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China’s 13th Five-Year Plan Opportunities & Challenges For the U.S. Semiconductor Industry

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1. Introduction

Semiconductors (sometimes referred to as integrated circuits, ICs, or chips) are the foundational enabling technology of modern electronics and play a key role in communications, computing, transportation, health care, energy, and many other sectors at the forefront of global technological innovation. Today’s \$334 billion semiconductor industry is truly global and interdependent, enabled by a complex global semiconductor value chain based upon a commitment to international collaboration, deep investments into R&D, free and open markets, the protection of intellectual property, talent development, and other complimentary policies.

Indeed, according to the World Semiconductor Trade Statistics (WSTS) organization, China is the fastest growing and single-largest market for finished semiconductors, totaling nearly 27% of global demand. Global companies must participate in China’s vast market, and Chinese companies must participate in the vast global semiconductor supply chain, in order to succeed globally. Continuing access for U.S. semiconductor firms to the China market is vital to our overall competitiveness. The primary factor behind the size of China’s electronics market should be of no surprise: China’s burgeoning domestic demand for products bristling with semiconductor devices. For example, according to Gartner and IDC:

- China represents 20% of Global PC unit consumption
- China represents 29% of Global Smartphone unit consumption
- China represents 17% of Global Tablet unit consumption
- China represents 27% of Global Auto unit consumption
- China represents 23% of Global Telecom capital expenditures (equipment)

In addition, China is an integral part of and deeply embedded in the semiconductor and electronics industry global supply chain. In 2015 China exported nearly \$600 billion in

electronic goods that are powered by semiconductors, representing nearly a third of all Chinese exports. Many U.S. semiconductor firms have also invested in the China market, including semiconductor design, fabrication, and assembly/test. These investments have allowed the U.S. semiconductor industry to take full advantage of China's unique electronics industry supply chain, in particular the ability to foster closer partnerships with the growing number of domestic Chinese original electronics manufacturers (OEMs.)

The recently released Chinese 13th Five Year Plan aims to capitalize on these market conditions, and further spurring domestic demand for ICT goods and services, and will present new opportunities for the U.S. semiconductor industry. For example, the 13th Five Year Plan includes initiatives to promote the construction of 5G wireless networks, accelerating the adoption of internet and e-commerce platforms, expanding the use of big data and cloud computing, and promoting the digitalization of traditional and manufacturing industries through the "Internet Plus" and "China Manufacturing 2025" initiative. U.S. semiconductor firms are poised to reap the benefits from all of these policies and programs.

China's most recently published 13th Five Year Plan also highlights the need for China to develop strategic emerging industries, including semiconductors. China has legitimate interests in developing its economy, including a domestic semiconductor industry, and their participation in the global semiconductor value chain is welcomed.

Recognizing the benefit of the semiconductor industry, the Chinese Government is implementing policies to develop a robust semiconductor capability with the goal of establishing a leadership position in all major segments of the semiconductor industry by 2030. No other Chinese industrial development program for the information technology (IT) sector is supported with the financial resources and central government attention given to the IC industry plan. This plan is backed by billions of dollars in investments and a range of policies covering intellectual property, cybersecurity, procurement, standards, antimonopoly, and others. To date, Chinese policies have called for acquiring resources from, not integrating into, the global semiconductor value chain.

However, industry experts have observed that some of China's policies and actions may depart from market-based principles and may discriminate against foreign multinational companies. The problematic impact of Chinese industrial policy in sectors -- such as high-speed rail, aviation, LED lighting, wind, and solar panels -- is well known. Non-market based industrial policy in the semiconductor sector has the same potential to distort the global market and impede innovation, to the detriment of both Chinese and global semiconductor companies. This negative impact can be avoided if China works with the global industry and other stakeholders to develop its industry in a manner that is market-driven, globally integrated, non-discriminatory, transparent, and consistent with international obligations.

2. The Importance of the Global Semiconductor Value Chain

The key to ensuring the success and growth of its industry is its further integration into the global semiconductor value chain. The global semiconductor industry operates in a vibrant global ecosystem that has helped facilitate the remarkable advancements in the industry in ways that

distinguish it from virtually all other industries. Participation in this broader ecosystem is essential to the success of the industry as a whole and every individual firm within it. Indeed, no firm has ever thrived outside of it.

This ecosystem is an essential foundation for success in the semiconductor industry and encompasses the following:

- Pre-competitive, collaborative research and technology road-mapping to achieve advancements in basic science and overcome technology challenges facing the industry.
- The development of scientists and engineers with unique skills, through the funding of research programs.
- Cooperation to develop manufacturing improvements, including partnerships among device manufacturers, tool suppliers, and materials suppliers to develop new manufacturing processes and equipment, process chemicals, and other innovations.
- Integration of the global supply chain, including research labs, design centers, fabrication facilities, assembly and test facilities, and suppliers of specialized manufacturing equipment and materials around the world.
- Open, consensus-based international standards to promote interoperability, safety, and other aspects of product development and manufacturing.

These conclusions are consistent with the experience of Chinese Taipei, the European Union, Japan, South Korea, and the United States: integration into the global semiconductor ecosystem is essential for firm-level and country-level success. The scale, complexity, and pace of semiconductor industry innovation make global collaboration in this industry essential. The semiconductor industry has also recognized that protectionism is counterproductive to the competitiveness of the downstream industries (i.e. OEMs), which constitute our markets. For this reason, the semiconductor industry has strongly backed the expansion of the WTO Information Technology Agreement and immediate duty-free treatment for our own products.

3. China's New IC Industry Development Strategy

As the world's largest and fastest growing market for semiconductors, China has placed a sweeping initiative in motion to build its own homegrown industry. The Chinese leadership at the highest levels has made it a priority to develop and produce semiconductor technology. While many countries engage in stimulating domestic industry and technology development, some of the policy tools employed by China are likely not based on market forces and the model of global integration that has enabled the success of this vital industry in other parts of the world. China's strategy to promote its indigenous semiconductor industry includes: (1) semiconductor-specific policies, as outlined in the IC Promotion Guidelines; and (2) a broader range of incentive policies that are used in other sectors as well.

This effort is already underway through government funded and directed investment activity, specifically targeting companies and technologies at all levels of the semiconductor development and fabrication lifecycle. In addition, multiple Chinese government investments in "national champions" – each billions of dollars in scale – are being bolstered to rapidly expand domestic IC manufacturing capacity.

China's national IC policy structure is now in place to facilitate these goals, featuring three key pillars:

1. High-Level Government Task Force:

China has established a leading small group (LSG) for IC development, led by Vice-Premier Ma Kai, with senior MIIT participation and other leaders included, to oversee industrial strategy and set development "targets." There is also a newly created experts group that includes industry representation, although foreign stakeholders have not been invited to join. The highest levels of Chinese leadership have made it a priority to develop, produce and control semiconductor technology.

Ma Kai has stated: *"Our government places great importance on...promoting the program of replacing foreign technology with leading, secure, indigenous domestic products."*

Chinese President Xi Jinping, who now chairs a special party committee on cybersecurity and said *"that for China to build a strong cyber country, [we] must have our own [Chinese] technology, and have technology that is up to scratch."*

2. National Strategy

In June 2014, China released the Promotion of a National IC Industry Development Guidelines that call for the development of an entire semiconductor industry ecosystem within China, with the goal of becoming the global leader in all-major segments of the industry by 2030. These Guidelines are consistent with efforts underway in China to indigenize the broader ICT sector and establish "secure and controllable" technology. The Guidelines encourage the adoption of so-called "secure and reliable" technologies.

3. Massive Government Funding

Key to China's IC Promotion Guidelines is the massive central and local Chinese government and/or state-directed investment funds designed to build or acquire a leading semiconductor industry. To date, \$21 billion has been raised by the National IC Fund, and \$26 billion has been raised by local government funds. The majority of investment capital comes from government and other quasi-government "societal" (i.e., chiefly SOE) funding. These funds are already active and have been used to finance investment, merger, and acquisition activity, targeting companies and technologies at all levels of the semiconductor development and fabrication lifecycle.

For example, the national and local funds have supported overseas mergers and acquisitions (M&A) by domestic Chinese IC firms as a tool to rapidly gain access to key semiconductor technology and intellectual property (IP). Since 2014, there have been more than 34 cases of completed and or pending international M&A deals by Chinese headquartered firms in the semiconductor industry (many of which received government financing), for a total investment of more than \$20 billion. These funds are also being used to invest in domestic firms, enabling the hiring of talent, development of new products, and expansion of domestic IC manufacturing capacity. The National IC Fund alone has invested more than \$7 billion into domestic IC firms in the form of equity share

purchases. The Chinese government reportedly intends to have “the visible hand of government join with the invisible hand of the market.”

i. State-Controlled Procurement Orders

The IC Promotion Guidelines explicitly seek to leverage government control over key economic sectors to create demand for its local semiconductor industry. The IC Promotion Guidelines call for public and SOE procurement decisions in sectors such as telecommunications and internet service providers (major consumers of ICs) to be “based on projects aimed at expanding domestic demand” and “based on secure and reliable” software and hardware products -- similar to the “secure and controllable” standard China has sought to adopt in relation to ICT products used in the financial, insurance, and telecoms sector.

ii. R&D Grants

The IC Promotion Guidelines complement existing Chinese government applied semiconductor research and development (R&D) programs. These include “national megaprojects” that fund product development undertaken by Chinese semiconductor companies and special grants from government agencies that allow Chinese semiconductor firms to fund and operate their R&D programs with direct government support through a “national enterprise technology center program.” Chinese R&D is oriented toward applied rather than basic technology, designed to achieve commercial advantage.

B. Broader Indigenous Innovation Policies Affecting the Semiconductor Sector

China is supplementing these IC specific policies with a series of complementary policies that are applied across the ICT sector. These policies are part of a comprehensive strategy to develop industries deemed “strategic.” Some of these policies may either by design or accident impose market restrictions on foreign companies, potentially forcing them to transfer technology and intellectual property as a condition to access the Chinese market and/or to qualify foreign products as indigenous – all of which generally distort the commercial marketplace. These additional policies affecting the semiconductor sector include:

- i. Mandating or Inducing Technology Localization*
- ii. Technology Transfer*
- iii. China-Unique Standards*
- iv. Limits on Encryption*
- v. Security Testing and Licensing*
- vi. Cybersecurity Trade Barriers*
- vii. Potential patent pooling*

4. Implications and Recommendations for the U.S. and China

Again, access to the China market is critically important to the success of the U.S. semiconductor industry. China’s commitment to further economic development, innovation, and liberalization will continue to provide tremendous market opportunities for U.S. semiconductor firms as demand for semiconductor products continues to grow. Done appropriately, China’s support for

the semiconductor industry is a welcome development, and will aid China in their economic and social transition.

Yet, some aspects of China's semiconductor industrial policy may potentially create new challenges for the U.S. semiconductor industry. Some of these policies have the potential to: (1) force the creation of market demand for China's indigenous semiconductor products; (2) gradually restrict or block market access for foreign semiconductor products as competing domestic products emerge; (3) force the transfer of technology; and (4) grow non-market based domestic capacity, thereby disrupting the fabric of the global semiconductor value chain.

Proactively promoting the alignment of China's efforts in the semiconductor space in a way that embraces, not separates from global semiconductor value chain should be viewed as a top priority for all market-oriented firms in the ICT sector and their governments. China must ensure the protection of intellectual property, proper market access, maintain the vibrancy of the global value chain, and avoid non-market based distortions to the semiconductor industry. In order to achieve this, governments and industries should work with China's leadership to ensure market-based principles consistent with China's international obligations are applied, and that cooperation within the global value chain is embraced.