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How Does China's Industrial Policy Support Specific Sectors?

Summary

The brief summarizes discussions and findings from the workshop on China's Industrial Policy: Sectors and Resources, which was hosted by the UC Institute on Global Conflict and Cooperation (IGCC) with support from the UC San Diego 21st Century China Center, on September 30 – October 2, 2022. Held in La Jolla, California on the UC San Diego campus, the workshop examined Chinese industrial policies in the sectors in which China hopes to make the biggest technological leaps, including high-performance computing, artificial intelligence, electric vehicles, solar, robots, aerospace, and biotech. Participants from leading universities, think tanks, and industry, along with U.S. government representatives, shared their research and observations along China's industrial policy life cycle, from formulation to implementation.

The workshop on China's Industrial Policy: Sectors and Resources is part of an IGCC initiative that synthesizes new and existing information on China's science, technology, innovation, and industrial policy initiatives. Led by Tai Ming Cheung and Barry Naughton, both of UC San Diego and IGCC, the initiative will map China's policies, players, and programs, and provide—for the first time—an integrated and coherent view of China's innovation and industrial policy efforts as a whole. Though many small teams of researchers have produced excellent stand-alone studies on discreet elements on China's industrial policy, IGCC's initiative, which is supported by the U.S. Department of State, studies Chinese industrial policy in a large and coordinated way. The objective is to integrate different types of data, harmonizing related data classification systems, and using different but complementary methodological approaches. Detailed sectoral studies are an important component of this data-driven approach: industry experts provide realistic accounts and rich context which is essential to keep analysis based on flawed aggregate data on track. This conference was designed to share important sectoral studies and data, and to identify key next steps for moving forward on the aggregated approach.

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IGCC Policy Brief
November 2022

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Chinese industrial policy has undergone a significant shift since 2019, driven by intensified U.S.-China technological rivalry and the COVID-19 pandemic.

The policies incorporated into the 14th Five-Year Plan (2021–2025) showed that the pace and scope of industry and technology policy hasn't slowed down or moderated—quite the contrary—but has instead taken on new objectives relating to the U.S.-China trade war. There is much greater focus on self-reliance, security, and alignment with national priorities.

China is trying to do more—and more costly—things in its industrial policy.

China's ambitions go beyond simply targeting and nurturing specific industries and fostering their spread. And China is not only concerned with addressing bottlenecks or playing up its competitive advantage. Instead, the Chinese state is trying to do everything at once. Xi's pronouncements indicate he may intervene anywhere or everywhere. Industrial policy as traditionally conceived fails to capture all that China is doing.

The many goals and objectives of Chinese industrial policy create dilemmas and trade-offs. For example:

- China is mobilizing an extraordinary volume of resources, but this is likely to produce significant waste. Simply stated, China is likely to get less bang per buck of industrial policy, but it is spending many more bucks.
- China's nationalistic and self-reliant approach poses many risks for innovation. The partial decoupling in science and technology made inevitable by this policy will hurt China's progress in fields in which it lags.
- In fields where China is closer to the frontier, it faces significant trade-offs in how technology is handled. For example, artificial intelligence (AI) is a classic enabling or "general purpose technology" that will boost productivity in many sectors across the economy. There are economic benefits to making tools and data more accessible to facilitate the spread of AI, but nationalist policies will inevitably mean domestic restrictions as well. Similarly, Chinese planners coping with the cut-off of U.S. high-end EDA (electronic design analysis) software tools must decide between funding open-source efforts in EDA software that could foster expanded access and diffusion versus supporting national champions with propriety EDA products.

Chinese policymakers appear to understand these challenges and are attempting to map out, from the top down, a different architecture for each important economic sector *and* technology.

That is, they are defining the structure of new "national teams" for each key area. Although the overall vision is set from the top—i.e., the state—policymakers understand the enormous advantages they derive from maintaining a market economy and competitive companies. The aspiration of the leaders at the top is to provide an architecture for each area that allows independent companies (private and state-owned) to play the biggest possible role at the "bottom" of the organizational pyramid for that sector or technology. Firms will play that role by competing to land contracts to provide goods and services to each national team. The purpose is to provide a spectrum of "national teams," in which the mix of command and market elements varies systematically according to the characteristics of the sector.

China's targeting of technologies as well as industrial sectors brings its own challenges.

The complex of fast telecom, ubiquitous sensors, big data, and artificial intelligence is seen by many Chinese policy intellectuals as a new wave of "general purpose technologies" that will transform virtually every sector in the economy. Naturally, that strengthens the case for government support, since these technologies have the potential to bring unanticipated productivity gains in a range of sectors. However, it also opens a can of worms about which technologies are to achieve priority support. Is it the technologies most vulnerable to embargoes? The areas in which China has established economic advantage that needs to be defended? The break-through and disruptive areas where the future is most uncertain but the upside potentially the largest? The attempt to do everything could easily lead to an outcome where nothing is done well or funded adequately.

The policy motivation behind investments in specific sectors varies.

At one end of the spectrum are the critical national high technology projects, including military projects and the space program. These are almost entirely top-down, mission-driven projects with most of the primary actors state-owned entities. These are seen by Chinese policymakers as highly successful, and they are comfortable spreading this model to a larger number of projects and sectors. But a crucial reason for success, in the view of policymakers, is that these projects have been able to incorporate the scientific work of China's research institutes and have contracted out key work steps to firms (mostly but not entirely state enterprises).

At the other end of the spectrum are the mostly market-oriented, lightly planned economic sectors like photovoltaic cells and electric vehicles (EVs).

These sectors have also seen some rather spectacular successes, but policymakers are too smart to attribute these successes to their own top-down guidance. While government subsidies have been crucial in the growth of both photovoltaics and EVs, the initiative has often come from local governments and robust entry and competing business models from Chinese firms. Policymakers want these sectors to be relatively "light touch" in part because they see their firms as having already achieved a degree of competitive advantage, and they know that additional policy support will create further backlash and threaten their access to global markets. However, they believe that very selective, targeted interventions can still foster key technologies that will contribute to Chinese firm competitiveness.

In between these extremes are many sectors and technologies with an intermediate position. These range from steel to biotech, and characteristics of sub-sectors within these industries vary widely.

The intention of the Chinese government today is to orchestrate the right mix of mission-driven research and market operation for each sector or key technology.

The task is particularly urgent for vulnerable key technologies in which China remains dependent on imports. For example, China has fostered a large industrial robot sector, but it remains dependent on imports for key, high-quality, high-tech components. Policy is increasingly focusing narrowly on the specific components and technologies that are potentially vulnerable.

Multiple channels are being mobilized to provide resources to specific sectors.

Government Guidance Funds (GGFs), which have played an important countercyclical role in financing, probably reached their peak importance in 2022 and will be maintained but de-emphasized. Other forms of support are also being maintained, such as asset securitization, and new approaches are constantly being added. The most important new additions are (a) government efforts to manipulate capital markets and the stock market listing process in favor of national champions, and (b) increased use of government procurement and set-asides to support start-ups. These proliferating channels present formidable challenges for researchers, not only in collecting overall data, but also in understanding how the institutional setups work (and sometimes don't work).

It is beyond any reasonable doubt that the net effect of China's industrial policy measures will be a substantial increase in the degree of direct government intervention in the economy.

In the view of Chinese policymakers, priority, mission-driven programs are judged to have succeeded. However, the primary market-conforming instruments to support industrial policy goals—government guidance funds—have had a mixed record, as shown by recent scandals in the integrated circuit ("chip") fund, the highest priority of all.

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The threat of additional U.S. technology embargoes elevates these issues to the level of national security, further justifying more direct government intervention.

China is not currently pursuing full decoupling. Its industrial policy programs are consistent with its strategy of economic engagement with the world.

On the one hand, China is "decoupling" technologically, by explicitly targeting the areas where China is technologically dependent, and aggressively trying to foster domestic alternate suppliers—a costly and difficult task. In this sense, China is much further ahead with decoupling than is the United States (although it was, and probably still is, more vulnerable than the United States). On the other hand, China is clearly seeking to develop a graduated set of tools to respond to future U.S. embargoes and sanctions. The objective is to identify sectors and technologies in which the outside world depends on China, and prepare to use those dependencies in a tit-for-tat, or even more aggressive, response to American actions.

Chinese policymakers are likely considering whether they have developed an adequate set of tools to respond to U.S. semiconductor technology embargoes. The answer is probably: "Not yet, especially in the context of the Ukraine war. But very soon." In essence, both sides recognize that profound decoupling is not currently economically feasible. China is preparing for close-in wrestling with a formidable adversary—the United States—with whom it is inextricably entangled. The United States has no choice but to prepare for this same close-in struggle, which is no longer just about fair competition and protecting and rebuilding U.S. industries.

The "success" of China's industrial policy is limited, mixed, and hard to measure.

The degree of success varies enormously among sectors. This is due in part to variation in evaluation metrics, but more importantly, to the difficulty in disentangling the impact of industrial policy from the dynamics happening simultaneously in China's large and intensely competitive markets. New firm entry and increased patent applications are important indicators, but evaluating success requires firm-level data.

Such data can help answer questions such as: can targeted firms get loans more easily? Do they generate higher revenue, especially export revenue?

> *"Chinese industrial policy is dynamic, highly sophisticated, and varies across sectors. Chinese industrial policy also appears to have effectively developed a high level of scientific, technological, and industrial capacity in a wide range of critical sectors regarded as essential to the digital economies of the future, such as AI, supercomputing, clean energy, and space applications. For all the talk [in the media] of systemic weakness in the Chinese macroeconomy, China's performance and prospects in key high-technology sectors appear strong and bright. Even if China today does not lead in specific critical technologies, it may have systemic advantages that allow it to develop a superior general capacity to innovate. On the other hand, its model may be ill-suited to the needs of emerging industries that flourish in open-source systems and highly integrated global supply chains.*
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> —Workshop Participant

> *If you look at the various industries that we discussed in the workshop (EV/automobile, robotics, PV [photovoltaic], wind, steel, semiconductors, biotech), even the typical success cases of China's industrial policy (EV, PV) seem more complicated, and the result of a lot of efforts by small companies that try to get things off the ground despite fickle and relatively unreliable government support. Still, I tend to think that at least in these areas (and high-speed rail, shipbuilding, steel, the space program and rare earths) it "worked." Perhaps the redirection of investors away from Internet services towards "the real economy" can be counted as a relative success as well. Quite a few of these successes are based on some form of tech transfer: foreign intellectual property was bought (wind, high-speed rail) or overseas returnees drove innovation (China's atomic bomb, but also the PV sector). Additionally, all of these successes seem to have come at great cost. No one seems to argue that the U.S. should mimic China's approach, except maybe for the way it pointed investors to a specific tech area (as in solar panels)."*
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> —Workshop Participant

Compiling and analyzing data related to China's industrial policy is fraught with difficulties, and the discipline is evolving in response to changes in China itself (zero-COVID) and in U.S.-China relations.

Nonetheless, there is data available and researchers can dig much deeper into what is available, but more creative methodologies are needed.

There are many frameworks used to analyze specific industries that could benefit the study of other industries.

Responding to China's increasingly secretive industrial policy and securitization efforts is costly, so better frameworks for evaluating the actual risks and benefits are helpful.

Specific steps can move quantitative research forward rapidly.

The need for a standard for technology tags is an immediate priority. This could pave the way for dataset connectivity or identifying tech trends across firms in the future. One challenge, however, is how to retain as much information as possible from technology and sectoral designations that are non-standard and relatively coarse, as is true of much of the investment data. Further extensions may allow us to build out firm databases, identifying subsidiaries and key staff. If possible, this would permit relational analysis of funding, companies, and patents, for example. However, this will require completion of intermediate steps first.

Authors

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About IGCC

The UC Institute on Global Conflict and Cooperation (IGCC) is a network of researchers from across the University of California and the Los Alamos and Lawrence Livermore national labs who produce and use research to help build a more peaceful, prosperous world. We conduct rigorous social science research on international security, the environment, geoeconomics, nuclear security, and the future of democracy; help to educate and train the next generation of peacemakers; and strive to ensure that what we are discovering contributes to a safer world.