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China’s technological ambition and trajectory have become central concerns for the U.S. as reflected in the current U.S.-China trade war. According to Yu Zhou, Professor of Economic Geography at Vassar College, these concerns will likely define U.S.-China relations for decades to come. The American accusation of China’s “illegal and unfair” trade practices indicates that the ultimate frontier of U.S.-China competition is in the area of technology. The U.S. complaints center around China’s alleged intellectual property theft, “forced technology transfer” as a precondition for foreign companies to do business in China, and heavy-handed industrial policies.

In this competition for dominating future technologies, can China become an innovation nation despite its rigid education system, conventionally characterized by a lack of creativity? Is China’s state capitalism more of an obstacle or a strategic asset to innovation? Does China still only occupy the low ends of global production networks while foreign countries monopolize important research and development (R&D) and intellectual property rights (IPR)?

With these questions in mind, Zhou reviewed ten major industries that were studied in her edited volume: China as Innovation Nation (Oxford University Press, 2016), including machine tools, high-speed rail, automobile, information and telecommunication technology, and renewable energy. Attempting to extract Chinese innovation models, she found a much more diverse and complex picture about the role of the Chinese state and Chinese enterprises than typically assumed of a centrally command-and-control economy. Innovation experiences vary across industries because of the different nature of technology, markets, and dynamics of competition.

Zhou first defined “innovation” as the process that generates a higher-quality or a lower-cost product than those previously available. This process is collective, involving many related actors. It is also accumulative, a result of many incremental changes over time. An innovation nation is a nation that has acquired this capability and the institutions to generate better products and/or at lower costs in the long run.

Zhou then traced the evolution of China’s policies on technological innovation since its reform and opening period, beginning in the late 1970s and early 1980s. China first tried the
Taiwan model by encouraging small and medium-sized enterprises (SMEs) to engage in productions, mostly in the electronic sectors, for export. These companies thereby became part of the global production network. They were very flexible and adaptive to both domestic and international market demands. Most of these productions were on the low-end of the global production, and did not create their own brands. China tried the South Korea model in the late 1980s and 1990s by creating large state-owned enterprises (SOEs) as national champions in key strategic industries, similar to the Korean chaebols. China forced foreign companies to form joint ventures with SOEs, which led to the charge later of China’s “forced technology transfer.” But for most of the industries under examination, this goal of learning western technologies was not achieved with the exception of high-speed rail.

Zhou explained that the technology for high-speed rail didn’t advance significantly since the Japanese bullet train of the 1950s. More importantly, this technology had little global market, due to the expenses and difficulties with land acquisitions. Anemic demand for high-speed rail placed China in a favorable bargaining position for this technological transfer. In auto and integrated circuit sectors, such conditions did not exist, so most of the joint ventures continue to depend on their foreign partners, and a technology gap persists.

Since the 1990s, China tried the U.S. model by establishing multiple capital markets, with a rapid increase of venture capital, which has greatly stimulated small companies to innovate, though serious governance issues remain for the capital markets. At the same time, China’s public research institutions and large private companies have all boosted their investment in R&D since 2006.

Zhou emphasized China’s enormous size and diversity. Any simple generalization would not capture the complexity of China’s innovative patterns. Zhou summarized her findings into an acronym: DYANMIC. “D” stands for dual-track, meaning China simultaneously engages in a top-down approach and a bottom-up approach to stimulate innovation. China is not a completely centrally-controlled system because it also has a vibrant market-oriented private sector. Investments in R&D by both SOEs and private companies have increased dramatically over the past decade.

The “Y” stands for youth. Chinese entrepreneurs are often in their 30s or 40s when their companies succeed. Their business models keep changing, as they are very nimble and agile. The “A” stands for adaptive innovation, which Chinese companies favor much more than inventing novel products themselves. The “N” stands for networked enterprises. These networks are so large and complex that they have formed an industrial eco-system, in which companies within the same segment can provide feedbacks to each other, which in turn improves production and innovation.
The “M” stands for what Zhou called “the middle market,” where the quality of products doesn’t have to be top notch, but is “good enough” and keeps improving. This is the market segment where most Chinese companies take and expand. The “I” stands for integration of components around the world. This is a common competitive strategy of Chinese enterprises even if they do not produce the core parts. The “C” stands for clustering in space. Chinese companies have formed integrated clusters in which each player contributes to the scaffold of knowledge to advance production.

Zhou underlined the role of the Chinese state as important but diverse, pervasive but reflexive. Domestic private Chinese companies have become a main driving force in boosting China’s total R&D investment and technological capabilities. China’s human resources are also large and diverse, with an increasing number of returnees from abroad or from foreign companies in China, bringing their management and technical expertise with them as they move on in China. Zhou concluded that China already has the key elements—diverse institutions, vibrant market, ample capital and human resources, and sufficiently good infrastructure—to continue moving up the technological ladder.

In the end, Zhou acknowledged China’s various government and corporate challenges, but did not consider them insurmountable. She concluded that although China still needs external markets to export to, as well as foreign companies’ help to develop new technologies, China’s industrial eco-system has already come into existence. Even if the current U.S.-China hostility prevents Huawei, China’s champion of innovation, from buying equipments from American suppliers, China will be able to find alternative suppliers, or be more motivated to rely on Chinese domestic R&D to open alternative paths. Such results will ultimately damage the market prospects of American firms.