarcated growth fields and the significantly reduced risk exposure going along with these. As a consequence, “other” innovation efforts and unorthodox entrepreneurial creativity in fields, which lack state-“approval” and -support is crowded-out, as any engagement in such innovation endeavours is accompanied by relatively higher costs and comes with significantly higher risks to invested resources and career prospects.

As a consequence, there exists a tendency for over-investments in governmentally promoted areas while innovation-fields not covered in state-planning or governmental communications remain under-invested. There exists a substantial danger that in this top-down approach government initiatives overlook important technology trends and fields of innovation, which then remain under-researched.

Against this background, the greatest risk of the Chinese approach of a centralized determination of innovation areas and the subsequent concentration of national resources on these very areas, lies in the danger of identifying the wrong targets. Directing national endeavours towards unrewarding goals would not only result in massive waste of resources but also inhibit and delay innovation forays into more productive areas.

As such, independent creativity is being subdued. However, decentralized market environments with their multipolar information generating and processing agents, can be expected to better cover broad fields of innovation and not forego important lines of development. Furthermore, they can provide for a greater spectrum of cross-fertilization opportunities that can generate new impulses for innovation activity. China’s highly focussed state-directed formal innovation regime is foregoing these possibilities.

It is at this critical juncture that China’s private entrepreneurs come into play and attain a crucial role in China’s overall innovation system.

5. Private entrepreneurship in China’s innovation system

Most of China’s private entrepreneurs and small & medium sized enterprises (SME) are not fully integrated into the state-controlled innovation regime governed by comprehensive state guidance that constitutes the backbone of China’s innovation system. The central and local governments’ tool-box to guide and incentivize innovation efforts does not fully fit with the reality of most China’s private enterprises and SME. Most of them are too small, lack necessary connections into the party/governmental realm, or do not possess the personnel and organizational capacity to navigate the great number of governmental programmes. And many do not even have full access to those sectors of the formal economy over which most governmental incentives are distributed (financial sector, capital market, external trade, etc.). Lack of access also restricts these firms’ capacity to establish innovation alliances with universities or dedicated research institutes in order to tackle more complex innovation problems.

As such China’s private innovators start out alone. Only after they have mastered the multitude of problems, resource constraints and discriminatory framework conditions they face and have something to show, they can enter the formal innovation regime and participate in its promotional structures.

This development path usually starts with innovation endeavours in areas that lie outside the radius of attention of the Chinese Communist Party (CCP), government agencies and the formal enterprise sector. These areas are often deemed by the established players in the formal, state-controlled sector as un-interesting (in terms of potential market volume, expected rate of return) and too complicated and/or costly to explore.

Private endeavours to explore such “long tail markets” are therefore directed at an area where they do not face competition by strong incumbents and can also operate “under the radar” of government policies and regulation. The task is usually to satisfy pent-up market demand by devising technologies and operative procedures that break-up existing bottle-necks, and allow for scalable generic approaches to until then idiosyncratic technical and/or business routines. Such innovation quests require first of all savvy, out-of-the-box thinking, but hardly any capital-intensive equipment. A good understanding of dormant market demand, an office and a powerful computer is often all that is needed. It is therefore not surprising that China’s most successful, innovation-driving firms in the field of the digital economy, e-commerce, fin-tech and AI-based technology applications in general are coming from the private sector.

In capital-intensive technology fields, which require massive up-front investments in equipment and R&D facilities (e.g. development of AI-supporting semiconductors), in contrast, private actors are hardly to be found. Here the formal, state-directed innovation regime prevails.

But, once they have succeeded in the technological as well as commercial exploration of a specific long tail market and contributed to its integration in the formal economy, private entrepreneurs and firms can become part of the formal state-directed national innovation regime, get access to greatly enhanced financial and technical resources as well as highly valuable political capital.

The transformation of some private firms that started as niche-players, which nobody took seriously when they started their operations, into key-players in the current national AI-strategy is an example in place. Alibaba, Baidu, Bytedance, Sougou and others are highly successful private firms that have been able to disrupt China’s digital market environment and the application of AI to various socio-economic fields. With these achievements they have become eligible to become core players in national innovation strategies.

The development of artificial intelligence is a shining example. The implementation of AI routines in a myriad of different business models is high up on the agenda of current state promoted innovation.
projects. A broad range of initiatives promotes related activities and hands out respective incentives. In the Ministry of Science and Technology’s (MOST) strategy to advance AI-innovation and its roll-out in society and economy, now an increasing number of private firms has become to play a crucial role. The MOST has set-up five open platforms (“national teams”) that shall advance corresponding technical knowledge. While keeping overall control in its own hands, MOST has invested five private firms with the coordination and entrepreneurial guidance of these platforms: Alibaba is tasked with advancing AI in the framework of smart cities, Baidu shall drive innovation in AI for autonomous driving, Tencent is to push forward the development of health sector related AI, Iflytek takes the lead in the field of AI-based voice recognition related innovation efforts, and Sense-time is to do the same for the AI behind face recognition.

For the respective private firms, becoming integrated in national innovation programmes goes along with substantial changes in their positioning in the national economy and its innovation system. The greatly improved access to governmentally controlled resources and favoured treatment in China’s politico-economic system comes at a price. The five private firms heading the MOST AI-platforms, for example, are long since co-opted to the state economy and uphold very intensive relations to leading decision personalities in the CCP. They have become part of the “establishment” or rather the country’s ruling elite. As such firms like Alibaba, Baidu, as well as Huawei, Sany and others provide the CCP and the Chinese economic and innovation planning agencies with highly valuable insights in real “market” demand, scarcity structures and investment requirements. Their integration into the national innovation system provides the later with an institutionalized “reality check” and improves the latter’s effect and functionality.

But, by becoming part of the system these formerly highly creative entrepreneurs lose their capacity to explore new ideas in adverse environments. Their business ventures now become subjected to much greater attention and control by the CCP and government organizations, which results in a significant politicization of their business models. At the same time they become subjected to increasingly detailed regulation and forego their capacity to innovate in an “under the radar”-approach.

As such, the formal Chinese innovation system needs a permanent flow of new private entrepreneurs to provide innovation stimuli and corrective impulses to the state-directed formal system.

6. Conclusion: The state in need of private entrepreneurship

The origins of China’s contemporary innovation system and its approach of heavy-handed state-guidance are rooted in the country’s catching-up growth development era. During the first three decades of China’s reform and global re-integration that was started under the rule of Deng Xiaoping, foreign templates provided Chinese policy makers and development planners with highly valuable orientation and templates ready to copy and adapt to Chinese realities. In the second decade of the 21st century, China has grown out of this growth and development model. In many business and technological fields Chinese actors have already reached the frontiers of global know-how. Now, with hardly any foreign templates left to provide guidance, the Chinese system of state dirigisme has to find new navigational beacons to determine its directives and lead the nation into the future.

Interestingly, it has found this power in the country’s market-oriented, highly creative private entrepreneurs. They have now taken over the role formerly played by the advanced foreign nations, their business sectors and innovation systems.

The contemporary situation is much less paradox than appears on first sight: China’s heavy-handed state directed formal innovation sector relies on the systematic absorption of (domestic) private entrepreneurship and the continuous evolution of new creative minds and business ventures outside the formal system. Without this permanent intake of fresh impulses the formal system would quickly lose direction and effectiveness.

The political elite of China is very much aware of the need for this specific interaction. At the same time, however, it fears the uncontrollable creativity and “dangerous” out-of-the-box thinking of exactly those minds it needs so much. As a consequence, the latter are quickly absorbed in the elitist state-business nexus of the country and hereby become part of the “system”. But as this neutralization of “dangerous” elements at the same time deprives them of a significant part of their value to the national innovation system, ever new flows of entrepreneurs must be attracted, employed and eventually absorbed.

The business sector and innovation efforts outside the formal state-system are consciously kept outside the state-directed sphere and remain discriminated against with respect to a large array of resources. But they are certainly not understood as unimportant or something that needs or should be repressed. China’s modern business and innovation system relies on both regimes and the cross-fertilization between them.

7. Recommendations for action

There is more to the Chinese innovation system than appears on first sight. The top-down directed innovation regime featuring heavy handed state-guidance and a strict regulatory framework is a very important manifestation of the Chinese innovation eco-system – but not its only one. In the background exists a highly creative sector of (mostly private sector based) innovators whose efforts are not restricted by state guidelines and who are truly thinking and acting out-of-the-box. As such they can – and are actually employed in such a way – provide important stimuli for the formal state-directed innovation system of China. In this capacity, they influence the direction of state-initiatives by indicating new fields of innovation and disruptive demand trends.

German and European politics and industry traditionally focus on China’s formal innovation system and its state-directed innovation activities. This is absolutely necessary and important in order to understand contemporary innovation endeavours in China.

Knowledge about the innovation efforts and activities in the informal (private) realm, however, is limited. But it is in this realm that China’s most creative innovation forays are undertaken and most disruptive ideas are born. European politics and business sectors could profit substantially from a better understanding of the activi-
ties and dynamics in this hidden Chinese innovation regime. European agencies like the European Chamber of Commerce in Beijing as well as national Chambers of Commerce and business associations should be tasked with collecting more information and gain a better understanding of this sector. The goal should be to get an improved holistic picture of the overall innovation dynamics in China, thereby provide input for better informed European policies vis-à-vis China, ascertain potential new fields for R&D collaboration, and identify interesting business opportunities for European industry.

References


China's foreign technology market perspectives

Abstract

The still comparatively high GDP growth rates as well as its sheer size make the Chinese market continuously attractive to international and Chinese companies. The political aim to strengthen the national demand and to develop into an innovation-driven economy, thereby becoming more independent of technology imports, adds to the inward orientation of many Chinese companies.

This paper raises the questions if - next to political and to some extent also economic isolation effects - isolation also occurs in terms of science and technology. Some empirical indications of such effects are presented, even though the paper concludes that - if at all - we are at the beginning of such trends. It recommends, however, to develop a European strategy and specific collaboration instruments. It also suggests that it is necessary to negotiate a new collaboration model with China, which puts mid- to long-term returns for both sides centre stage.

Introduction

The 2008/2009 financial crisis had a severe impact on China - more than on most other countries - mainly because China was - and still is - a globally leading exporter. As a reaction to the crisis, the Chinese government announced its intention to become less dependent on international markets and to focus more on developing its national market and domestic demand instead. This was supported by a stimulus package to compensate some of the most severe effects on the Chinese economy - and indirectly on other national economies as well as import demand remained high. Several of these benefitting nations are located in Europe. However, the times of two-digit GDP growth in China had already vanished by the beginning of this decade, and most international spectators even challenged the officially reported growth rates of more than 7% per annum. In 2014, less than one year after taking office, president Xi Jinping introduced the 'new normal' that accepts annual growth rates below 7%. Since then, these have indeed been the officially reported values for this indicator.

The Chinese economy is still growing however - and growing faster than most other national economies. This growth continues to make the Chinese market very attractive to international companies wanting to trade with or even directly invest in China. At the same time, this growth offers Chinese companies huge development potentials. The vast majority of these companies do not even consider developing international markets, given the continued attractiveness of the domestic market.

This current and past growth has been accompanied by a scientific and technological catching-up in many fields and sectors. This catching-up has been - to some extent - supported and, in some cases, even driven by international collaborations and exchanges (Frietsch et al. 2018; Frietsch, Kroll, Jonkers forthcoming). In most cases, these collaborations were justified by so-called win-win-situations. This was the formulation used to describe technology transfer in exchange for market access. The question is whether the Chinese now perceive such win-win situations less often, given that they have since largely caught up technologically and scientifically. Has there been a one-sided termination of the previous deal on market access in exchange for technology transfer? Do we need to "negotiate" a new basis for the exchange between China and Europe?

One could formulate the thesis that the systemic competition that some Western countries have observed and that was taken up and is currently even being pushed by the Chinese government might lead not only to political foreclosure/isolation, but also to the scientific and technological isolation of China. One indication that this might be happening is the quasi-moratorium on “Made in China 2025” (MIC2025) since about mid-2018. This is the name given to the Chinese strategy for catching-up and even jumping to first place in advanced manufacturing technologies. The Chinese government has reduced communication on MIC2025 to a minimum, which could be interpreted as an isolation effect, but which also might be a way to avoid misunderstandings and not share the strategies in this crucial field with the outside world. The question is whether there are any other indications of scientific and/or technological isolation.

Dependency on foreign technologies

The Chinese government continuously emphasizes the need for China’s scientific and technological independence from foreign technology imports. In the Mid to Long-term Plan for Science and Technology (MLP), the intention was already formulated to strengthen "indigenous innovation" capabilities (Gu et al. 2009; Gu et al. 2016). These are defined as innovations with considerable Chinese intellectual
tual input that create Chinese value added. The objective to shift the Chinese economy towards an innovation-driven one and to become more independent of technology imports is still one of the Chinese government’s most important policy goals. Despite all the economic, scientific and technological achievements of China, its dependency on foreign technology imports seems to linger. According to World Bank statistics, there has only been a marginal decrease in the share of IPR payments over receipts for the years since 2001, which is one indication of technology dependency. In addition, the OECD has shown that while the domestic value-added content of China’s exports increased significantly compared to previous periods for the years up to 2011, there have been hardly any changes in import substitution and high shares of foreign embodiment in national exports in certain sectors, including ICT with more than 63% (OECD 2015).2

Technological competitiveness at the international level

Under the plausible and empirically tested assumption that patents structure and protect markets, especially for medium and high-tech products, we would expect the Chinese portfolio to have developed over time. Its transition from a developing, via a developed to a high-tech country should be clearly reflected in its technological competitiveness at international level. This is the political intention of the Chinese government as laid out in the National Innovation-Driven Development strategy (2016). It is the overarching strategy that shapes current science, technology and innovation (STI) policies and to which other strategies like “Internet Plus” or “Made in China 2025” refer. Three development stages for the socialist modernization of China were formulated and are mirrored in other strategies: China should be an “innovative nation” by 2020, an international leader in innovation by 2030, and a well-established worldwide powerhouse of scientific and technological innovation by 2050.

Technological focus

Despite a recent broadening of innovative activities - in terms of the actors involved and the absolute volume - China is still a technologically rather specialised economy. As one key indicator of this situation, China’s patent output remains limited to a comparatively small number of areas. In 2016, the two most important fields of communication engineering and computers amounted to about 30% of all patenting activity, down from more than 40% in the mid-to-late 2000s, but still at a very high international level. If the perspective is extended to the top 5 patenting areas (including three additional fields closely related to the two main areas above3), the share amounts to nearly 44%, down from more than 50% in earlier years. In Germany and Japan, this share of the top 5 fields in overall patenting would only be around 20%, even in the US and Korea, with their more specialised and ICT-oriented innovation systems, values notably above 30% have become unusual in recent years. While China profits from the fact that its key fields of expertise are at the centre of an unfolding, worldwide digital revolution, it is important to point out that many other capacities are less developed.

In line with the above observations, it seems obvious to assume that China continues to benefit substantially from international technological competences in order to achieve genuine advances in various sectors of industry in which its own capacities remain less developed. However, relative assessments should not tempt us to underestimate the significant absolute growth in inventive activity that China has realised in complementary or adjacent areas as well. While its profile in terms of international technological activities remains focused, national patenting demonstrates that innovative capacity has increased significantly across a number of diverse sectors. Given that the Chinese market is already the most dynamic market in the world in many sectors - e.g. automobiles, medical instruments, pharmaceuticals, chemical industry, etc. - and that China is already the second largest economy in the world, and on the brink of becoming number one, Chinese actors still address international innovation competition. It is the Chinese market where international innovation competition takes place!

Inward orientation

Having said that, an overt share of China’s innovation activity remains domestically oriented. This is demonstrated most prominently by the fact that an overwhelming majority of its inventors are applied for patents solely at the national office (now CNIPA, formerly SIPO). To a degree, this is natural for a country with such a large home market. Patenting at the national office also plays a strong role in the USA, for example. In China, however, we find further indications that international market perspectives remain intentionally underexplored. While Chinese PCT (Patent Cooperation Treaty) applications have become increasingly common, the PCT procedure is frequently not used for the purpose it was intended to serve - the protection of domestic inventions on various foreign markets. Currently, many of the Chinese patents formally applied for through the PCT procedure are subsequently not actually transferred to other national offices. In recent years, the share of PCT patents with a patent family size of less than three (i.e. those Chinese priority filings that are subsequently filed with the WIPO under the PCT procedure, but which never enter the national/regional phase at any other patent office) has amounted to about 50%. Thus, roughly half of all Chinese PCT filings remain little more than national market applications in disguise. In most other countries, filings through the PCT process are used to transfer patent protection to as many countries as commercially relevant.

Figure 1: Share* of discontinued PCT filings

* 3-year moving average

Source: EPO - PATSTAT; Fraunhofer ISI calculations

1 World Bank: World Development Indicators, Table 5.13 Science and technology
http://wdi.worldbank.org/table/5.13
2 http://english.gov.cn/policies/lastest_releases/2016/05/20/content_281475353682191.htm
3 These are: units of automatic data processing machines, optical and electronic measurement technology and broadcasting engineering
PCT filings allow the applicant to delay the decision on further action by an additional 18 months compared to the regular filing procedures at subsequent offices under the Paris Convention, where such a decision needs to be made within 12 months. Consequently, the PCT procedure is frequently used for strategic patenting (Arundel, Patel 2003; Blind et al 2006; Frietsch et al. 2012; Daimer et al. 2017). This is especially the case if the markets for the technologies are still uncertain, if technology cycles are rather short (shorter than the granting procedure at most offices), or if the intention is to point out international prior art. The Chinese government sets the goal of increasing its PCT applications a couple of years ago with the intention to become the world's number one applicant. Support is given to achieving this goal by funding application fees. Given the uncertainty in the decision-making process in general combined with the extra time allotted for making a decision at zero cost, Chinese applicants are probably more frequently inclined to file a PCT application, which they then abandon in the further course of the process. In addition, high shares of patent applications in information and communication technologies - where the technology cycles are indeed shorter than in most other areas - may also partly explain the high shares of PCT applications that never enter the national/regional phase at a foreign patent office. However, it is striking that China's shares of discontinued PCT filing processes are higher than in all other innovation-oriented countries.

Hence, we can conclude that the international market activities of Chinese applicants are more limited than they might appear - based on the published statistical data - and that a strong national market orientation is still high on the agenda. Arguably, this overall inward orientation has increased rather than decreased in recent years, even though China's rising technological capacities offer additional opportunities to foster the world market orientation of its technological offers. A more critical reading of the above findings could be that the average Chinese inventor might have increased the number of filings, but not necessarily, because he or she has become more productive in substance.

This together with the above-mentioned fact that a substantial share of seemingly high-value PCT applications are never actually transferred to national offices suggest that we may be witnessing a lot of patenting for patenting's sake - triggered by well-known political incentive systems. It could well be that more of China's innovators are now filing patents through the PCT procedure to suggest international quality standards (and to a degree indeed document those in pre-examination), but still shy away from moving into the national phase, where an in-depth examination would follow - with a potentially less favourable outcome - and, in any case, higher costs.

In addition to the market perspective, knowledge flows and knowledge exchange processes seem to have changed considerably as well. A further indication of decreasing rather than increasing international orientation is the observation that the shares of foreign invented patents applied by Chinese applicants (SHIA) and Chinese-invented patents applied for by foreign applicants (SHAI)* have decreased notably during the past decade, down from 30% to 7-8% for applicants from abroad and down from 17-18% to about 6% for inventors abroad. Typically, such interrelations are the result of boundary-spanning corporate activity, during the course of which inventions are made in one place but the patent is subsequently applied for elsewhere by headquarters or other subsidiaries seeking to launch the resulting innovation on a specific market. While a similar decoupling trend is visible in Germany, particularly after the end of the economic crisis-effects in about 2011, the overall decrease here is much more moderate, from about 23% to 16% for foreign applicants and 19% to 13-14% for foreign inventors. Recently, the shares have been more constant and the trend consolidated. What we witness for China, in contrast, is quite evidently a shift from what was a globally oriented economy to one whose technological system's embeddedness in transnational corporate networks is now notably below average by international standards. On a positive note, this finding may reflect the rise of manifold domestic technological enterprises that have gradually eclipsed the role of those multinational corporates that accompanied - if not paved - China's move onto the global technology stage from the early to the late 2000s. Since then, China has become technologically more independent and - quite probably - also politically less open to international collaboration as well as foreign investors interested in reaping the benefits of Chinese inventions internationally.

### Outlook

The current geopolitical situation provides ample reasons why China seems to be turning inward, not only economically, but also with a view to its scientific and technological activities. Irrespective of who originally triggered these self-reinforcing developments towards techno-economic decoupling, the above findings suggest they will have three main implications:

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4 SHAI means that the patent owner is a Chinese company, but (at least one of) the inventors is a foreigner, whereas SHIA means vice versa: (at least one of) the inventors are located in China and the owner company is foreign. SHAI reflects the ability to source knowledge abroad and integrate it in national knowledge and technology generation processes, whereas SHIA reflects the attractiveness of the national knowledge and technology processes for foreign companies. Even more simplifying: SHAI is a measure of knowledge gain from abroad, whereas SHIA is a measure of knowledge loss.

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**Figure 2: Share of China’s patents with a domestic inventor and foreign applicant (SHIA) as well as with foreign inventors and national applicant (SHAI)**


Source: EPO - PATSTAT; Fraunhofer ISI calculations
First, that the recent politically driven decoupling further weakens an already dwindling web of global technological relations. Western firms no longer substantially influence the Chinese technological system, and most Chinese firms remain staunchly oriented to the domestic market. Thus, the notion of a globally oriented China seems at stake to some degree.

Second, much suggests that China’s technological system remains unbalanced and that the substance behind at least some of its impressive patenting figures may be more limited than apparent at first glance. Hence, any genuine decoupling would likely hit China itself the hardest in the short term and notably weaken its capacities.

Third, however, any weakening of China would weaken the overall global system at the same time. Not only by impeding foreign firms’ access to China’s domestic market, but also by limiting access to its now substantial scientific and technological capacities. Any further decoupling would weaken the global ability to solve pressing problems.

**Recommendations**

It is obvious that the previous foundations for collaboration and exchange no longer exist in the same way. It is necessary to forge and negotiate new foundations for international collaboration with Chinese companies, and even more so with public institutions in China. This necessitates a strategy on the side of Europe.

How the Chinese economy develops is key to the world economy. Chinese institutions have also become key to global scientific and technological developments. It is essential to integrate China into international science communities as an equal partner. China’s participation in the Framework Programmes is an important step in this direction, which should be extended to additional scientific areas where China might not immediately see its own added value or benefits. Similar initiatives at the level of European member states should be encouraged. Coordinating or at least exchanging experiences on the European side should be considered.

European stakeholders should develop a dedicated strategy (e.g. the existing Roadmap) and jointly pursue it.

The political, economic, as well as scientific and technological isolation of China must be avoided! We have not yet entered a phase of isolation, but its onset must be resisted!

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Innovative and Sustainable Mobility – Learning from China?

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China invests in innovative and “green mobility” in urban transportation as well as in long-distance transportation. It uses central planning, standardization, and economies of scale to achieve efficient metro and e-bus as well as railway systems. In an amazingly short time, China managed to move huge numbers of people effectively. According to the World Bank, China’s high-speed trains are a model for developing and newly industrialized countries (Lawrence et al. 2019).

This policy brief addresses two fields in which governance and learning have created opportunities for the Chinese transportation system. So far, it seems that differences in framework conditions and concepts such as system, efficiency and sustainability have kept Europe from seeking strategic opportunities to learn from China. Nevertheless, an increasing number of achievements in China’s transportation planning and practice could be insightful cases for Europe, as they are the shortcomings and incremental improvements in its implementation. Defining Europe’s goals and advantages in co-operation projects could help to achieve at better results in negotiations and joint innovation in this field.

Urban Transportation

Chinas mega cities have long been suffering from congestion combined with high amounts of fine dust. This has led to determined efforts to improve this situation. At the same time, China uses this challenge to re-define the future of urban mobility and to fulfil long-term goals such as innovation and leadership in new technologies.

China’s focus on e-mobility

Thirty years after the opening for foreign partners, China shifts from “learning from the West” to establishing their own industrial realm. Its prioritizing of e-mobility follows Porter’s theory of national competitive advantages through using the basic factor and advanced factor endowments of their huge country which have been fostered by state policy and financial resources (Porter 1985). The main competitive advantages of China are listed below:

1. Cheap energy from manifold local sources such as coal, water power, solar energy, nuclear power and low prices through state-owned energy providers and price control;

2. Megacities with a steadily further extended public transportation system. Advantages:
   - a) The growth of the megacities allows planning ahead for huge new housing districts;
   - b) Political system: benefits for the whole society enjoy a higher priority than individual (property) rights. Therefore infrastructure developments can take place with few legal restrictions or debates;

3. Digitalization: Real-time information for public transport users through an advanced digital infrastructure and 5G connectivity;

4. Education and technophilia – fascination for high tech, innovations and digital advancements:
   - a) A strong (Confucian) belief that learning pushes careers and societal status;
   - b) A very competitive system for university access (gaokao) in schools;
   - c) Increasingly good universities in the megacities and a high number of foreign teachers and students;

5. Market: Sophisticated consumers/passengers in the huge cities, welcoming autonomous driving and online support such as Baidu as a search engine and WeChat for finding their ways in the megacities, and appreciating innovative digital entertainment features in cars and public transportation (CNNIC 2018);

6. The companies’ size, strategy and rivalry: state-owned and hybrid conglomerates, implementing the government’s plans: more than 60 Chinese e-car manufacturers;

7. Capable suppliers in the field of electric cars, such as the world’s biggest battery manufacturers: BYD (“Build your Dream”) and CATL (“Contemporary Amperex Technology Co”); Only batteries from those two companies are allowed in China (Hua 2018) which means a duo-poly for those in China and discrimination of foreign suppliers.
8. Potential for using batteries for peak power generation and transmission capacity through state-regulated monitoring of charging patterns and location power levels (IEA 2019);

9. Access to raw materials for batteries through ownership/partnerships for rare metal mines like cobalt, lithium, manganese and nickel (IEA 2019) in several parts of the world (Australia, Africa, Central Asia);

10. Sufficient staff and space to deal with the recycling or end-of-life management of batteries.

The combination of the listed advantages turns China from a pioneer to a leader in the market for e-mobility. It reveals China’s unique advantages in e-mobility compared to Europe. Europe’s car manufacturers can build e-cars, but without joint governance and without their own capable battery provider, European vehicle manufacturers will not be able to reach China’s prices and economies of scale, even though supported by the EU and national subsidies (see BMWi 2019). Volkswagen started a pilot line for the manufacturing of their own battery cells (Vetter 2019) and also partnered with CATL and LG Chem (Volvo 2019). In parallel, the Chinese battery giant CATL received government support for a battery factory in Erfurt and co-operates with BMW and potentially more car manufacturers.

The existing co-operations show that Europe is already teaming up with China. But since they bring knowledge and money, the Chinese partners have a better position in the team and can, for example, decide with whom they cooperate and under which conditions. A local content requirement, reinforced by European/state regulation, for corporations which, in their home countries, impose the same requirements on European enterprises, would make it easier for European companies to have an equal or 51% stake in the business. This would mean a shift in Europe’s open market philosophy, but one which is more future-oriented than the existing screening system for Chinese investments in Europe (Hanemann, Huotari & Kratz 2019).

Market economies count on private companies and competition to be the main drivers of innovation. But through regional experimentation and differentiation of approaches, China also has a good chance of achieving a variety of situation-adapted innovations. The central government takes its time to design a plan, consult with manifold internal and external experts in the provinces, companies and universities (Reisach 2013), and then uses top-down decisions, combined with regionally aligned approaches, to get ideas implemented. The dominance of the Communist Party in decision making and the pragmatism in trial and error procedures, create a system advantage in infrastructure development.

Several governance actions are working in parallel and are mutually amplifying their impacts. Among them are non-traffic-related measures such as moving factories with high CO emissions to locations outside the city, requesting the use of filter technologies, banning coal ovens and providing gas for heating and cooking, regulations for covering fine sands at construction sites with plastic material and many more. Among the directly and indirectly traffic related measures are the following:

1) Requesting 5 % (2020) and 20 % (2025) of e-cars in local and foreign car manufacturer’s fleets (GibeC 2016),

2) Limiting access to city traffic rings for gasoline driven passenger cars, vans and busses,

3) Rising the number of charging stations for e-cars and e-busses to 1.08 million charging posts and 245 power stations for electric vehicle drivers to change batteries across the country by the end of August 2019 (China Electric Vehicle Charging Infrastructure Promotion Alliance, quoted by Xinhua 2019) through state-owned providers such as Potevio which co-operates with State Grid (Potevio 2018), the Chinese (state owned) energy provider (Reisach & Stizel 2019), and with the cities’ (state owned) transportation planning centres,

4) Subsidizing e-cars and e-taxis through tax advantages and preferences in city traffic,

5) Subsidizing Battery manufacturers like BYD and CATL (Masiorea et al. 2016) and preferring their own battery manufacturers instead of, e.g., South Korean competitors,

6) With more than 400,000 electric buses (about 99% of the world’s total), China is a pioneer in e-busses for public transportation, especially in Southern Chinese cities such as Shenzhen,

7) Keeping energy prices low, since energy prices are a strategic field where the government, respectively state-owned companies, set the price (not competition and market forces),

8) Using different forms of alternative energy production such as nuclear energy, wind, water and solar energy and liquid gas for electricity and charging of batteries,

9) Fostering the standardization of batteries in order to reduce cost, improve battery energy density and safety and promote energy storage technology (Delfs 2019), Standardization of charging stations for usage through different car types,

10) Supporting the research and manufacturing of hydrogen cars in Zhangjiakou, the cost city of the Winter Olympics in 2022 (Delfs 2019),

11) Establishment of a Technological Innovation Centre for New Energy Vehicles (NEV) in Beijing, to boost the supply of key new energy vehicle technologies to meet the growing demand (Ministry of Science and Technology, quoted by State Council/Xinhua 2018)

12) Providing incentives for research on alternative energies for cars, including R&D funding

13) Increasing the speed of construction of new metro lines,

14) Optimizing city traffic flows through extensive usage of public transportation data and pedestrians/passengers WeChat location data in so-called Urban Transportation Planning Centres (e.g. the SUTPC in Shenzhen).
The above-mentioned measures show how many different initiatives jointly facilitate the politically desired change to cleaner cities and less congestion. With favorable funding and state-owned companies, the Chinese government helps transforming city traffic and establishing new business models and multi-modal mobility services. A key facilitator will be the Technological Innovation Centre for NEVs and EU policy is strongly encouraged to ask China for co-operation in this field. This time, Europe could learn from China, e.g. in battery technology, but could help in other fields such as an efficient manufacturing organization. And Europe needs to adapt the learnings to their own system which differs in several aspects: Many of the measures only function because crucial actors are state-owned or mixed ownership companies. The competition in market economies makes it difficult to, for example, standardize the charging stations and to build a joint charging network which would help all users. Democracy in general and the EU with their complex decision-making processes have the tendency to slow down the speed of decisions because compromises need to be negotiated and to be approved by national governments which are elected through regional and national elections that cause changes of political priorities and people in charge.

The Chinese city authorities address the challenges of urban mobility in megacities with priority, establish urban transportation planning centres for network planning, congestion avoidance, passenger flow forecast, as well as traffic and pedestrian flow simulation in model cities such as Shenzhen (SUTPC 2019 and Nedopil 2018). Using sensors for weather, air quality, and location data from the search engine Baidu, from train, metro, bus, taxi and car passengers, as well as from the messenger app WeChat, they can provide a comprehensive planning framework that goes far beyond the existing traffic management technologies in Europe. While Europe’s private companies collect vehicle data to improve their engineering and customer service, China is able and willing to establish holistic mobility systems.

Some of the measures in the list of urban transportation measures could also work for Europe, such as standardizing charging stations and optimizing city traffic flows through the usage of public transportation data and anonymized pedestrians’/passengers’ location data, e.g. from Google maps. A modernized public transportation system in European cities would also allow to use chip cards for their passengers and thus be able to get the number of persons e.g. in a city train or bus, as some European cities already do. For new mobility solutions such as e-busses, a whole city’s (bus) routes need to be reorganized and optimized, using (anonymized) data on passengers’ starting points and destinations – rather than letting the manufacturers and city administrations guess and debate how the existing lines and routes could be equipped with charging stations. Way too many actors such as city governments, energy providers, charging station operators and manufacturers of means of transportation, are working isolated and un-coordinated in European urban traffic management.

European carbus manufacturers and suppliers need to partially re-define their business models in order to arrive at a competitive mixture of mobility solutions like hybrid, e- and fuel cell cars, combined with public transportation and short-distance vehicles like e-scooters and bicycles. Their role might be different than it was previously because China is already leading in battery- and e-car innovation (Floerecke 2019) and almost all e-busses worldwide are made in China (Fichtner et al. 2019: p. 17). Innovation policy for European automotive industries should focus on research in the next generation of mobility, e.g. in hydrogen/fuel cell transportation for long-distance transportation of busses and vans and multimodal planning and transportation system optimizing. In those fields, Europe has some competitive advantages through engineering and previous knowledge. If the European interests and goals are clearly defined, European and Chinese researchers and companies might benefit from funding from both sides to engage in joint research on hydrogen energy and intermodal mobility solutions.

Long-distance Transportation

The rise of China Railway Rolling Stock Corporation (CRRC)

Based on the Treaty of Rome, the intra-European transport was a pre-condition and consequence of the European Single Market. The four freedoms (free movement of goods, services, capital and labour) required transportation and the first mentioning of a Trans-European Networks (TEN) was in the Maastricht Treaty and the Whitepaper on the Future Development of the Common Transport Policy (Commission of the European Communities, 1992). With the goal of a stronger economic and social cohesion, interconnectivity was sought for passenger traffic as well as freight transport.

Those goals were quite similar to China’s goals, following their Medium and Long-term Railway Plan (MLTRP) which was approved in 2004. While European companies tried to convince China to use the magnetic elevated train (“Maglev”), when the route from Shanghai Airport to Pudong was ready for the Olympic Games in Shanghai, the Chinese train ministry decided to be “… as self-sufficient as possible in high-speed rail (HSR) technology by mobilizing research and development resources on a massive scale to establish China’s own systems and standards.” (Lawrence et al. 2019: p. 10). In 2009, the first major long-distance route from Guangzhou and Wuhan started operating, followed by the Beijing-Shanghai and Beijing- Guangzhou line in 2012. The HSR network was expanded up to 25,000 route-km by the end of 2017 and by 2020 the national railway operational mileage shall reach 120,000 km (Tan et al. 2016). This includes conventional lines with a 160–250 km/h speed, secondary speed trains with a speed of 200–299 km/h), and full high-speed trains with a velocity above 300 km/h. In their “Advanced Rail Transit” program of the 13th Five-Year Plan, safety assurance and emergency management should be improved, high energy efficiency of traction power supply realized, life cycle maintenance and environmental friendliness implemented. Beyond that, ambitious goals such as key technology for 400 km/h and above high-speed passenger transport equipment as well as space-air-train-ground integrated rail transport safety and control technology are foreseen (Tan et al. 2016). The magnetic levitation train idea has been revitalized in China and a new 600 km/h prototype has been presented in Qingdao in May 2019, integrated certification is expected in 2021 (Xinhua 2019). A track between two megacities in Southern China and Central China, Guangzhou and Wuhan, is planned. This time the whole CRRC project runs completely without European participation – a pity for the previous partners, but maybe a topic to re-negotiate in a science and innovation dialogue with China.
The state-owned Chinese railway companies learned from the leading European train manufacturers, Alstom, Bombardier and Siemens and from Japan's Kawasaki and their Shinkansen train which started construction in 1967 and ran the first lines in 1975 (Nippon.com). Like car manufacturers, the foreign train manufacturers needed to follow the Chinese “local content” requirements. They needed to establish joint ventures together with Chinese (state owned) partners that were holding the majority of shares and were in the lead position. The World Bank acknowledges that the first Chinese trains were imported or built under technology transfer agreements with European and Japanese companies, but adds that China rapidly adapted and improved the designs for local use (Lawrence et al. 2019: p.18). In addition, they joint forces through mergers and standardizations.

China Northern Railway (CNR Corporation Limited, CNR) and China Southern Railway (China South Locomotive & Rolling Stock Corporation Limited, CSR) merged in 2014 to a state-owned conglomerate, the China Railway Rolling Stock Corporation (CRRC), now the biggest railway technology conglomerate worldwide (Railway Gazette 2014). Between 2012 and 2014 the design plan on a Chinese high-speed train was finished and the two merged companies started implementing the joint plans. For building their first Chinese “Fuxing” train which runs at 350 kmh and is the pride of the Chinese high-speed trains now, the Chinese Ministry of Science and Technology and the former Ministry of Railways had joined forces for a China High-Speed Train Independent Innovation Action Plan (Tan et al. 2016). It comprised six large-scale enterprises, 25 key universities, 11 first-class scientific research institutes, 51 national laboratories and engineering centres, in total 500 professors, more than 10,000 engineers and technicians (Lawrence et al. 2019: p. 18). This development comprised engineering, operation and management and not only required train and signal technology but also track construction, pile building and stabilizing on sandy grounds along rivers or coastal lines, and tunnel building to overcome geographical challenges in mountain areas.

Controlling 99 percent of China’s train industry (Yu, quoted by Smith 2016), CRRC is benefitting from economies of scale and large state orders and is now serving increasingly large markets in Central Asia, Eastern Europe and Africa along the Chinese new “Silk Road” (BRI). The China Railway Signal & Communication Co., Ltd. (CRSC) has a similarly strong presence on the highly standardized Chinese and BRI railway infrastructure. They standardized not only trains but also designs for embankments, tracks, viaducts, electrification, signalling and communication systems which cut costs and duplication of effort (Sweet 2014). Through this standardization, prices are low and infrastructure can be built fast. Chinese railway manufacturers have a comparatively comfortable position within the huge Chinese train market and along the BRI.

Despite governmental subsidies, (Hillmann 2018) CRRC and CRSC so far have not been able to conquer European markets significantly (Kaiser 2019). Along with the British fear of increasing prices after a merger, the lack of evidence that China would be a serious competitor for European rail companies was one of the main reasons why the European cartel authorities did not permit the merger of Siemens (Germany) and Alstom (France). A focus on the competition within the European market ignores the business interests of global players which gain a significant part of their revenues on international markets. CRRC Zhuzhou Locomotive Company has meanwhile reached an agreement with the German train manufacturer Vossloh in Kiel (Barrow 2019) and might thus be able to enter the European train market – if they are allowed to do so. Agreements on the mutual opening of public procurement in this market would establish reciprocity and would be part of the requirements: If European companies may purchase a Chinese company in the railway sector and qualify for public procurement in China, then Chinese companies can do the same in Europe.

Suggestions for project learning exchanges

Many of the technologies and skills for the Chinese railway development were provided and taught by European experts, by their activities in China and through the many Chinese students who studied in the relevant European universities. It would be a kind of “giving back”, if European students and researchers could be part of new technology projects in China in order to learn from China. European universities that have high numbers of Chinese students in technology fields which are close to Chinese showcase projects should consider balancing the number of incoming and outgoing students or ask for exchange programmes for professors, research assistants and PhD candidates. European science and education ministries could support that with signing bilateral partnership agreements which also include language assistance or courses and project work in English as a joint language. Funding for research on how Europe and China could both benefit from a Eurasian connectivity network would encourage researchers on both sides to think of potential solutions. In cooperating with the modern China, we should be pragmatic in negotiating to achieve results which clearly also serve the EU’s strategic interests.

Summary

The strategic approach in mobility reflects characteristics of the Chinese system and culture: First, the long-term thinking and industrial policy are based on China’s “Socialist Market Economy” which forms a synergy between two dialectic poles. It is reinforced by the Communist Party’s leadership and long-term planning (von Senger 2008, pp. 115). Those plans set a general guideline, an innovation path, an appellate call to follow the party’s direction. Details of the implementation are in the hands of provinces, municipalities, state-owned and private corporations. The standardization of the most successful technologies and procedures (Lawrence et al. 2019: 3), and own improvements based on local conditions and skills, help to reach their mobility goals. Issues such as sustainability and support for local partners are increasingly considered, but executed in a flexible way.

Secondly, “Learning from the West” has been the path of modernization since the Communist Party’s opening up in 1978 (Goodman 1990: p1). While the West dreamed of China’s transformation to a full market economy (“change through trade”), Chinese see themselves as the world’s next leading economy. Their dialectic thinking enables them to see synergies and interconnections between several technologies and to establish more holistic innovations. Flexibility, illustrated through the “flowing like the water” analogy (Sun Tzu), frequently lead to adaptations of regulation to current and situation-al needs. By using competitive advantages and learning from Europe, China challenges assumptions such as the clinging to established models and lengthy (democratic) processes in debating on
transportation infrastructure. China's government grasps opportunities and encourages its researchers to join forces in order to develop and implement technological innovation and thus also foster societal cohesion.

Maybe that is one of the major lessons we should take along from China and its many provinces: In all our European diversity and manifold challenges that we face, we should join forces and develop plans for a modern European transportation infrastructure, in the cities as well as on the long-distance transportation. In the cities, a comprehensive traffic planning for multi-modal mobility, based on real-time data, should be introduced and public transportation made more attractive. Growing urban population requires a faster planning and implementing of new public transportation facilities. The Trans-European Network has been improved but still could be better, with fully standardized gauges, interoperable rail traffic management and advanced train control systems (using existing models and implementing them sooner), with more reliable passenger trains, more silent freight trains, a more efficient operation and predictive maintenance, a joint digitalized planning system in Europe and more environmentally conscious rail transportation, rather than truck congestion and CO₂ emissions on the motor highways. China started its modernization after the 2008 financial market crisis and maybe Europe could do so now in a phase of an economic slowdown. Even though the EU might not agree to some of the Chinese views, it can learn from the Chinese long-term thinking and strategic planning.

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What’s hyped and what’s real: The state’s innovation ambitions versus society’s concerns

Social media discussions on Artificial Intelligence (AI) and ethics in China

1. Reality check on China’s AI ambitions: Pushback from society and call for AI governance

China is in a race with Europe and the United States to achieve leadership in the field of Artificial intelligence (AI), a set of technologies that promise to increase productivity in industry and provide solutions to societal challenges. Widespread adoption of AI systems and a vast amount of training data are seen as the main advantages China has in this race (Castro et al. 2019). However, these advantages also entail enormous risks. Smart gadgets, millions of cameras and platforms such as the social credit system can be used to build a mass surveillance system that threatens the freedom and rights of individuals. Moreover, the regulatory environment for emerging technologies in China has also been (in)famous for its leniency in allowing companies space for innovation at the cost of compromising consumers’ interests.

Beyond the lists of flashy AI innovations coming from Chinese companies, from internet giants to tech unicorns, a pushback from society against invasive practices has surfaced frequently in the past few years.

For example, when Robin Li, the CEO of Baidu, made a comment at a High-Level Development Forum held in Beijing in March 2018 that Chinese people are less sensitive to privacy issues and more willing to trade privacy for convenience, safety and efficiency, he received furious criticism online (Abacus 2018). In the same year, the phenomenon of biased online booking platform algorithms raising prices for regular customers was so widely discussed and criticized by the public that the phrase “Big Data ‘kills’ regular customers (大数据杀熟)” was chosen by the party state’s newspaper “People’s Daily” as one of the ten most important social catchwords of the year.

The Chinese government, with its ambitious strategies to be a world leader in AI innovation, is aware of the importance of using governing mechanisms to keep AI systems controllable and safe. In the New Generation Artificial Intelligence Development Plan issued in July 2017, the State Council outlined the goal to establish ethical norms and regulations in several AI industries by 2020, and to codify a system of laws and regulations to govern AI between 2025 and 2030 (State Council 2017).

Currently, the development of AI ethical guidelines in China is led by government affiliated research institutions, universities and industry leading companies. In the latest move, in May 2019, a group of leading Chinese institutions including the Beijing Academy of AI (BAAI) backed by the Ministry of Science and Technology and the Beijing municipal government, Beijing and Tsinghua University, the Chinese Academy of Sciences, and industry leaders like Baidu, Tencent, and Alibaba released a code of ethics called “Beijing AI Principles”.

Despite its name, the ethical guidelines for AI developments that were set out in the “Beijing AI Principles” are consistent with most AI ethical guidelines published globally, emphasizing that AI development should benefit humanity and respect privacy, dignity, freedom, autonomy and rights (Sterling 2019). Although in the light of prevalent surveillance technologies in China, these principles may be dismissed by many as disingenuous official narratives, there are nevertheless observers who argue that this set of principles signals the “willingness to discuss such issues within Chinese policy circles” (Knight 2019).
The official policy-making process in China is notoriously opaque but discussions among experts and consultation with the general public do have an impact on the overall shaping of policies and their implementation. This paper therefore goes beyond the AI ethical principles issued by top-level institutions and instead analyzes discussion about AI and ethics on two popular Chinese social media platforms, WeChat Public Accounts and Zhihu, between industry experts, academics, tech-focused independent media outlets (only on WeChat) and informed members of the public (only on Zhihu) within the last two years (October 2017-October 2019).

Although the Chinese authorities have been putting increasing restrictions on the use of and contents on social media, online platforms are still important sources for investigating public (or published) opinion in China. The Chinese government tolerates and influences debates on current issues in order to get feedback on its policies, monitor communication, prevent collective networking, or undermine any attempts to organize protests. Controversial opinions within the political elite also contribute to the persistence of a public space of differing opinions (Shi-Kupfer/Ohlberg 2018; Stockmann/Luo 2017).

The diffusion of AI technologies will not respect national boundaries, so research on AI ethics requires dialogue and effort on a global scale. A look at the discussions between industry experts, scholars and informed members of the public on Chinese social media not only provides more information on the impact of AI systems on societies but also provides valuable knowledge to better prepare for exchanges between experts within and outside China, by identifying common ground and potential topics for research collaboration in the field of AI development, application and governance.

Source: MERICS Research
2. Assessing the risks: Why expert bloggers in China are worried about the impact of AI on ethics

2.1 Context for the discussions: AI ethics are primarily framed as a philosophical matter

The discussions on WeChat Public Accounts and Zhihu that were analyzed mostly approached the impact of AI technologies on human societies in terms of philosophical considerations such as:

- The nature of technology itself (e.g. whether it can possess or develop morality and the ability to tell right from wrong)
- The relationship between humans and machines (e.g. love, competition) and their responsibilities toward each other (mutual respect)
- The nature of humanity (i.e. consciousness, intelligence, senses, emotion) and the superiority of human beings (e.g. in terms of creativity and compassion)
- The ultimate goal of developing AI (should be servicing humanity)
- The changes in the way people behave and associate with each other caused by AI technologies

A significant amount of the discussions is also based on the applications and technicalities of AI in specific scenarios such as in autonomous driving and service robots. Other discussions are inspired by the depictions of AI in popular media such as film and science fiction. Figure 1 presents the different types of content in the discussions on the two social media platforms as a share of the total.

2.2 Analyzing concerns about the ethical impact of AI: Concerns about societal security prevail over concerns about individual rights

Contrary to the often cited overall positive attitude of Chinese people towards technology as such (Handley 2018), a majority of the analyzed bloggers argue that AI technologies will bring risks to human societies rather than opportunities. Figure 2 presents the share of posts by the different types of assessment on the two social media platforms: those who raise the ethical risks associated with using AI technologies are represented in red; those who conclude that AI technologies will bring opportunities to human societies are represented in green; those who touch upon both the risks and opportunities that AI technologies can bring are represented in yellow.

A closer look into the specific concerns that are addressed in the posts finds that they vary between the two platforms. Discussions on AI ethics have not yet moved beyond speculation about AI’s general impact on human societies, inspired by popular media. There is little focus on more pressing risks posed by specific AI applications.

On Zhihu, the majority of concerns raised fall into one category, that is, concerns for society and/or humanity in general. On both platforms, concerns about the potential threat to humanity posed by AI are for the most part inspired by films such as Matrix and science fiction by writers such as Isaac Asimov – in this sense they are similar to debates in liberal democracies. The fast learning capabilities of machines serve as the basis for the concern that they could one day surpass the capabilities of humans and therefore come to dominate humans.

The posts from WeChat Public Accounts mention a wide range of concerns such as the legal status of AI systems and its responsibilities/liabilities, algorithmic bias and its impact on justice and equality, employment and reskilling etc. The higher presence of academics and technology-focused commercial media may explain why the concerns raised here are more specific than on Zhihu, where the users are mainly informed members of the general public but without in-depth expertise in the domain.

When it comes to safety concerns, writers do not generally agree with the assumption that an autonomous vehicle is fundamentally safer than a car driven by a human driver. Moreover, they are skeptical that autonomous vehicles can provide a better solution to the very often raised “train dilemma”.

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2 This policy brief focuses on the risks of AI and ethics only.
3 For each post, up to three types of concerns have been coded.
4 Also known as the “trolley problem”. The initial question is: A train threatens to run over a worker on the tracks unless it is diverted. However, diverting it would put the lives of the train’s passengers at great risk. What would you do?
Reasons for this are twofold: On the one hand, some writers believe that ethical questions cannot be translated and solved with algorithms. Other writers point to the diversity of opinions on ethical issues in society and cannot envision a fair compromise. Many authors warn against an increase in inequality because, for them, in view of the costs of AI-related development, it is likely to become another tool in the hands of only the powerful. This would also have a direct impact on the definition of ethics:

“The strong can use a large amount of social resources and wealth to hire a group of people to demonstrate the correctness of their own behavioral ethics from a ‘professional point of view’. Under this non-reciprocal game situation, the weak have no way, and can only be slaughtered.” (Li 2019)

The discussions analyzed offer clear evidence that there is a growing backlash in Chinese society against government and tech companies’ ambition to incorporate AI systems into every aspect of life as although this will increase efficiency and productivity, it risks compromising people’s humanity and intruding on their privacy. For example, currently there are extensive experiments in schools across China to adopt facial/emotion recognition systems to increase students’ level of attention in class. A photo from Megvii, a leading AI start-up in China, demonstrating how their facial-recognition-powered classroom monitoring solution analyzes students’ behavior, went viral on the internet in September 2019, leading to widespread criticism of the product for invading student’s privacy and freedom. One commenter wrote:

“Schools should be places to cultivate people, and normal people should have emotions and attitudes such as anger, happiness, procrastination and laziness. Schools now (with AI systems) are not places to cultivate people, but grades.” (TMTpost 2019)

Concerns related to the technical complexity and (perceived) incomprehensibility of technical aspects of artificial intelligence – the “black box” phenomenon - are the least mentioned risks. Outside of purely technical discussions, it is only in legal contexts that the concern that AI is a black box is raised. The Chinese government has started to experiment with AI judges as assistants (Pillai 2019) in order to supervise and speed up legal procedures. At least the author of this post is afraid of a trade-off between efficiency and true justice.

Figure 4: Beyond legal measures, solutions for managing risk are contested

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<td><strong>Technical approach</strong></td>
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Source: Description of recommendation given by writers on WeChat and Zhihu

| Source: by writers on WeChat and Zhihu |
2.3 Offering recommendations: Improving the legal framework and ensuring more education

The different types of recommendations for managing the risks posed by AI on human societies offer insights into the conflicting interests and dynamics within the stakeholders with regard to the development and use of AI in China.

Figure 4 presents the different types of recommendation offered by writers on WeChat and Zhihu.

A similar proportion of bloggers on WeChat and Zhihu call for the establishment of legal/regulatory frameworks and for training to empower citizens to adapt to new challenges. In terms of the next best solution, each platform has a different focus.

A particularly loud voice on WeChat arguing that companies should practice self-regulation above all to ensure ethical use of AI is Tencent Research Institute. Not a surprise, this represents the position of many internet companies with regard to AI governance. The recommendations given in the posts can be summarized with the following categories:

4. Conclusion: Analyzing expert debates as a proxy to assess China’s policy on AI and ethics

The analysis has demonstrated that discussions on AI and ethics has already started in the online fora in China with multiple groups of stakeholders including state-affiliated think tanks, leading tech corporations such as Tencent, academics, industry practitioners and informed members of the general public. While this last group still often approaches the ethical risks of AI from the perspective of popular film and science fiction, industry practitioners and scholars play very important roles in directly the discussion toward specific scenarios and imminent risks that AI could pose to society.

Looking at the quantified assessments made by selected writers on the impact of AI, reveals that concerns about the risks of AI outweigh optimistic and neutral views. In his recent debate with Elon Musk, which attracted worldwide attention, Jack Ma said he was optimistic about AI technologies. This brings to mind a recent debate in which Chinese entrepreneur Jack Ma defend his optimistic views about AI technologies against Elon Musk. While Jack Ma’s view may be interpreted as a representation of the “Chinese view,” at least our research finds that there are clearly plenty of stakeholders in China that share Musk’s views and warn against an overdrive of AI development.

Chinese experts in AI technologies display concerns across a full range of issues and their concerns are aligned with concerns raised by people around the world. Judging by the discussions, there is so far no sign of a unique AI ethical framework with Chinese character. Discussions are largely consistent with the discourse globally on this topic, although risks related to the common goods/society are more prominent among Chinese expert bloggers.

For German/European policymakers, three key recommendations can be drawn from the discussions analyzed:

1. Make ethical dimensions of AI a topic in official talks with China.

Chinese policymakers will need to balance between giving corporate leaders the regulatory certainty they need to continue AI innovation and mitigating its ethical risks. The Chinese government has already shown great interest in the European General Data Protection Regulation (GDPR) and incorporated many of its principles in its own data protection legislation. The field of ethics, of which privacy protection is also one core element, offers another opportunity for Germany/Europe to offer its experience and seek exchange with Chinese counterparts, e.g. on how to incorporate ethical principles in the design and production process of AI-based products and services, or how related standards and labels could be structured. This could be also expanded to other emerging digital technologies.

2. Scrutinize statements like “The Chinese people don’t care about ethics or privacy etc.”

Some representatives of Chinese governmental institutions and companies as well as sometimes several foreign corporations claim that since “the Chinese people” do not care about ethics or privacy, China can innovate much faster and without the regulatory “burden” existing within the EU. These statements use the “Chinese example” to make the case that innovation and ethics are a kind of zero-sum game. German/European policy makers should not be blinded by such over-simplified statements. They should view regulations on privacy and ethics with self-confidence and strive for thought-leadership in this realm vis à vis China. To avoid being perceived as riding the moral high ground based on “Western” concepts, German/European policy makers can reference opinions and trends in Chinese debates.

3. Systematically track Chinese expert debates on digital technologies/innovation

In times of political hardening within China, an assessment beyond official narratives becomes ever more important. Besides regular exchange and face-to-face meetings with individual Chinese scholars, analyzing and tracking key themes and potential shifts within the published opinions of Chinese, expert bloggers serve as a valuable framework for an informed assessment. Moreover, as in the discussions analyzed in this paper, arguments and recommendations could be picked up and injected into dialogues or official meetings with Chinese counterparts. In an additional step, a comparison with arguments made in the official party-state media as well as within academic magazines could then also help German/European policy makers shed more light on potential alliances or disagreements between the various actors who have influence over Chinese policy-making.


TMTpost (2019): AI monitors you during lessons, but how can the privacy of students be protected? (“AI 盯着你上课，但如何保护学生的隐私?”), WeChat, 9.4.2019. https://mp.weixin.qq.com/s/loE_A_xi0zYiUgUXRiJpx7mg

Executive summary

The Chinese legal framework on cyber security and data privacy will potentially create disproportionate legal risks and practical hurdles for research and data exchange with China.

This paper introduces some of the newest legal draft proposals and their potential impact, and argues for a push for an open and less regulated legal environment. In an age of increasing importance for competitiveness depending on data control and data flows, the legal framework can cause harm and be one-sided, making cross-border research more risky and from a policy perspective potentially less desirable. This makes more, not less dialogue an important priority.

1. The change of the legal and systemic environment in the Chinese jurisdiction

In the past two decades the Chinese environment and legal system largely converged with the legal Western framework due to the accession of the country to the WTO. During these years hope was nurtured that this trend would continue and support the increasing entwinement of the economies in East and West. With the increasing significance of the so-called new economy and impact of big tech companies the Chinese leadership very quickly decided to build up its own national champions and break the dominance of the US government and its companies in this sphere.

With a starting point already before or around 2015 there have been strong efforts to rein in the economy in China and secure and reinvigorate Chinese Communist Party’s control over the economy and in particular over any kind of data and tech-based services, including indirectly also awareness by government on advanced knowledge entering or leaving the country (Shi-Kupfer and Ohlberg 2019).

Nationalistic policies

The Made in China 2025 policy targets those areas of industry where a western dominance currently exists or is perceived to do so. The areas of artificial intelligence and machine learning technology, biotechnology, robotics and quantum information and sensing technology have been identified under this policy and elevated from the pure realm of competition between companies into the realm of politics and matters of national security (Zenglein and Holzmann 2019).

With a denial of access for Western leading companies into the Chinese market and the expulsion of companies like Google, China managed to create a closed-off ecosystem which allows companies like Alibaba, Baidu, Tencent and others to thrive and build a domestic empire, while still having access to the markets in the US and elsewhere, including capital markets.

An unlevelled playing field has allowed China to catch up and to develop a unique system of technical services and advanced new services inside China. Citizens in China below the age of 30 do not know how to “google” something, they use WeChat instead of WhatsApp and tend to rely on domestic companies for arranging their online life, their daily communication and increasingly their daily business. Foreign companies in this area are substantially dependent on Chinese partners and the system “as is”, and cannot shape or develop the market by themselves.

The Chinese government considers it as justified to do so as it explicitly wants to prevent a westernization of society. Rather, technology shall be used as a means to shape and control a society with Chinese characteristics and to have a strong role by government rather than being driven or influenced by individual big tech companies. It is clearly intended that access by foreign companies can only be allowed if they adhere to the oversight and control of the Chinese Communist Party.

New rules on cross-border data transfers and the potential stifling of cross-border research and innovation

Dr. Thomas Pattloch, LL.M.Eur, Head of the IP Group within the China Group TaylorWessing
Social credit system and domino effect on foreign companies

The mantra of an ever-present government and party is now complemented by a new social credit scoring system which aims at individuals and companies alike (European Chamber of Commerce in China 2019). The system builds on a compatibility of technical surveillance and extensive data gathering in all areas of daily life such as social media, communication apps, banking and health related IT applications.

Under the Social Credit System “SCS” which was introduced as early as 2013 and expanded ever since, a “General Hub” of so-called credit-related information is being built up and continuously updated and supplemented. At the moment, more than 34 billion records in relation to credit information have already been accumulated, gathered inter alia by way of collecting internet-based information, but also through direct input by supervision authorities in China.

Under the SCS, a “Unified ID” relates to individuals, companies or organizations, and the government collects information in relation to each Unified ID, making a highly individualized analysis possible. This includes in a first step information the government itself has on record, such as published data like penalties, administrative approvals granted, warnings and fines handed out and so on. But it goes much further and may involve other information provided by whistleblowers, other databases, public reports etc.

Based on an evolving mechanism, the information is then used to weigh different factors to arrive at a credit ranking. Such ranking in case of a positive result may lead to less inspections, easier funding, endorsement by the government and fast tracking of applications. But vice versa, in case of a bad record it may increase the number of government inspections, oversight of legal representative and responsible persons, and lead to difficult funding, restriction of travel and personal consumption, restricted bidding and procurement or even restriction of market access or filing for IP rights.

Authorities at all levels of the state further implement a three pronged list system with the categories for “Honor”, “Blacklist” or “Watchlist”, each with further impact on the daily life as individuals and companies alike struggle to fall into the right bucket. They can gather “points” as incentives e. g. by voluntary work, donations, receipt of awards etc., and must ensure maintaining properly more neutral factors such as registrations, qualifications and approvals. But apart from incentives, there is also a disciplining element included: Companies and people must avoid a blacklisting, administrative fines or enforcement, refusal to implement court judgments or decisions by administrative authorities, unpaid taxes, social security funds, etc., thus strengthening the trustworthiness of their business and society as a whole.

Any individual or company under the system has to verify and secure that not only its own actions, but also the actions of its business partners, branches, legal representatives and other people or organizations it deals with are compliant at all times. If not, this may be deemed to be within its sphere of control and lead to a very real risk of negative publicity, restrictions and even sanctions.

The SCS builds on incentives and discipline at the same time, but also strongly on oversight, in-depth understanding of the behavior of individuals and companies alike. As collateral (and fully intended) effect, it will also greatly increase government access to know-how, IP and internal information of companies and individuals.

The system cannot be side-stepped if business in China is undertaken: Being able to conduct normal business inside China increasingly requires use of all government monitored and supported apps, programs, service providers and equipment, with an alternative option to rely on the previous normal off-line way of doing business increasingly limited. This in turn provides the Chinese government with much more reliable data1 and means of oversight, and increases the pressure on any participant in the Chinese hemisphere to play by the rules and avoid getting a bad credit status.

The introduction of the increased control is likely to create a knock-on effect on foreign companies. Ministries like the Ministry of Industry and Information Technology MIIT in recent circulars implement the “Circular of the Ministry of Industry and Information Technology on Strengthening Data Security Management Specifications for Basic Telecommunications Enterprises to Clear up Data for Foreign Corporation” to “encourage enterprises to regularly carry out special screening of network data in their external cooperation business, and promptly find problems and eliminate hidden dangers.” Enterprises are urged to dynamically evaluate the data security safeguard capacities of their collaborating partners, “fully leverage contractual constraints, credit management and other means to strengthen the management of collaborating parties” (MIIT 2019).

Impact on research activities: Framework conditions potentially opposite to Western values increase

This societal and economic change founded in a fundamental different political system (Shi-Kupfer and Ohlberg 2019, p.11) also will reach and concern research and development activities in China; it cannot be bypassed under the presumption that “science is a-political” or only academic. As one case in point, the Measures of Management of Scientific Data issued by the General Office of the State Council (General Office of the State Council 2018) give a first impression on the attempt to build centrally managed and controlled platforms which increase transparency not only for a certain group of users, but in particular for government authorities.

It also will likely create a one-sided access opportunity for Chinese researchers and companies, and only an incomplete or even restricted access by foreign companies and researchers, unless such researchers follow government-determined standards. Such a system will create its own reality and working environment, and in consequence has an impact also on international cooperation in science and research, potentially without sufficient benefit for German companies and their researchers. Many questions remain how this system will evolve, and whether copyright, freedom of speech and free research will be respected and supported.

A need to re-calibrate

In essence, policy requirements increasingly start to influence purely scientific and research related activities by making them subject to a new array of legal requirements and checks, leading to uncertainty and a lower degree of facilitation of cross-border research. From the German perspective, the development in China significantly increas-

1 See for example the Public Comments Sought on the Administrative Provisions on Network Security Vulnerabilities (Draft for Comment), issued on 18 June 2019, which in its Art 10 foresees a China National Vulnerability Database and China as well as China National Vulnerability Database of Information Security
es uncertainty to what extent data researched in China can be exported outside of China and can be used, including for processing, patenting or licensing agreements.

This policy paper argues that the fundamental different societal and legal system pursued at the moment is likely to be a significant barrier and creates new substantial risks for cross-border scientific collaboration. Policymakers in Germany in response need to reconsider how to support German companies and organizations active with R&D in China, but also to weigh the consequences of an increasingly unlevelled playing field.

In an age of increasing importance for competitiveness depending on data control and data flows, the legal framework can cause harm and bring unwanted one-sided benefits in specific circumstances, making cross-border research more risky and from a policy perspective potentially less desirable. This is making more, not less dialogue an important priority.

2. Critical new elements of the proposed regulations

In the last two years between 2017 and 2019 alone, more than 130 Cyber Security Law-related laws, administrative regulations, measures, technical guidelines and standards have been either passed or been published for comment.

The trend to capture any and all activities becomes clearly visible in recent draft regulations for the legal framework for cyber security, data privacy and general data control. Various new proposals by Chinese ministries will – if passed as proposed – significantly impact scientific activities by foreigners in China.

It starts with a very broad reach of new laws and regulations which will bring onerous and significant legal obligations even to the level of SMEs, small research organizations and individuals. The broad reach of subjects concerned by the new legislation is complemented by a currently unpredictable concept of review and control, including over data export, for so-called “important data”.

2 Regarding the area of Personal Information and Important Data Protection, earlier on since 2013 the following most important pieces of legislation have been issued or promulgated as drafts for comments:
- Provisions on the Protection of Personal Information of Telecoms and Internet Users, issued by MIIT on 16 July 2013 and effective as of 1 Sept 2013
- SPC, SPP Judicial Interpretations on Criminal Cases Involving Infringement of Citizens’ Personal Information, issued on 9 May 2017 and effective as of 1 June 2017, together with the SPP Guidelines for Prosecutorial Authorities to Handle Cases Involving Infringement of Citizens’ Personal Information, issued and effective as of 9 Nov 2018
- Draft Information Security Technology—Guidelines for Data Cross-border Transfer Security Assessment, issued by Technical Committee TC260 on 30 August 2017
- Measures on the Administration of Scientific Data, issued by the State Council on and effective as of 2 April 2018
- Draft Regulations on Cyber Security Multi-level Protection Scheme, issued by MPS, SSB, SCA and CAC on June 27, 2018
- GB/T 35273-2017 Information Security Technology—Personal Information Security Specification, issued by TC260 on 29 December 2017 and effective as of 1 May 2018
- Draft Administrative Measures on Data Security, issued by CAC on 28 May 2019
- Draft Measures on the Security Assessment of Cross-border Transfer of Personal Information, issued by CAC on 13 June 2019

3 All qualifying as “network operators” and thus becoming subject to new legal obligations for recordal, review of data, security measures and restrictions of data export, but also potentially mandatory sharing of data researched in China.

It is further extended to the use of increasingly common tools such as cloud-based systems. And it finally brings about new duties to cooperate and disclose information potentially to a much larger degree than under the current law, raising concerns of know-how protection, espionage and undue government influence.

a) The new draft Data Security Measures

The Cyber Security Law CSL introduced a distinction between network operators and organisations for critical information infrastructure. While it is common to put increased requirements on critical information infrastructure providers, the Chinese legal framework has not stopped there but through subsequent measures of the Cyber-space Administration of China CAC and the Ministry of Public Security MPS increased legal obligations also of network operators – a term applying to almost any publicly available internet-based activity - to an extent which requires close and constant interaction with Chinese authorities even for small sized enterprises or individuals.

“Important data”

Art. 37 CSL contains the requirement to locally store personal information and important data gathered and produced during operations in China. Allowing export abroad is subject to “business requirements” and a security assessment.

The concept and meaning of important data so far has not been sufficiently clarified. According to a draft national standard it may encompass many areas of concern to research in and with China, including industries, but also conceptual areas such as economic security, social stability, public health and safety, or types of information such as undisclosed government information, information in relation to large-area population, genetic health, geography, and mineral resources.

New additional Filing requirements

Art. 15 draft Data Security Measures for the first time introduces an additional layer of government oversight with a requirement for network operators who collect important data and sensitive personal data for “business operations purposes” to file the personal data collection statement and other information such as purpose, scale, method, scope, type and term of the collection etc. with the local cyberspace administrators.

Cloud-related further restrictions

The Chinese system is also very restrictive in relation to foreign cloud-based activities and services. According to the applicable legal framework, foreign business must choose domestic providers, which often significantly impacts company-internal cross-border data exchange.

Article 29 draft Data Security Measures reinforces this concept and stipulates that where a domestic user accesses any domestic

4 Art. 38 No. 5 “Circular of the Cyberspace Administration of China on Seeking Public Comments on the Administrative Measures for Data Security (Draft for Comment)“, issued in May 2019 (“Data Security Measures”) under its No. 5. stipulates a somewhat narrower definition than under previous draft standards, but still does not provide the degree of clarity required to exclude ambiguous or unfair treatment under the law.
cyberspace, the traffic shall not be routed outside the territory of the PRC.5

Duty to assist government agencies
The draft Data Security Measures in its Art. 36 stipulate further that a network operator shall provide any relevant data controlled by it upon request by the relevant competent department under the State Council in accordance with laws and administrative regulations with a view to performing their functions and duties for safeguarding national security, social management and economic regulation and control, etc. Given differing perceptions of government’s role, such clause could be perceived as basis for intrusive government questioning.

b) The draft Personal Information Measures and data export

On June 13, 2019 the State Cyberspace Affairs Commission issued the Personal Information Export Security Assessment Measures (Draft) (“Personal Information Measures”). Prior to the Personal Information Measures, CAC in April 2017 had issued the “Personal Information and Important Data Export Security Assessment Measures (Draft)”, which then for the first time specifically addressed the export of personal information and important data.

Regarding personal information, if the security assessment establishes that the cross-border transfer of personal information is likely to undermine national security or harm public interest or it is difficult to effectively guarantee the security of personal information, such cross-border transfer shall be banned (State Cyberspace Affairs Commission 2019, Art.2).

Extraterritorial scope
The scope of application of the Personal Information Measures does not only encompass network operators in China, but also the recipients of personal information and foreign organizations. As foreign recipients are located outside China out of the reach of Chinese authorities, the Personal Information Measures mandate contractual safeguards to be entered into between data providers and data recipients (State Cyberspace Affairs Commission 2019, Art.4,13 et seq.).

Security assessment: Process and requirements
The first draft measures in 2017 provided for a requirement of network operators to organise assessment on their own data before export. If data export might have affected national security and social public interests, such as an accumulation of personal information of more than 5000 people or information on population health, then export would need to be cleared by authorities.

The new Personal Information Measures stipulate for network operators mandatory security assessment without any quantitative or qualitative preconditions or benchmarks, meaning the process always applies. This means that prior to any export a security assessment in respect of any personal information must be done before it is transferred out of China. Even where recipients are always the same, the assessment must be repeated every two years and additionally when the purpose, type and overseas retention time of personal information export changes, and thus the risk of data export changes (State Cyberspace Affairs Commission 2019, Art.3).6

Data export
The process of security assessment by the CAC focuses on compliance with local law, a full guarantee of the rights and interests of the data subjects, whether the contract can be effectively performed, as well as whether the network operator or data recipient has a history of damaging legitimate rights of personal information subjects or got involved in any major cyber security accidents. It is further assessed whether the network operator acquires the information lawfully and appropriately (State Cyberspace Affairs Commission 2019, Art.6).

Export of data is prohibited where there is a relatively severe data breach and data misuse incident of the network operator or data recipient, where it is impossible or difficult to maintain the legitimate rights and interests of personal information subjects, or where the network operators or data recipient is unable to protect the security of personal information (State Cyberspace Affairs Commission 2019, Art.11). As a result, if there has been a data security incident on record, the data export will more likely be banned in the future.

c) Measures for the Management of Scientific Data

Apart from the general legal framework and its control, the scientific area is also subject to efforts to create a more organized and accessible digital platform. China has moved forward with a bold concept under the Management for Scientific Data Measures (“Scientific Data Measures”) whose implications are still somewhat unclear. Unlike the previous Measures and Regulations, the Scientific Data Measures have entered into force as of 17 March 2018 (State Council of China 2018).

Scope of application
The Scientific Data Measures apply to activities relating to scientific data, including its collection and production, processing and arrangement, opening and sharing, and management and use, which are carried out with the support of the government’s budget funds. Where any entity or individual works on activities relating to scientific data within the territory of the People’s Republic of China, which conforms to any situation specified in the Measures, the Measures apply (State Council of China 2018, Art.3).

National scientific data center / National network management platform for scientific data
Art. 13 Scientific Data Measures stipulates that scientific data formed in science and technology planning projects (special projects or fund projects) at all levels supported by the government budget fund shall be submitted to the relevant scientific data centers by project leading entities.

5 In addition, new rules further restrict and regulate the use of cloud platforms including software, hardware facilities of cloud computing services, relevant management systems and so on to ensure security and controllability of cloud computing service platforms offered to the Party, government organs and the operators of key information infrastructure. See also Art. 2 Measures for Security Evaluation for Cloud Computing Services, issued on 2 July 2018 and in force since 1 September 2019 and Art. 7 Measures for Security Evaluation for Cloud Computing Services, with further reference to the Security Guide of Cloud Computing Services and the Security Capability Requirements of Cloud Computing Services.

6 Art. 3 draft Personal Information Measures. The process for review on the government side is supposed to be completed within 15 working days upon submission of complete declaration materials; this time frame may however be extended in “complicated cases”, see also Art. 5 draft Personal Information Measures. 7 Art. 11 Personal Information Measures; see as benchmark for security capability the Information Security Technology - Data Export Security Assessment Guideline (Exposure Draft).
According to MOST, there are currently over 20 “Scientific Data Centers” (mentioned in Art. 7 Scientific Data Measures, but also elsewhere in them) in China. These Scientific Data Centers are responsible for the integration and submission of scientific data in their relevant fields.

The “national network management platform for scientific data” described in Art. 7, but also in Art 12 Measures as “national uniform government affairs network and data sharing and exchange platform”, and as “national data sharing and exchange platform” in Article 19 refer to the same platform, i.e. the “Portal of Chinese Science and Technology Resource” (https://www.esscience.org.cn/static/eng/index.html, in Chinese “中国科技资源共享网”)

Access to scientific data by government
Art 15 Scientific Data Measures stipulates that scientific data formed under the support of social funds and involving state secrets, state security and social public interests must be submitted to the scientific data centers pursuant to the relevant provisions; encouragement is given to other scientific data “formed under the support of social funds”, with the term “social funds” not defined.

Art 24 Scientific Data Measures goes on to stipulate that if scientific data needs to be used for government decision-making, public security, national defense construction, environmental protection, disaster prevention and mitigation, and non-profit scientific research, the legal entity concerned shall provide scientific data free of charge; where the relevant expense indeed needs to be charged, the proper charging standard shall be determined pursuant to the established procedures and non-profit principle, and shall be publicized to and subject to supervision by the public. Where any scientific data needs to be used for any operational activity, the parties concerned shall sign a contract on paid service to define their respective rights and obligations.

It is currently unclear how the national scientific data center and network management platform will be implemented in practice going forward. Research activities in China will have to consider the additional rules. They may require to share or submit their scientific data, which in turn will have far-reaching and potential serious implications spanning from copyright to patenting and know-how protection.

3. Impact on cross-border research

The sets of draft rules and new measures introduced here fit neatly into the new approach of emphasizing cyber sovereignty and government control. Should they be passed they will easily match the workload and burden caused by the GDPR, however, with a much stronger focus on government control than only a focus on protection of private rights for personal data.

Risks for industry 4.0
For German and European research activities in China, this set of rules will be difficult news and hard to adapt to. Taking an example of industry 4.0 and smart manufacturing as a declared objective for both China and Germany: In a normal scenario a technology provider may be situated in Germany and look for a Chinese cooperation partner. The sharing of technology and data typically starts e.g. with the

sales of production machinery and exchange of program software, tools, maintenance parts and training.

Once this stage has been passed, remote services and predictive services are the next step, with the first step usually covering optimization of the services for the use of complex machinery. In the further step towards a smart factory and just in time cost efficiency, increased Internet-based collaboration and constant exchange of data must take place. In order to reach real-time indoor localization and improve workload for the manufacturing capabilities of the machinery, further interfaces are built also to integrate other logistical services, often not coming from China, which involve data potentially deemed important, and may also involve other companies in China which are qualified themselves as critical information infrastructure organisations.

Such rather common scenario will encounter many new legal problems and challenges along the way and would have to consider multiple recordals, self-assessment procedures and limitations under the envisaged law. It is also currently entirely unclear when and to which extent time a new self-assessment must be made each time the integration between German and Chinese partner moves forward.

Blocking of access to data
Under the proposed laws, close and constant interaction with China's governmental authority must be maintained, and previously unproblematic data may suddenly become important data, for example because an important state owned enterprise or a company active in the military sector is included later on. This creates considerable risks for German partners that their investments may be lost, as critical data may not be made available or delayed.

Contamination under the Social Credit Scoring system
A further problem may be created in the future by way of the social credit scoring. Scoring of foreign research partners will be influenced by cooperation partners and third parties (such as suppliers) who may become subject to breaches of the Cyber Security Law and related regulations on the protection of private data. A negative impact can be caused also for IP, patents or scientific research, as all of these areas are specifically mentioned under the SCR as subject for either incentives or disciplinary measures in case of misbehavior.

Research agreements will have to address new potential risks, with the German partner usually at a significant disadvantage as he does not have the know-how on the decisive factors in the social credit scoring system and its requirements, and will not be able to control a negative impact. Risks of contamination are difficult to predict under the system, and negative consequences e.g. on tenders for government-led projects etc. may apply without knowledge or even in case of knowledge without effective ways of defending against an unfair bad score.

Unknown new systems of data sharing
Finally, the Scientific Data Measures raise many questions on risk of unwanted disclosure and sharing of scientific data.
4. Summary

While the new set of rules is coherent with the self-set priority objectives of China, it may in the area of scientific collaboration create a more closed-off, non-transparent, practically less accessible, high-workload and high-cost environment with potentially disproportionate risks for IP and know-how of foreign partners. With the final laws still in the making, close attention should be paid to the further development.

A re-calibration of government promotion of research in and with China will likely be inevitable if uneven market access in the crucial IT sector, a too low degree of collaboration on joint standards and a lack of reliable mechanisms to defend against abuse of power under a new system of social control and digital surveillance in China continues.

The German government and related EU institutions may consider taking the following actions in response:

- Intensify the dialogue with the Chinese government at all levels to seek clarifications and communicate concerns
- Intensify efforts to create global and joint standards on Cyber Security and data protection and improve access of German companies to Chinese standard-setting processes
- Create a direct communication mechanism on government level between EU Member States to share assessment of new laws and regulations on European research and co-operation with China
- Seek a mutual recognition that compliance with the GDPR standards is sufficient (e.g. by way of standard contracts) and allows to assume compliance with related Chinese laws and regulations
- Design support mechanisms for German and European research organizations active in China (including collecting experience and drawing lessons on a regular basis)
- Create more efficient early warning and communication mechanisms for undesirable effects of Chinese legislation on German and European companies and research organizations (safeguarding free speech and freedom of research)
- Review available and create new mechanisms to sanction uneven market access for German companies and organizations
- Issue coordinated measures for treatment of R&D activities and market access by Chinese companies and research institutions in Europe based on the principle of reciprocity

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