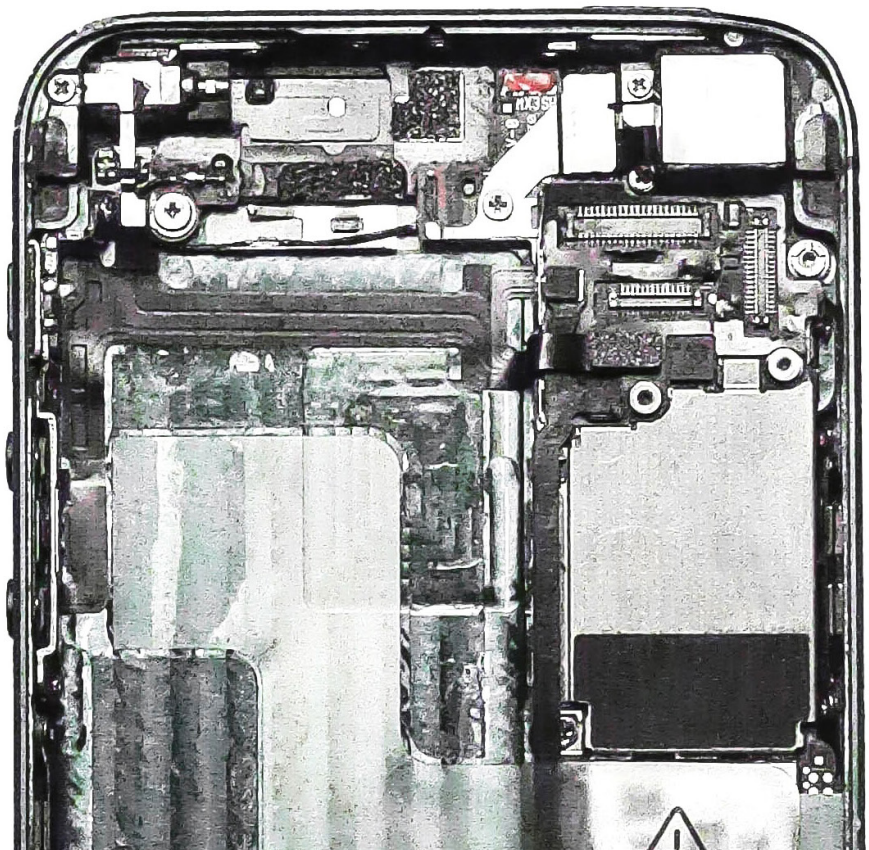
Centre for International
Governance Innovation

CIGI Papers No. 239 — March 2020

Getting beyond Forced Technology Transfers

Analysis of and Recommendations on Intangible Economy Governance in China

Anton Malkin



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About the Author

Anton Malkin is a CIGI research fellow. His research focuses on China's role in the global economy, with a focus on finance and intellectual property. At CIGI, Anton has published works on the impact of China's industrial upgrading policies on global trade governance, the domestic politics of capital account liberalization in China, and China's relationship with the International Monetary Fund and regional financial governance arrangements. Anton's current research examines the impact of China's industrial policies on Chinese multinational firms' acquisition of foreign-owned technology assets and China's financing of emerging technologies through venture capital.

From 2012 to 2013, Anton was a senior visiting scholar at the School of International Studies at Peking University. His Ph.D. thesis examined the role of foreign financial institutions in the transformation of China's financial markets and state-owned enterprises.

Acronyms and Abbreviations

3G	third generation
5G	fifth-generation
AI	artificial intelligence
CCP	Chinese Communist Party
FDI	foreign direct investment
ICs	integrated circuits
ICTs	information and communications technologies
IoT	Internet of Things
IP	intellectual property
IPR	IP rights
JVs	joint ventures
LTE	Long Term Evolution
M&A	mergers and acquisitions
MNCs	multinational corporations
MOFCOM	Ministry of Commerce
NDRC	National Development and Reform Commission
NPEs	non-practising entities
OECD	Organisation for Economic Co-operation and Development
R&D	research and development
SAMR	State Administration for Market Regulation
SEPs	standards-essential patents
SOEs	state-owned enterprises
VC	venture capital
WIPO	World Intellectual Property Organization

Executive Summary

This paper examines the drivers of Chinese firms' acquisition of foreign technology, which has elicited a great degree of unease among advanced economy policy makers. It focuses, specifically, on the Chinese government's role in Chinese firms' tech acquisitions. Categorized by critics as "forced technology transfers," China's technology acquisition regime in fact encompasses legitimate, rules-based methods of technology acquisitions, such as outbound mergers and acquisitions (M&A), patent portfolio purchases and competition law enforcement. It also encompasses failings of the Chinese legal and regulatory system, government-business collusion, trade secret theft and other types of intellectual property (IP) infringement. Conflating the failings of China's regulatory system and legal enforcement with the actions of Chinese firms (private and state-owned), and with China's industrial policy writ large, leads to the conclusion that China's technology acquisition practices amount to a concerted public-private effort to advance Chinese business interests at the expense of those of its trading partners. This paper challenges this common perception surrounding the motivations behind Chinese firms' technology acquisition strategies.

It investigates China's technology acquisition framework from three dimensions: first, the asset-seeking dimension, which involves Chinese firms' outbound technology acquisitions; second, inbound acquisition based on joint ventures (JVs); and third, regulatory and jurisprudential policies employed by Chinese authorities. In addition, this paper provides a model for understanding China's technology acquisition regime and explains how China's changing IP protection and commercialization framework changes the dynamics of Chinese firms' approach to foreign technology. It shows that while the Chinese state plays an active role in Chinese firms' technology acquisition choices, its role should be seen as one of facilitator, rather than as one of a predominant driver of the choices that Chinese firms make in catching up with their global rivals' technological capabilities. This process of catch-up is carried out within an environment when both global, as well as domestic, IP laws are tightening, as Chinese firms are expected (by Chinese authorities) to commercialize and utilize intangible assets in order to become globally competitive.

Introduction

What role does the Chinese government play in the acquisition of foreign technology by Chinese firms — both state-owned and private? The answer is seemingly straightforward, or so the US government contends: IP theft and industrial espionage, coupled with market leverage to extract foreign technology from foreign direct investment (FDI) arrangements. These practices are typically referred to as forced technology transfers.[1] However, a closer examination of the issues presents a more complicated picture.

To begin, the concept of forced technology transfer is itself broad. It encompasses legitimate, rules-based methods of technology acquisitions, such as outbound M&A, patent portfolio purchases and competition law. It also encompasses failings of the Chinese legal and regulatory system, abuse of Chinese FDI regulations, industry-government collusion and other rent-seeking behaviour by Chinese firms (both state-owned and private). This paper seeks to illuminate these complexities and to give a more accurate picture of what China's trading partners could expect from the country going forward. It also seeks to give guidance to small, open economies, such as Canada, on how to maintain and improve trade relations with China. This issue has gained special urgency in the context of the emerging technological and trade rift between China and the United States, which threatens to balkanize the world's technological supply chains.

This paper investigates China's technology acquisition framework from three dimensions:

- first, the asset-seeking dimension, which involves Chinese firms' outbound technology acquisitions;
- second, the dimension of inbound, JV-based practices; and
- third, the dimension of regulatory and jurisprudential policies employed by Chinese authorities.

The paper begins by providing a model for understanding China's technology acquisition regime and explains how China's changing IP

1 See, most prominently, the United States Trade Representative (2018) report on China's IP and technology transfer policies.

protection and commercialization framework changes the dynamics of Chinese firms' approach to foreign technology. While considering the three dimensions within the model, the paper examines publicly available qualitative and quantitative data, as well as reports in industry journals on Chinese outbound M&A activity and IP portfolio transactions, and looks at selected cases and secondary literature on Chinese competition policy and trade secret enforcement. Where available data is insufficient to illustrate the trends analyzed here, the author utilizes brief case studies and semi-structured, anonymous interviews with market participants.

This paper finds that the practices that Chinese firms employ in their acquisition of foreign technology cannot be reduced to a top-down government-driven effort aimed at giving Chinese firms an unfair advantage over their foreign counterparts. Instead, they are built of a complex policy mix of state guidance and funding, independent agency on the part of Chinese and foreign firms, and a policy-driven desire to level the playing field between global oligopolistic and monopolistic business interests and China's technological development imperative. The paper further shows that, paradoxically, as accusations of China's illicit or state-driven acquisition of technology reach a fever pitch, China's domestic and outbound technology acquisition regime, as well as its IP system more generally, is becoming more formalized, predictable and rules-driven. This paper concludes that, given the evolution of China's technology acquisition regime and its rapidly evolving IP commercialization regime more broadly, policy makers and firms with significant intangible asset portfolios should prepare for a not-too-distant future when technology transfer flows from, not just into, China.

China's Technology Acquisition Model

This section presents an analytical framework or model for understanding the different policy tools, as well as the practices and institutional drivers, behind Chinese firms' acquisitions of technology assets from their foreign counterparts. It suggests that, rather than viewing tech acquisition as a function of the coercive power of the Chinese state, policy makers and researchers should take a more holistic view of how and why Chinese firms acquire technology. Figure 1 provides an overview of the interconnected set of actors and strategies involved in China's acquisition of tech assets, illustrating that technology acquisition is not simply a function of outbound M&A.

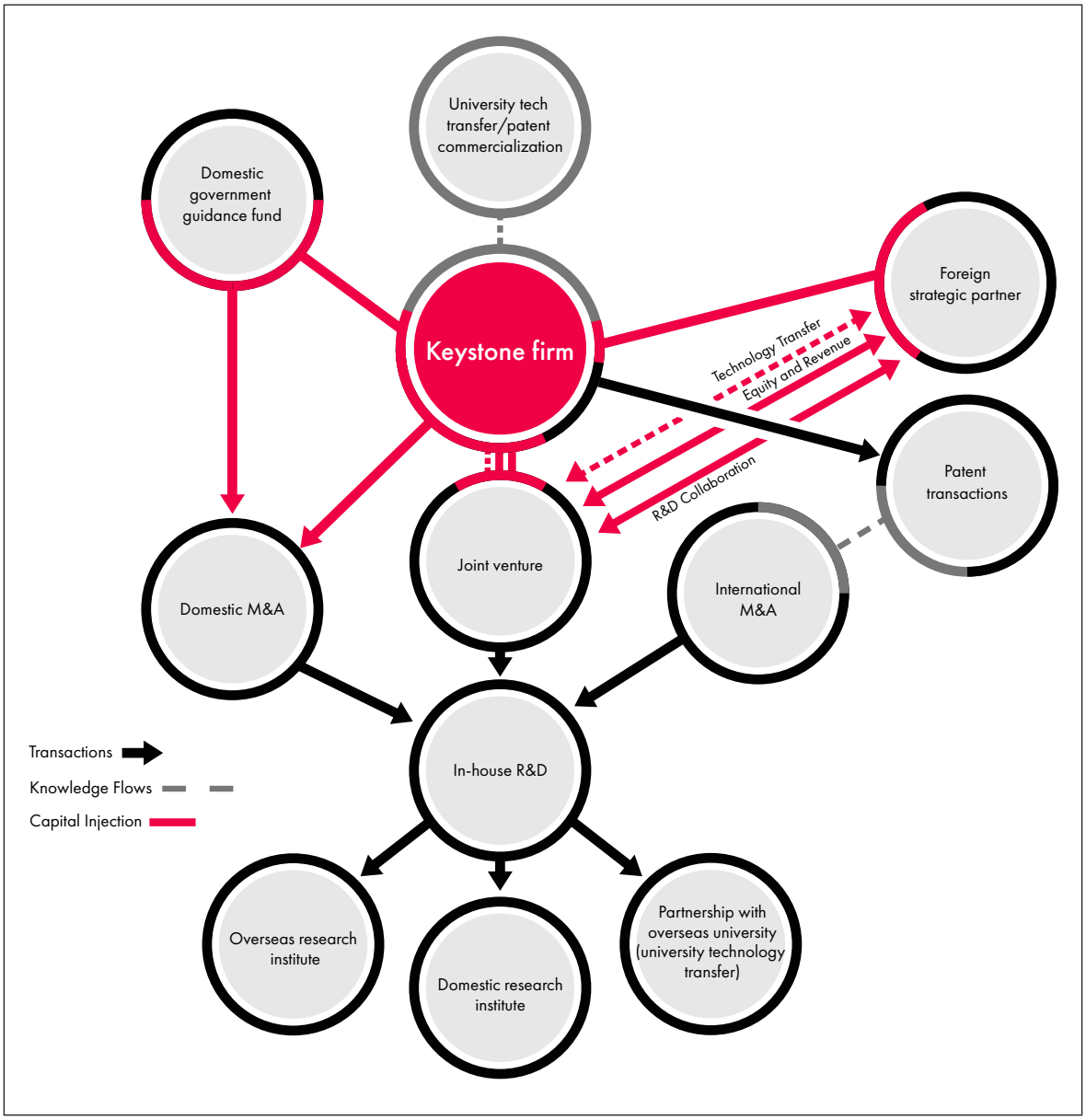
Chinese firms' internationalization strategy employs a variety of tools, many of which are more important than international M&A. Some firms, such as state-owned Ziguang (Tsinghua Unigroup), which designs and manufactures computer memory chips, rely on relationships with domestic universities to commercialize technological inventions at the early stage of development. Others, like Huawei, rely on a huge pool of funds to pay for in-house research and development (R&D) activities in China and abroad — many of which they carry out in partnership with foreign universities. Still others, such as carmaker Geely Global, consumer electronics company Haier Group Corporation and air-conditioner giant Gree Electric Appliances, initially relied on JVs with multinational corporations (MNCs) to import and localize technology for the Chinese market, and used state subsidies and procurement to secure a steady stream of domestic revenue to use on technological upgrading in later stages of development. And some firms, such as appliance maker Midea, have made use of international M&A to leapfrog the slow and risky stage of technological upgrading.

As Figure 1 illustrates — and the case studies below will show in more detail — the Chinese government is, indeed, involved in Chinese firms' tech acquisitions. But the involvement is typically indirect, with Beijing playing an important refereeing role. This role includes setting active, developmentalist antitrust and monopoly rules, providing various types of subsidies for both early-stage and mature technology firms, continued formal and informal JV requirements for national security-sensitive industries, and IP commercialization policies at the university level. In a more direct capacity, the state has also set up "government guidance" venture capital (VC) and private equity funds, which work in tandem with private capital to allocate resources to sectors slated for development.

Not all of these policies effectively induce technological adaptation, and firms with the least government support, in terms of subsidies, procurement and equity funding, tend to be the most technologically advanced and internationalized (Fuller 2016). Therefore, it would be inaccurate to say that the savviest Chinese technology acquisitions, M&A-based or otherwise, are state-driven. At best, they are state-enabled and facilitated, and at worst, state-impeded.

Lastly, not all Chinese firms utilize every method illustrated in Figure 1. The diagram represents a model, or ideal framework, of Chinese firms' technological acquisitions practices. These are, in effect, tools enabled by China's historical experience with market reform and internationalization. The rest of this paper explains and illustrates this argument in detail.

Figure 1: Technology Acquisition Model for Internationalized Chinese Enterprises



Source: Author.

Dimension One: State-abetted, Market-driven Acquisitions

It is no secret that China's policy makers seek to guide China's outbound investment away from its long-standing orientation toward natural resource extraction and real-estate acquisition. Indeed, in 2018, the State Council restricted outbound investment in real estate, hotels, cinemas, entertainment complexes, arms and weapons manufacturing, research and distribution, as well as investments that are deemed politically sensitive sectors in host countries (Linklaters 2017). There are numerous reasons for these restrictions that shed some light on how Chinese policy makers approach the issue of guiding technology acquisition and technology transfer.

To begin, Chinese authorities have concluded that investment in real estate and entertainment complexes is an avenue for capital flight and has discouraged these types of capital outflows for the time being (ibid.). Conversely, investments in sectors that contribute to productivity growth (i.e., consumer goods, services and technology) are encouraged. Indeed, despite the focus on outbound M&A, greenfield investment from China has risen, especially in manufacturing (ibid.). Nevertheless, M&A remains an important pathway for Chinese firms entering foreign markets, and the latest wave of M&A has focused on the acquisition of advanced technology-bearing firms, such as those in multimedia and information and communications technologies (ICTs); robotics; semiconductors; and artificial intelligence (AI) (ibid.).[2]

However, several recent cases of Chinese outbound M&A activity in bleeding-edge technology fields such as robotics and semiconductors, as well as, in the case of Canada, "critical infrastructure" assets, such as China Communications Construction Company's attempted takeover of Aecon, have garnered controversy. It is presumed that the deals they undertake are driven at least in part by rent-seeking, as Chinese market actors try to line up with the Chinese Communist Party's (CCP's) goals of industrial catch-up and global market dominance (Meunier 2014; Wu 2016; Gordon and Milhaupt 2018).

These hypotheses are not entirely unfounded. Nonetheless, discerning the connections between Chinese firms and the central government's political goals is no easy feat. Indeed, when it comes to technology asset acquisition — whether this takes place domestically through Sino-foreign JVs, outbound M&A or university-firm research collaboration — the question about the CCP's role in commercial activity has not been adequately addressed from an empirical standpoint. But market participants frequently point to the ubiquitous presence of the Chinese government in a range of business transactions — especially in areas that are confounding to foreign firms, such as business strategy and long-term investment decisions.[3] Jiwen Chen (2017), a lawyer specializing in Chinese IP, summarized the complexity of this issue as follows: "A deep analysis and understanding of the ownership of Chinese companies can be difficult. Some state-owned companies try to make it appear that they are privately owned, while privately owned companies sometimes try to behave as if they are state owned. There are local government-owned companies that want to behave like national government-owned companies. In addition, individuals whose names appear as shareholders, directors or executives may not actually be the real stakeholders."

However, while it is true that setting up shop in China forces firms, domestic or foreign, to develop a genial relationship with local governments, government-owned investment funds or other state entities, it is far from clear that — barring Belt and Road infrastructure projects, in which the Chinese government is directly involved — Chinese firms are acquiring technology to further their government's objectives.

One example is Chinese appliance manufacturer Midea. The firm made waves in 2017 when it acquired robot designer and Germany's industrial national champion Kuka. Understandably, German industry leaders and policy makers were taken

2 Outbound VC investment has also risen over the past two years (Blachman 2018), but, given that the biggest VC market outside China is the American one, growth in this segment of Chinese outward FDI is likely to remain limited until VC deal volume and the technology sector expand substantially in emerging market economies.

3 Author's interview with market participant, February 19, 2019.

aback by the prospect of losing their industrial capacity to a relatively low-end appliance maker. Naturally, German leaders are also unhappy about the lack of reciprocal market access that Chinese and German firms enjoy in bilateral investment terms (Hanemann and Huotari 2018). This concern is shared by China's trading partners beyond Germany. Simply put, China's trading partners worry that private Chinese firms, from Huawei to Tencent, succeed globally because the Party offers them a favourable regulatory environment and informal subsidies at home, which in turn offer them commercial success and scale at home, allowing the firms to compete globally on an uneven ground (Lucas 2018). These worries are compounded by the fact that in information technology and adjacent sectors, national security measures such as the Great Firewall have served as an inadvertent industrial policy, giving domestic firms an advantage over their foreign rivals.[4]

But none of these issues tell us very much about the drivers of Chinese firms' acquisitions of technology. Subsidies and regulatory or administrative support at home tell us very little not only about why Midea decided to buy Kuka, but also about why Kuka decided to sell to Midea. M&A transactions involve practices and institutional incentives that push Chinese firms to behave in global markets in ways that frequently resemble their rivals in advanced economies. The differences between China and the West, however, are apparent with respect to China's political economy — namely, Beijing's approach to nurturing national champions and incentivizing its firms to scale up and become globally competitive. The next sections present several case studies that outline these similarities and differences.

The firms chosen for the cases — Midea, Haier, Gree, Geely, Xiaomi and Huawei — provide a broad sweep of the drivers of technology acquisition by Chinese firms as illustrated in Figure 1. Unlike Huawei, Midea, Haier, Gree and Geely are not familiar names to many consumers in North America, but they comprise a cohort of Chinese consumer electronics firms that emerged as global brands (see Markets Insider 2018) from nascent experimentation with private business and Sino-foreign JV arrangements in the late 1980s and 1990s. Xiaomi, one of China's leading smartphone and home electronics retailers, has rapidly evolved over the past decade, from a firm maligned by a reputation of being a low-cost copy of their US competitor Apple, to a globally competitive and increasingly innovative technology proprietor (see Newby 2018). Huawei is perhaps China's most famous global brand, and the centre of numerous national security- and IP-related controversies across the globe.

Comparing their business approaches provides an overview of the similarities and differences among firms regarding both the market and the policy-based aspects of Chinese firms' technology acquisition strategies. Midea, Geely and Haier are private enterprises that have succeeded in the Chinese market through alignment with the government's industrial policy priorities — first, low-cost, efficient manufacturing, and more recently, industrial supply-chain upgrading and capturing a higher share of manufacturing value added both at home and abroad through foreign acquisitions and JVs with foreign firms. Gree has used similar strategies but is state-owned and therefore receives a greater degree of direct state support. Xiaomi and Huawei, by contrast, have taken more independent routes in their respective ascents in global technological value chains, opting for in-house R&D and direct acquisition of IP assets.

The Drivers of China's Outbound M&A Practices: Market Pressures and Government Support

Yanting Guo and Gang Zheng (2019) show that Chinese appliance firms such as Midea, Haier and Gree all began as low-end consumer goods manufacturers and gradually moved up the value chain in part through vertical and horizontal integration M&A in their home market. All three enterprises benefited from state support in earlier stages of their growth (see Liu 2005). Of the three, only Gree can be classified as a state-owned firm (state-invested, to be specific, as the state only owns a minority of the listed shares), with the municipal government of Zhuhai owning 18.22 percent of the firm, which is listed as based in the city of Shenzhen (the Zhuhai government later announced that it would reduce its holdings to 3.22 percent; see Yuan Talks 2019). Indeed, despite its former CEO Dong Minzhu's independent management streak, it has remained a state-owned enterprise.

4 For a discussion on China's information controls and their impact on Chinese ICT firms' competitiveness through the lens of Silicon Valley firms lobbying on trade agreements, see, for example, Azmeh and Foster (2016).

Making distinctions between state and private firms in the Chinese context is not only difficult in many cases, but relatively irrelevant for the analysis presented here. This is largely because all firms in China, whether state-owned enterprises (SOEs) or private ones, have some direct or indirect connections to the CCP. Connections do not necessarily imply control or even direct influence.[5] Much depends on the degree of political importance of the given firm to the locality in which it is anchored. In the case of Gree, its importance to the local Zhuhai economy limits not only the independence of its management,[6] but also the firm's acquisition of bleeding-edge foreign technology. Existing literature on the subject of the role of the state in Chinese private and state-invested enterprises suggests that there is no fine line separating state from market in China, but that the most politically connected enterprises tend to be more risk-averse and do not engage in risky overseas investments. As Meg Rithmire (2019, 11) summarizes the issue, "while most firms in China have some political connections, most are informal, local, and arms-length, and, critically, competitive firms do not depend on political access to resources for revenues and profits."

Rithmire's point is true even of firms like Haier, which in its early phase of domestic expansion made good use of government procurement policies favouring domestic firms and industrial subsidies — to say nothing of making use of the government as an agent to foster technology transfer as a condition for market access. However, by the early 2000s, the fruits borne by this business model began to wane. As multinational enterprises improved their capacity to prevent Chinese firms' reverse engineering of imported technologies and undertook strategies to prevent technology leakage more broadly, Haier and other Chinese firms begun to mimic their foreign counterparts in developing technology in-house, taking advantage of reduced costs of older-generation technology afforded by the development of global supply chains (ibid.). Following the saturation of the Chinese appliance market, Chinese firms typically made capital investments into R&D centres (at home and abroad), sought collaboration with universities and expanded beyond their core areas, especially into the business of the Internet of Things (IoT), due to the growing integration of smart technology into consumer appliances worldwide.

Three firms illustrate this process of scaling up and internationalization particularly well: consumer appliance maker Midea (discussed below), and consumer technology developer Xiaomi and telecommunications giant Huawei (discussed in the next section).

The Case of Midea

Why did Midea buy Kuka? This paper does not seek to ascertain the *precise* intent of Chinese enterprise outbound investment or the role of government therein. Rather, it is worth examining the logic of scrutinized purchases in commercial terms. Simply put, did it make business sense for Midea to acquire Kuka, and what evident role did observable policies set in Beijing play in the transaction?

While much of the policy-making world had focused on the acquisition of world-leading technology by a Chinese enterprise, a subtler story is the firm's transformation from a low-end consumer appliance manufacturer, to a global firm focused on building an intangible asset portfolio.

Over the past decade, Midea's corporate strategy has shifted to an overarching focus on intangible assets, as the firm offered competitive salaries to engineers and other professionals, worldwide, and sought to compete with leading global appliance brands (Guo and Zheng 2019). In 2016, the firm used its formidable cash assets from its growing consumer appliance sales in China to purchase a controlling stake in Toshiba's white goods unit, which was facing perpetual losses.[7] As part of the Toshiba deal, the appliance maker also acquired 5,000 IP rights (IPR), including trademarks, patents and copyright assets (Schindler 2016a). Indeed, this shift to focusing on intangible assets was further cemented in 2017, when Midea, along with its domestic competitors, including Haier, TCL, Hisense, Changhong and Aux, created a forum for coordinating IP

5 The role of the state in Chinese private enterprises has been subject to some controversy in academic literature. Government-business relations are distinct in China, with CCP organizations having a presence within private firms, and with private firms hiring former officials to serve on their corporate boards to improve communication with government officials and regulators (see Dickson 2016).

6 Former CEO Dong Minzhu has faced friction with the firm's largest shareholders, the Zhuhai local government, on issues of management and control of the firm (see He 2019).

7 Indeed, by 2019, Toshiba's appliances were back to making revenues under Midea's new business model (Masuda and Kawakami 2019).

licensing and litigation in China's domestic consumer appliance sector (Schindler 2017a).

Midea's acquisition of Kuka in 2016 could be seen as part of Midea's effort to expand into the higher-end appliance business (Schindler 2016b), which requires both a competitive intangibles portfolio, as well as access to increasingly automated manufacturing facilities for the development and manufacturing of novel consumer products. Acquiring Kuka, one of the world's top-four suppliers of industrial robots, helps Midea move up the value chain, automating its factories through vertical integration, just as the purchase of the Toshiba unit helped to accomplish this goal through horizontal integration. Both acquisitions have significantly contributed to the firm's acquisition of intangible assets, by giving Midea access to not only patented technology but also the two acquired firms' global brand recognition. This point was iterated in the company's 2017 annual report, which noted Kuka's advantage in R&D and IoT innovation, and Toshiba's existing global design and manufacturing ecosystem (Midea 2018).

The decision to purchase Kuka was not made by Midea alone. Midea first entered into a partnership with the firm, buying a large minority stake, which it later raised to 13.5 percent, and then to 25 percent in 2016 (*China Daily* 2016). The firm hired a legal consultancy, Freshfields Bruckhaus Deringer, to clear regulatory hurdles in China and the United States (Kuka was a government contractor in the United States), as it considered raising its stake in Kuka from minority to majority. While Midea was seen to be in the driver's seat in the acquisition, the consultancy was responsible for convincing Kuka shareholders, board members and politicians in Germany to trust Midea to create value not only for the acquisition target, but also for the German economy as a whole (see Freshfields Bruckhau Deringer 2019).

From a commercial and business strategy perspective, the logic for acquiring Midea is not particularly mysterious. Midea has been expanding globally since the early 2000s. For the first decade of its global expansion, the firm relied on JV partnerships for local players, including the Belarussian firm Horizont in the former Soviet space, and Japanese-owned Toshiba Carrier in North America, with whom it held a China-based JV since 1995 (Dow Jones 2004). Over the past decade, however, the firm has moved from a position of technology utilizer to that of technology proprietor — in line with the firm's shift to prioritizing intangible asset growth. The firm sought to do this through both foreign technology acquisition and in-house R&D efforts.[8]

The global consumer appliance industry is trending in the direction of IoT digitization of devices, but Midea itself is not in the business of automation. Kuka, on the other hand, has styled itself as the poster child for Germany's "Industrie 4.0" — Germany's plan to further automate the country's economy (Kuka 2017). In this context, Midea's acquisition of the firm looks to be a long-term strategic play aimed at entering China's consumer IoT market. Indeed, the acquisition of Kuka is not Midea's first or only foray into this strategy. In fact, prior to acquiring Kuka, the firm had already established two JVs with Japanese robotics manufacturer Yaskawa, with one of the two aimed at the consumer electronics market — with a controlling stake owned by Yaskawa (*Nikkei Asian Review* 2016). In this respect, the purchase of Kuka offered Midea a way to take more ownership over its strategy in its target market.

With respect to direct policy incentives, local governments across the country have long allocated funding to spur the development of local industrial and consumer robotics firms. Recently, subsidies and other tax breaks have seen renewed emphasis with China's efforts to create greater capacity for its manufacturing sector to be globally competitive, including the present, officially downplayed, but very much active, Made in China 2025 plan (see Malkin 2018). However, tax incentives in this area have long been a factor in both attracting FDI and promoting local industrial competitiveness in strategic industries (Du, Harrison and Jefferson 2014). These arrangements have been enhanced by China's drive to grab a larger share of global manufacturing value added.[9] Indeed, China's authorities continue to implement tax and other subsidy-related administrative and legal changes to attract both foreign and domestic businesses to locate manufacturing operations within their local jurisdiction.

To this end, Midea and Kuka formed a JV and established an industrial park in Shunde,

8 As of 2019, Midea has 20 R&D centres in China and abroad and employs 10,000 R&D personnel, 500 of whom are foreign nationals (Midea 2019).

9 For an overview of new local tax incentives for high-tech enterprises, see Koty (2018).

Guangdong Province, in part to take advantage of tax breaks and other subsidies offered by the province to spur domestic automation (He and Chen 2018). At the same time, despite the torrid growth of China's robotics market, and despite the country boasting the largest robotics market in the world, with global and domestic firms cumulatively selling as much as 35.6 percent of their machines there, domestic Chinese producers are yet to catch up to Japanese and German robotics firms in the Chinese market. As late as 2019, foreign firms accounted for an estimated 75 percent of industrial robot sales in China (Renéry 2019).

Given the local government funding and tax subsidies offered to firms (domestic and foreign) and the overseas talent involved in industrial automation under Made in China 2025 and other investment and industrial policy programs (Koty 2018; Reuters 2017), it is not surprising that Midea took the opportunity to localize Kuka's top-of-the-line industrial production equipment to grab a slice of China's expanding market and government policy.

Institutions: Playing the Global IP Game

To understand how Chinese firms went from being IP have-nots to IP-haves, and to understand Huawei's and other leading Chinese firms' technology strategy, and the role of the state therein, it is important to review China's IP protection and commercialization policies.

As Dan Prud'homme and Taolue Zhang (2019) have documented, China's IP enforcement and commercialization have undergone rapid and decisive changes in recent years. IP protection (especially in the areas of patent and trademark disputes) has risen substantially, often in response to grievances on the part of foreign firms. Several issues with respect to litigation (including trade secrets, which are addressed below) and enforcement remain, but available data suggest that IP infringement is becoming easier to address in Chinese courts, even though patent life terms and damages in China tend to be substantially lower than that in advanced economies (ibid.). Injunction orders — court orders banning the sale and manufacturing of products that are deemed to be infringing or suspected of infringing (in the case of preliminary injunctions) patents in force at any given time — are becoming commonplace. While comprehensive data on court judgments is not yet available for all levels of IP enforcement in China, one interviewee noted that injunction orders are, today, far more common in China than in the United States.[10] This is partly due to the influence of German patent law on China's IP system formulation and evolution (ibid.).

One of the main drivers for rising protection is the desire for IP commercialization, to incentivize the commercialization of scientific research. Starting in 1999 the municipal government of Shanghai offered subsidies for firms and scientists registering patents at home and abroad. By the mid-2000s, this subsidy scheme went national, and China's patent filing began to rise exponentially (see Malkin 2018). Over time, the government adjusted its policies to incentivize the filing and, importantly, the *successful* filing, of invention patents (see Prud'homme and Zhang 2019). Beyond this subsidy scheme, the Chinese government began to work with private firms to stimulate the commercialization of their patent assets and, as the case studies in this and the next sections will show, created state-owned technology firms out of intangible assets held by IP commercialization offices at Chinese universities.

To be sure, these events have not happened in a vacuum. The growing awareness of the importance of IP assets is the result of several factors. In no small part, the drive for IP assets is due to the government's subsidization of R&D and technological standardization initiatives, as well as to Chinese firms' experiences in global markets and collaboration (through R&D partnerships and JV arrangements) with domestic firms (Murphree and Breznitz 2018). It is also an outcome of growing labour costs and the concomitant declining competitiveness of China's manufacturing industry, which has contributed to a greater emphasis on innovation as a source of growth (Wei, Xie and Zhang 2017). China's education policy, which has spurred a growing quantity of academic scientific publications from the country (Xie and Freeman 2018), is another factor. China's scientific accomplishments have contributed to a growing tendency of Chinese firms to commercialize research, especially in areas such as standards-essential patents (SEPs) (Murphree and Breznitz 2018). Indeed, despite the growing concern about Chinese M&A in fields of emerging technology, US firms are responsible for the vast majority of global M&A activity in, for instance, the field of AI

10 Author's interview with market participant, December 9, 2019.

(World Intellectual Property Organization [WIPO] 2019, 105). According to a wide range of available data — in terms of both national filing for patents (see Malkin 2018) and WIPO's Patent Cooperation Treaty applications[11] — China is moving rapidly in the direction of IP commercialization.

A parallel narrative paints a very different picture of Chinese firms' competitiveness than the one that permeates public discourse. This view might point to Chinese firms' — SOEs' as well as private ones' — large investments in R&D (Wild 2019), as well as to government policies incentivizing innovation on a large scale (Bay Area Council Economic Institute 2017). While few would deny the government's idiosyncratically pervasive role in the Chinese economy, recent research has also emphasized the extent to which the government's involvement has spurred the creation of a vast, globally competitive private sector, through measures such as VC market formation (Lin 2016). China's ICT industry participants frequently point out that the story of China's theft of foreign technology is outdated. Entrepreneur and venture capitalist Kai-Fu Lee (2018) argues that imitation (i.e., stealing IP) has given way to innovation through a combination of Chinese private firms' ingenuity and a very competitive domestic market environment — one where IP assets and protection were scarce, forcing businesses to compete on the strength of their business models, rather than by being first to market with a particular technology. As Chinese firms gained market share and managed increasingly sophisticated intangible asset portfolios, they sought protection and valuation of these assets — first, domestically, and more recently, internationally.

Some Chinese enterprises have indeed, quite prominently, scaled up through foreign M&A, through arrangements similar to those depicted in the model in Figure 1. These include automaker Geely, which purchased Volvo in 2010; Lenovo, which purchased IBM's personal computing division in 2005; and ChemChina (China National Chemical Corporation), which acquired the biotechnology company Syngenta in 2017. But these traditional means of technological scaling up have not led to a proliferation of technological leaders. Rather, they have arguably contributed to global industrial concentration.

Chinese firms are catching up not only through M&A, but also increasingly by commercialization of IP assets, which includes patent portfolio purchases from their competitors. The market for technology, in other words, is not limited to M&A transactions. Indeed, while patent purchases and patent auctions tend to be populated by non-practising entities (NPEs; firms that specialize in building a patent portfolio, rather than developing technology per se), it is technology companies that have become increasingly involved in the global market for patents (Caviggioli et al. 2017).

Chinese telecommunications, cellular device and ICT firms have been active over the past decade in purchasing patents with the intent of overcoming challenges associated with entering markets defined by high entry barriers (Ellis 2016a). Huawei — the firm under close media and government scrutiny for its allegedly clandestine approach to technological acquisition — has been an active buyer of patents from defunct brands (Schindler 2018) and established market players alike (Schindler 2017b).

Although all eyes are on Huawei, a more notable case of Chinese private firms' technology acquisition is that of another private technology firm: telecommunications device maker Xiaomi. Xiaomi's rise, within the space of a decade, from newcomer to formidable competitor in the global cellular phone market illustrates not only Chinese firms' rapid climb up the steep learning curve of intangible asset management but also the government's potentially important role in facilitating this climb.

The Case of Xiaomi

Xiaomi, once maligned as a copycat firm, has amassed a formidable patent portfolio through its own R&D as well as through acquisition deals with hardware giants such as Broadcom, Intel and Casio, and software giants such as Microsoft (Ellis 2017). In 2016, for example, Xiaomi spent US$32 million purchasing intangible assets such as trademarks and patents (Schindler 2018). To be sure, the company spends 10 times that amount on in-house R&D (ibid.).

However, Xiaomi's most significant patent acquisition did not originate from a transaction with a foreign company, but rather from one with

11 See "Statistical Country Profiles – China" at www.wipo.int/ipstats/en/statistics/country_profile/profile.jsp?code=CN.

a domestic, government-owned NPE.[12] In 2016, the firm quietly purchased Ruichuan IPR Funds, a local government-owned sovereign patent fund (Ellis 2016b).[13] Sovereign patent funds are relative newcomers to the world of sovereign wealth management (see Clarke 2016), but their focus is most evident in the acquisition of IPR within a national context to spur patent commercialization. Ruichuan, in its inception, was the collaboration of the Beijing local government, software and cloud storage proprietor Kingsoft, and Xiaomi (Schindler 2017c). However, it was understood by market participants even when Ruichuan IPR and its patent commercialization arm, Zhigu, were created, half a decade prior to the absorption by Xiaomi, that Xiaomi was destined to be the ultimate owner.[14] This example underscores the extent of the government's involvement in the commercialization of IP assets in China, but it tells us little about Chinese firms' agency in promoting IP commercialization as a business strategy.

In the case of Xiaomi's IP manager Zhigu, public data does provide a window into such a strategy. Since 2014, Zhigu has purchased a variety of patents registered in the US Patent Office in a range of technology fields, including software and telecommunications patents from NPE firms, as well as a large portfolio (376 patent families and 561 patents in total) from Microsoft's technology licensing arm (ibid.). Indeed, Xiaomi is looking to expand into global markets by ensuring that its technology portfolio can withstand IP assertion litigation from its competitors there (ibid.). These transactions followed Zhigu's acquisition of global IP management talent — including hiring Paul Lin, an executive in NPE firm Intellectual Ventures, and active participation in standard-setting associations in China and abroad (ibid.).

The government's efforts to commercialize IP is not limited to supporting domestic firms. Foreign firms are likewise made part and parcel of China's hopes of bringing more IP into their national intangible economy ecosystem. As Edward Jung, the co-founder of Intellectual Ventures, notes (cited in Ellis 2014), "The Chinese government is the only one we meet with on anything like a regular basis, and when we do they share their top 10 invention priorities with us. Our expansion into China has gone really well. For all the hardships associated with that, [the Chinese authorities] have a great open-mindedness about innovation. Certainly, at a time when it seems the US government is doing everything it can to weaken the patent system, China seems like a very good investment for us."[15]

Chinese firms that have been denied large-scale M&A opportunities in Europe and the United States have been known to opt for smaller-scale patent portfolio transactions as a substitute (Schindler 2017d). For some Chinese firms, such as state-owned Beijing Optoelectronic/BOE Technology Group, patent portfolio acquisitions (see Ellis 2016c) are an especially attractive means of climbing global value chains, given the negative media coverage that Chinese acquirers (even private ones) typically face in host markets (see, for example, Fang and Chimenson 2017). Figure 2 illustrates the long and arduous journey ahead for Chinese IP holders. While payments for IP assets made to foreign holders in the Chinese market have risen rapidly since China's accession to the World Trade Organization (in relative as well as absolute terms), receipts for IP asset rents have only very recently begun to rise. This figure could be interpreted as an illustration of the global imbalance in IP payments, where large markets like those of China pay far more than they receive for patents, trademarks and copyrights in the increasingly lucrative and important intangible economy.

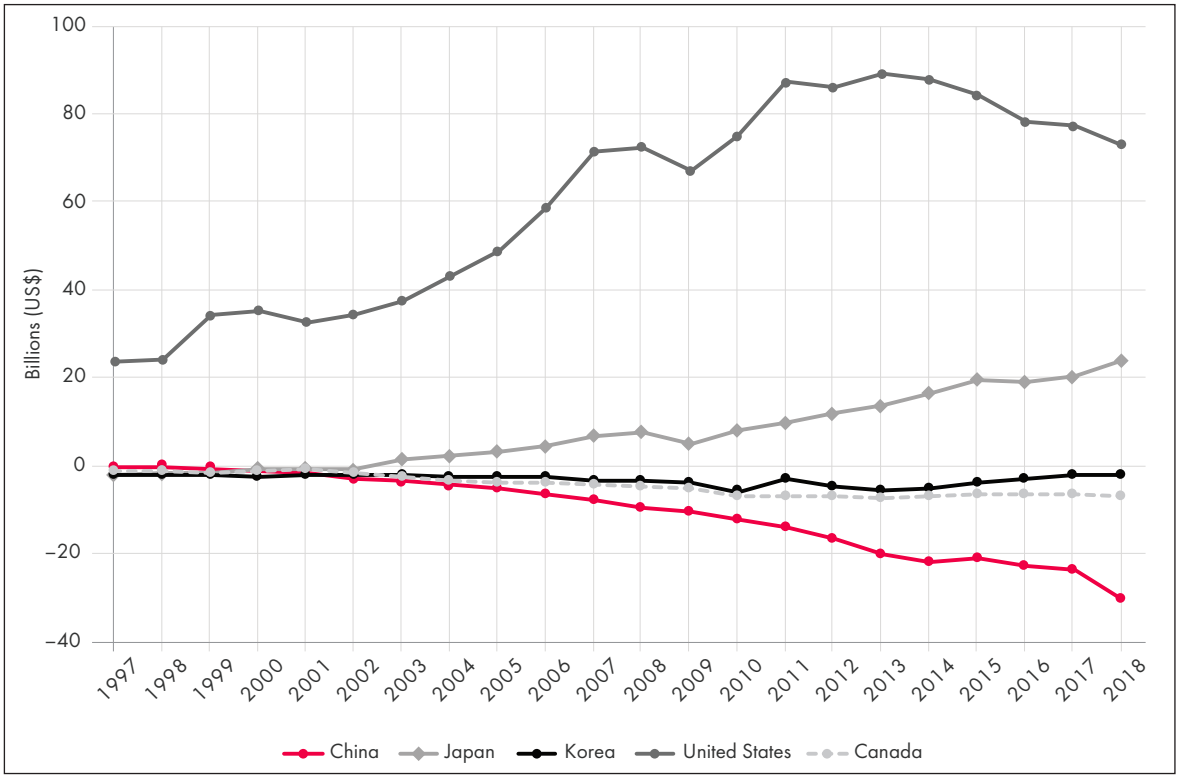
12 NPEs can be defined as "individuals or entities that initiate business models entirely around purchasing, acquiring, or filing for their own patent rights, and enforcing those patent rights to generate revenues" (Larson 2017, 23). These firms are frequently labelled "patent trolls" by critics, partly resulting from a slew of patent enforcement lawsuits launched by these firms over the past two decades that many see as frivolous, and also because NPEs focus on the monetary value of their patents, rather than on developing the invention that these patents are intended to protect (ibid.).

13 For a detailed analysis of sovereign patent funds, see Clarke (2016).

14 Author's interview with market participant, April 10, 2019.

15 Many patent holders have been unhappy with the direction of the US Supreme Court in the case of *Alice Corporation v CLS Bank International* (2013), which has reduced the rights of patent holders, especially in the software sector.

Figure 2: IP Balance of Payments



Source: Author.

It should also be noted that Xiaomi is not at all unique in its IP acquisition and commercialization strategy. While Lenovo's acquisition of foreign corporate assets is significant, the firm has also integrated intangible asset acquisition into its business strategy. In 2014, it bought 3G and LTE patents[16] from the NPE Unwired Planet, as well as from Japanese tech giant NEC Corporation. Indeed, patents were reportedly also a significant part of Lenovo's acquisition of Motorola Mobility from its erstwhile owner Google (Lloyd 2014).

The Case of Huawei

No analysis of China's foreign technology acquisitions would be complete without a discussion of the most scrutinized global Chinese firm today: Huawei. Huawei's ascent along the global chain of value creation has seized attention in recent years, from the US intelligence and defence community in particular. However, the focus has been on the firm's acquisitions of foreign technology; few empirical studies have specifically outlined *how* Huawei has acquired foreign technology.

Examining the US government's legal allegations against the firm is beyond the scope of this paper. It should be noted, however, that evidence that Huawei's alleged IP theft has significantly contributed to its competitiveness in smartphone design, telecommunications equipment or in other areas of business, is scant.[17] But even more importantly, evidence that could be drawn from existing qualitative and quantitative data on Huawei's approach to foreign technology acquisition suggests that the firm, unlike Midea and other Chinese technology brands, has not been especially reliant on M&A.

16 "3G" and "LTE" stand for, respectively, the third generation of wireless mobile telecommunications technology and the Long Term Evolution wireless data communications technology standard.

17 The US Department of Justice made serious accusations against Huawei in 2019, levelling national-security allegations on charges that were previously settled in civil court, including accusations that Huawei misappropriated T-Mobile's phone durability testing tool, "Tappy the Robot" (US Department of Justice 2020). However, such instances of alleged IP misappropriation do not necessarily point to the company's success being predicated on IP theft. As Adam Segal put it, "If Tappy is as far as they've gotten on [IP] theft, that seems to be pretty thin gruel" (Schatzker 2019).

To be sure, Huawei did bid for (and successfully acquire) several firms in Europe. But the successful deals were not a case of scaling up through acquisition of well-established global players, as in the case of Midea's purchase of Kuka, but rather acquisitions of smaller, early-stage firms that have fed into its vast global network of R&D, such as the 2013 purchase of Caliopa, the research-oriented photonics firm spun off from Ghent University, which was slated to continue its partnership with Ghent in order to fit into Huawei's semiconductor chip research efforts (Hardy 2013). This acquisition, perhaps not incidentally, followed a similar move by competitor Cisco's 2012 acquisition of Lightwire, a privately held firm that likewise focuses on optical network connectivity. Similarly, in 2015 Huawei purchased Amartus, a small Irish network software solutions firm (Thomas 2015).

The pattern of Huawei's technological M&A crystalizes when one considers the firm's large network of overseas R&D institutes, including partnerships with overseas universities. To date, the firm boasts 123 R&D labs and 525 research partnerships (Cave et al. 2019). In Canada, Nortel's demise did not enrich Huawei with direct patent acquisitions — the firm was not part of the Rockstar Consortium that acquired a large pool of Nortel patents for US$4.5 billion following its bankruptcy. Rather, Huawei has been enriched by IP arising from Canadian researchers that it later hired. Not long after the leading Canadian telecom provider went under, Huawei's research facilities in Ottawa boasted a staff of which an estimated 40 percent had, at some point in their careers, worked at Nortel (Blackwell 2020).

Huawei's strategy, therefore, is based less on direct acquisition of firms with large market share, and more on in-house IP commercialization. The firm is also an active buyer of patent portfolios from other market players. Media reports suggest that among Huawei's patents, several have original assignees from firms such as Sharp, IBM and Microsoft, as well as other American, Japanese and European firms (Ellis 2015). Not surprisingly, Huawei's own internationalization strategy, which began far earlier than that of its domestic counterparts,[18] has landed it a top spot as proprietor of fifth-generation (5G) telecommunications equipment SEPs (IPlytics 2019). As such, regardless of what one thinks of the firm's connections to the Chinese government, policy makers should pay closer attention to how Chinese firms actually acquire technology and expand their technological portfolio through internal means.

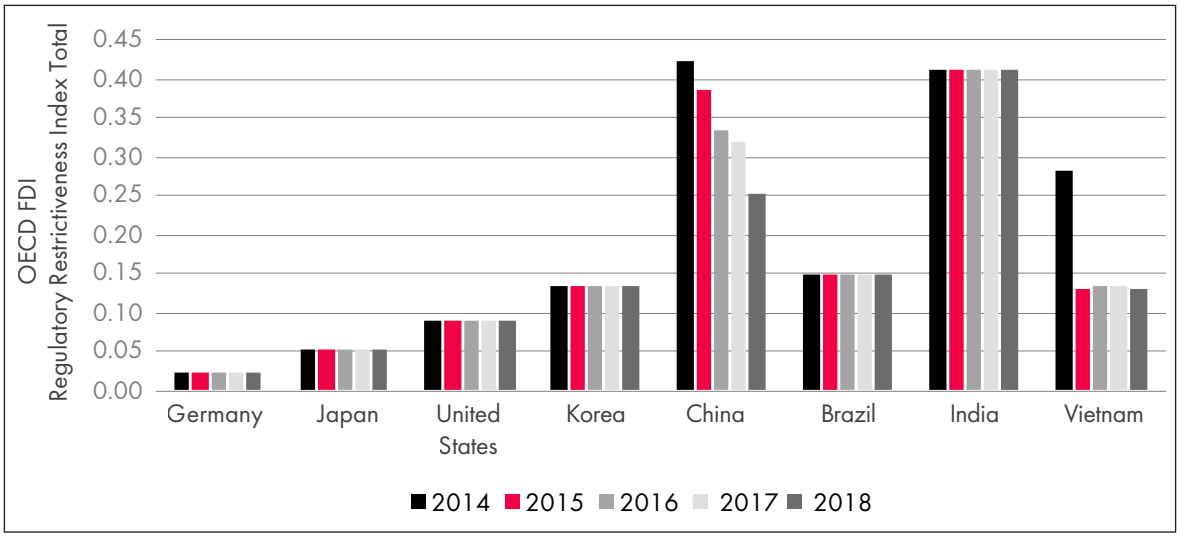
Virtually all major Chinese technology firms buy patents from and sell patents to their competitors as a form of technological development strategy. Indeed, a degree of clandestine technological acquisition, vis-à-vis trade secret theft and corporate espionage, has undoubtedly fed into China's rapid technological development over the past 30 years. However, despite the fact that significant issues persist, the most egregious cases predate China's present-day IP protection and commercialization and its firms' level of technological sophistication. Furthermore, there is insufficient evidence to suggest that Chinese firms today engage in such practices to a significant degree, any more than their international rivals do.

Dimension Two: FDI Restrictions and Joint Ventures

Among the most controversial aspects of China's technology acquisition regime is the widespread reliance on JV arrangements as a mandated, or a default (market-based), instrument for foreign firms' direct investment in the Chinese economy. These issues have been documented at length by government studies in the United States and the European Union (see Malkin 2018) and remain a frequent point of debate in the media, as well as a decades' long subject of academic study. To be sure, in the context of the US-China trade war, the issue of forced technology transfer is an umbrella term that applies to a range of

18 Douglas B. Fuller (2016) points out that Huawei is exceptional among Chinese firms in that it eschewed the safety of the protected Chinese domestic market and government subsidies in the early 2000s and opted for global market expansion, while its domestic counterparts were still working hard to maintain government procurement contracts as a crutch to enable growth.

Figure 3: FDI Restrictiveness in Select OECD and Emerging Economies



Data source: OECD FDI Regulatory Restrictiveness Index (www.oecd.org/investment/fdiindex.htm).
Note: OECD = Organisation for Economic Co-operation and Development.

issues covered in this paper, including trade secret theft (see Liu and Woo 2018). This section addresses the issue of forced technology transfer arrangements that are said to be embedded in JV contracts, wherein Chinese firms use the size of China's market to demand that foreign investors hand over IP as a condition for making an investment in partnership with a Chinese firm.

At first glance, this is a case of unfair policy arrangements. China's FDI regime is certainly among the most restricted among major economies, emerging and advanced alike (as Figure 3 shows, also illustrating, however, that this restrictiveness is trending down), and gives Chinese firms a home-field advantage in demanding technology in exchange for market access. The concern stems from several factors that have historically defined China's reform and opening-up period (which began in earnest in the early 1980s), but which have changed considerably over time. These factors include an economy dominated by SOEs, in which access to markets depends on contracts with these market players; a lack of IP protection; a government eager to be involved in JV negotiations that involve important technology assets; and an active industrial policy framework, involving SOEs, private firms, local governments and other actors that aim to accelerate the process of China's technological catch-up.

Some of these historically defining factors remain relevant. While it is often presumed that JV arrangements are mandated by Chinese law, this is only partially correct. Until recently, China has maintained a three-tiered FDI regime, consisting of encouraged, restricted and forbidden sectors (see Malkin 2018). Looking at the first tier, which accounts for the vast majority of China's economy, JV partnerships are not required; at the second tier, JV partnerships are necessary; at the third, FDI is (technically) not allowed. However, in many cases, foreign-invested enterprises often choose to partner with a Chinese firm even when no legal requirements exist. One market participant suggested that this is the result of the market idiosyncrasy and regulatory complexity that define China's economy.[19]

Moreover, the landscape that determines China's JV economy evolved very rapidly due to the strengthening of IP protection and commercialization in China in recent years, combined with China's recent legislative changes that eliminated China's three-tiered FDI regime — a regime marked by an opaque regulatory approval structure involving various central and local government agencies (US Chamber of Commerce 2018) — and a transition to a "negative

19 Author's interview with market participant, February 19, 2019.

list"-based system. One noticeable difference that has come into play over the past decade is that there have been fewer technology acquisitions via the unwanted appropriation of trade secrets by the Chinese partner in a Sino-foreign JV because of the legal enforcement mechanisms in Chinese courts. As a result, contract terms and legal due diligence are becoming important bulwarks against unwanted tech transfers.[20] Further still, the pressure to transfer technology, as it pertains to the government's role therein, differs dramatically by industry and the type of technology involved, and especially by whether a local government is or is not directly involved in a JV arrangement. Large multinational enterprises with a valuable IP portfolio are generally in a much better position to avoid unwanted IP transfers when local government actors are involved in JV contract negotiations.[21]

With respect to China's JV law, it has long been known that China's legislative framework has been very generous to Chinese JV partners by specifying the requirements for technology transfer directly, and by shortening the lifespan protection for the IP that these JVs generate. Indeed, the issue of technology transfers in exchange for market access has been the focal point of China's JV policy since the 1980s. One notable part of China's JV laws, article 27 of the Regulations of the People's Republic of China on the Administration of the Import and Export of Technologies, stipulates that any improvements made to the foreign partner's technology as part of the work conducted by the JV entity belong to the partner making that improvement (European Commission 2018, 4).

One can see how such a legal provision, in addition to several other JV provisions noted in a recent European Commission (2018) request for trade consultation with China, could give legal space to Chinese JV partners to spin off and acquire technology through illicit means, using Chinese courts to secure their legal rights to said technology. In this context, it is notable that this article was removed from China's JV law by the State Council on March 18, 2019, along with item 3 of article 43, which limited IP protection from transferred technology to 10 years (as opposed to 20 years — the normal term for patent and copyright protection); as well as item 4 of article 43, which required the JV to have the right to use transferred technology by the JV after the termination of the period of the technology transfer agreement (Schindler 2019).

Equally significant, the amended law no longer includes paragraph 3 of article 24, which indemnified the original technology owners in the transfer agreement from third-party infringement claims, as well as article 29, which prohibited the tech-transferring party from imposing on their Chinese partner conditions stipulating how the technology could be used (ibid.). This latter article stipulated specific behaviour, such as licensing terms, which falls under the category of competition enforcement (State Intellectual Property Office 2002). Of course, the extent to which Chinese authorities will move to enforce these new changes, especially in the context of the intensifying US-China trade and technology conflict, remains to be seen.

The most salient, but worst-documented, change over the past decade and a half has been the declining marginal utility of China's traditional JV model as a means of technology acquisition, where foreign firms exchanged existing technology for market access. Not only are foreign firms becoming savvier about defending their technology, but China has also moved to integrate the JV model with the broader network of parallel tools of technological catch-up that relies less on foreign technology and more on domestic R&D capacity, as well as on domestic and foreign technology M&A. This model depends in no small part on China's SOEs and universities scaling their domestic technological capabilities and combining them with foreign know-how to link market needs with both domestic and foreign capacities. To illustrate, the following subsection examines how China's Tsinghua Holdings links all these actors together to achieve China's catch-up goals in the semiconductor sector.

The Case of Tsinghua Holdings

Although Chinese acquisitions of foreign technology assets are increasingly driven by market dynamics, this does not mean that the government takes a hands-off approach to Chinese firms' competitiveness in global markets. China's attempts to catch up to the United States and other advanced economies in the semiconductor sector are decades-old (see

20 Author's interviews with market participants, February 20, 2019 and April 11, 2019.

21 Author's interview with market participant, April 10, 2019. See also Bosshart, Luedi and Wang (2010); Klein (2019).

Feigenbaum 2003), and China's integration into the global economy has done little to ease Chinese leaders' sense of vulnerability at being dependent on importing technological components that could be considered related to national security.

China's industrial policy in the semiconductor sector, while complex and multi-faceted, is no secret. It consists of financing and subsidizing the development of a homegrown industry that could rival foreign firms at the height of global value chains — those that specialize in "fabless"[22] integrated circuit design (see Majerowicz and de Medeiros 2018). The State Council's guiding document on China's semiconductor sector lays out the strategy as such: "China is the biggest integrated circuit market in the world, and market demand will keep rising at a fast pace. Under the new situation, the national integrated circuit industry faces great challenges and also seeing great opportunities, and shall make use of market advantages, provide a favorable environment for progress, boost company vitality and creativity, and motivate the whole industrial chain for continuous growth, and strive to catch up with the advanced international level and achieve development of the integrated circuit industry by leaps and bounds" (State Council 2014, 1).

A firm that plays prominently in this strategy is state-owned Ziguang (Tsinghua Holdings) — a technology commercialization holding company that owns several semiconductor design, software design and financing firms, including Tsinghua Unigroup (design of integrated circuits [ICs]), Tsinghua Tongfang (software), Unisplendour (private equity and investment), Tus Holdings (science parks and incubator) and Tsing Capital (VC).

The origins of Ziguang are as complex as the drivers of China's present-day technology acquisition regime. The firm was founded in 2003 when the State Council decided that the subsidiaries and other commercial technology assets owned by Peking University and Tsinghua University's research commercialization offices would be spun off to become standalone firms, with arms-length separation between the government and the companies. Ziguang was designated to operate subsidiaries "mainly engaged in the transformation and promotion of scientific and technological achievements, high-tech Enterprise incubation, technical information consultation, investment management, asset operation and capital operation" (State Council 2003).

Much like its Peking University counterpart, the technology conglomerate Founder Group, Ziguang was born from government efforts to use state capital and ownership to foster China's technological catch-up. But unlike Lenovo, which also spun off from the government sector (in its case, from the Chinese Academy of Sciences) but stayed at arm's-length from direct government management (it remains state-invested, but not majority state-owned), Ziguang did not move up the value chain through global M&A.[23] Like Lenovo, Ziguang (and its later-acquired subsidiary Tongfang) began as an indigenous computer manufacturer, but it quickly transitioned to ICs — a sector with much higher barriers to market entry, requiring far more in-house technological sophistication. Like Huawei, Ziguang receives state backing as a national champion and preferential lucrative contracts from state-owned firms (Fuller 2016). But unlike Huawei, which since the mid-2000s has sought to anchor itself in global markets and to compete in its own right, Ziguang invests in designated priority areas set by the state.

The role of Tsinghua Holdings in China's semiconductor ecosystem can be understood to have three overarching objectives: investment and commercialization of R&D; consolidation of China's IC design industry; and attracting foreign partners and domestic state funds to co-develop technology for the Chinese market. The first of these stems from the firm's origins in China's top tech research institution, Tsinghua University, which itself has long-standing research partnerships with foreign firms such as Microsoft. The Tsinghua University Science Park ("TusPark"), adjacent to the school in Beijing's Haidian district, is the world's largest science park and tech incubator. Tus Holdings, its developer, boasts another 20 some science parks and incubators across the country.

Tsinghua Holding's Unigroup also boasts several JVs with foreign firms, as illustrated in Table 1.

22 Fabless manufacturing refers to the design of semiconductor chips as a standalone business practice, with fabrication (manufacturing and processing) being outsourced to contractor firms. Much of the world's semiconductor industry supply chains currently function vis-à-vis a division of labour between designers (fabless technology proprietors) such as Qualcomm, Samsung, Micron, Nvidia, AMD and Intel and "pure play" manufacturers such as TSMC and Hon Hai Precision/Foxconn Group.

23 Lenovo famously purchased IBM's personal computing division in 2004.

The significance of these JVs is not their novelty — JVs are a mainstay of China's FDI regime since the start of the reform and opening policy. However, over the past decade, many Sino-foreign JVs and strategic partnerships, especially in the field of semiconductors, were formed to develop new technology rather than to import existing tech. Because data storage and server technology design face stringent national security regulations (and concomitant FDI restrictions) in China, foreign firms in these industries that wish to access China's market have few choices but to partner with domestic firms like Ziguang, to meet the government's security stipulations surrounding their products. Ziguang has taken the opportunity of rising demand for designed-in-China technology to consolidate China's

Table 1: Tsinghua Holdings' Sino-Foreign Partnerships

Foreign Firm	Date	Development Type or Product	Total Capital Committed (US$)	Type of Partnership	Ziguang Share (%)
Hewlett-Packard	2016	High-end server chips	4.5 billion	JV: New H3C Group	51
Western Digital	2016	Data storage centres	300 million	JV: Unis-WDC Storage	51
Intel	2014–2018	Cellular phone chip supply	1.5 billion	JV: Various ventures	55
ChipMOS Technologies and Powertech Labs	2016	Testing of various semiconductor design components	235 million	JV: ChipMOS Shanghai	48
Microsoft and 21Vianet Group (domestic)	2016	Enterprise data centre for SOEs	Unclear	Strategic partnership	N/A
Affymetrix	2005	Medical biochips	Unclear	Strategic partnership	N/A
Russia-China Investment Fund, Sistema Plastics	2018	Precision medicine (biotechnology)	Unclear	Strategic partnership	N/A
Dell	2015	Cloud computing, mobile internet, IoT, big data and smart cities	Unclear	Strategic partnership	N/A
IBM	2015	Agreement to license OpenPOWER technology ecosystem	N/A	Technology licensing	N/A

Data sources: Compiled by author from Factiva database and Chinese language media sources.
Note: N/A = not applicable.

chip industry and to do so with the aid of both government cash and foreign investment.

The firm's subsidiary Unigroup, under the leadership of Chairman and CEO Zhao Weiguo (also chairman of the parent firm Ziguang), has undertaken several strategic acquisitions domestically and globally to consolidate China's domestic chip design capacity and to source global talent and expertise. The firm acquired private semiconductor design firms Spreadtrum Communications and RDA Microelectronics in 2013 and 2014, respectively (see VerWey 2019). In 2014, Unigroup began its cooperation with Intel, via the latter's JV with Spreadtrum. As Zhao put it, "The strategic collaboration between Tsinghua Unigroup and Intel ranges from design and development to marketing and equity investments, which demonstrate Intel's confidence in the Chinese market and strong commitment to Chinese semiconductor industry" (cited in Mamiit 2014). These acquisitions coincided with Unigroup's announcement that it would invest US$47 billion over five years into its capacity to design high-end chips in China (Cartsen and Lee 2015).

The firm's foray into higher value-added fabless semiconductor design intensified in recent years. In 2016, Zhao struck a deal with the fund to invest in Unigroup alongside Intel, which would take a 20 percent stake in newly acquired Spreadtrum (Tan and Yue 2016). In 2018, Unigroup purchased French chipmaker Linxens (Wu and Chakravarti 2018). The same year, China announced the creation of a US$31 billion semiconductor government guidance fund, which would use state capital to promote the growth of China's chip design industry (Patterson 2018), and established a venture with Intel to develop a 5G mobile network platform for the Chinese market, based on Intel chips (Duo 2018). In this complex web of cross-investments, Chinese state capital, Unigroup and Intel would cooperate to develop China's smartphone chip supplier industry. While the details of each entity's contribution to the collaboration are far from clear, it is apparent that Intel would exchange some of its technology to gain a competitive edge in the increasingly important China market, allowing the firm to tailor its chip design to Chinese firms' demand (ibid.).

To be sure, Zhao's tenure at the company was rather short-lived, and his quest for M&A-based expansion was not well received by policy makers in Beijing (in 2018, Zhao retired). Buying up foreign firms in countries where IC design is a national security issue (namely, Taiwan, Province of China and the United States) foreseeably raised questions about China's tech ambitions and stoked suspicion on the part of policy makers in Washington and elsewhere that Beijing was restricting market competition in the sector domestically, while utilizing market openness abroad to buy up competitors (Tan and Yue 2016).

Not surprisingly, China's push for technological catch-up through foreign acquisitions has, thus far, not gone very far, and nothing illustrated this aborted effort more clearly than Zhao Weiguo's ill-fated attempt to take a 15 percent stake from computer hard disk manufacturer Western Digital. In 2015, Unigroup, under Zhao, sought a 15 percent stake, which Western Digital was using to acquire another storage hardware manufacturer, SanDisk (Mearian 2016). In other words, Unigroup was financing Western Digital's own M&A scheme — and seeking an equity stake, rather than takeover — in order to gain technological and management expertise in the US semiconductor sector. The deal was ultimately stymied by the Committee on Foreign Investment in the United States, which informed them of an impending national security review (Unigroup withdrew the offer following the Committee's notification; ibid.).

China's trading partners, however, are less concerned about the logic of Ziguang's recent acquisition spree than about the role of the state therein. The cause for concern is the role of government equity-based subsidies behind Ziguang and other state-owned semiconductor firms' acquisition — many of which have taken place domestically. In 2014, China incorporated China Integrated Circuit Industry Investment Fund (called "the Big Fund") to help the Chinese integrated circuit industry catch up to its American, Japanese, Korean and European rivals. As a recent study by the OECD (2019) has shown, the Big Fund has been involved in financing numerous acquisitions by Chinese semiconductor SOEs through equity investments aimed at consolidating China's semiconductor industry. The OECD report distinguishes such subsidies from public funding of R&D partnerships and considers equity injections, along with bank lending at below market rates, to be non-market-based subsidies.

However, as studies have also shown, determining the benefactors from market distortions in the semiconductor industry is difficult due to the interconnectivity of global supply chains, especially

within the context of global trade rules and norms as they exist today (Hoekman 2016; Baldwin and Venables 2015). Moreover, state subsidies are only one part of the larger puzzle of China's foreign technology acquisition regime. So far, much of the funds from the Big Fund have gone to fostering consolidation in the domestic fabless semiconductor industry, due in large part to much of their foreign acquisitions being stymied by both a lack of support from domestic government and foreign regulatory reluctance. But given intensifying concentration in global semiconductor markets over the past two decades (OECD 2019), and China's inability to influence either prices or market outcomes in large globally interconnected industries in general (see, for example, Massot 2019), these subsidies suggest that China is indeed intensifying its efforts to create national champions that can compete with established global industry leaders such as Intel and Qualcomm.

In the context of both the 2018 temporary US ban on US firms supplying ZTE with equipment (Xu Klein 2018) and the recently announced similar ban on Huawei (Pearlstine, Krishnakumar and Pierson 2019), the efforts outlined here are likely to accelerate and perhaps become more aggressive. According to Ding Wenwu, president of the Big Fund, "We do see limits and obstacles in buying foreign technologies....Under the circumstances, we should never forget the importance of cultivating our own chip sector without relying on other countries' support" (cited in Cheng 2019).

Trade Secrets, Industrial Policy and IPR Enforcement

Trade secret theft remains one of the most pervasive and controversial issues dogging Chinese firms as they expand globally. Trade secret theft as an illicit means of technology acquisition — whether or not it is sponsored by Chinese authorities, or carried out by private market actors that came of age in a system characterized by low levels of trust or rule-of-law enforcement — has been well documented in academic literature (see Yu 2015; Hui 2016). However, what remains patently unclear is the extent to which trade secret theft is the residual reminder of China's recent past as a country with poor IP protection, or whether China's current IP system or the state's thirst for rapid technological catch-up facilitates or incentivizes Chinese firms to illegitimately appropriate foreign technology. If the former is true, time should take care of the problem without much policy action from China's trade partners.

It is important to note that trade secret theft is a growing *global* phenomenon (Almeling et al. 2010). To be sure, the US government has recently stepped up its prosecution of trade secret theft cases under a national security enforcement umbrella, with Chinese nationals prominently featured in several high-profile cases (Dreyfuss and Lobel 2016). However, before jumping to conclusions, policy makers should not confuse correlation with causality. There may be several explanatory variables that account for the recent uptick of China-originating trade secret theft cases. First, China's advances in science and technology research in education (Han and Appelbaum 2018) have produced a growing number of highly skilled science and technology workers who are increasingly mobile. Chinese firms are looking to lure talent (in particular, talent with Chinese citizenship or of Chinese origin) away from their international rivals, which presents ample opportunities for illicit behaviour such as trade secret poaching.

Second, it is also possible that differences in business and legal culture — how trade secret theft is handled within China and in the rest of the world — play a role in the recent spike in litigation involving Chinese nationals in the United States. Over the past six years, US national security agencies have campaigned to broaden the range of legal parameters under which commercial trade secret theft could be prosecuted under national security laws. As Rochelle Cooper Dreyfuss and Orly Lobel (2016) have shown, US authorities are increasingly concerned that the lines separating economic competitiveness and military power are becoming blurred, which has led to legislation being enacted that in turn blurs commercial trade secret theft with national security offences. Indeed, China plays an especially and not unexpectedly prominent role in these considerations, as a result of policies such as the Thousand Talents Program, which offers financial and career incentives for Chinese science and technology talent to bring their skills and knowledge back to Chinese government-owned institutions and private firms in order to further China's scientific and technological development.[24]

24 For an overview of the politics and global governance issues surrounding the Thousand Talents Program, see Liu and van Dongen (2016).

A recent trade secret dispute involved a former Coca-Cola employee allegedly being poached by Chinese retailer Kingsport to steal trade secrets for chemical technologies that coat the insides of soft drink cans (O'Keeffe and Viswanatha 2019).

The issue is further complicated by IP infringement cases where industries such as semiconductors are involved. Available (but, notably, limited) data suggests that IP cases involving the word "chip" (referring to the semiconductor industry) tend to have a much lower win rate for plaintiffs — foreign and indigenous firms alike — than the average success rate in patent lawsuits across industries, across the country: 38 percent versus 78 percent (Schindler 2018). In the case of trade secrets, Chinese law is more accommodating toward offending parties. Non-compete agreements in China's courts are instructed to "(1) take into full account the actual level of the economy and technology development in our country; (2) based on the public interests, not only maintain fair competition in the socialist market economy, but also balance the interests of different market players" (State Council of the People's Republic of China, quoted in Hui 2016, 427). As a result, firms have been known to counter an unfavourable ruling in California or New York courts by launching a countersuit for trade secret or patent infringement in China (Cohen 2015). Indeed, court or jurisdiction shopping by MNCs to get favourable rulings in disputes with competitors is a documented phenomenon in general — not just in cases involving Chinese litigants (Beukel and Zhao 2018).

Therefore, if it is true that misappropriation is at least in some part due to state encouragement or Chinese authorities' deliberately turning a blind eye, it is even less clear what sort of policy responses could be mandated. By contrast, if IP protection in China is the result of the demand from Chinese firms to be able to assert their IPR in their main market, are we likely to see a groundswell of support for stronger trade secret enforcement? Likewise, would trade agreement negotiations or multilateral pressure work to change Chinese behaviour?

Neither of these questions has a straightforward answer. However, as mentioned above, over the past several years, Chinese authorities have, indeed, been moving to tighten up China's trade laws. The latest updates to China's trade secret legislation raise the ceiling on damages for trade secret misappropriation and place the onus on defendants to provide proof of absence of wrongdoing (Prud'homme and Zhang 2019).

An additional complicating factor is the prospect for overly zealous trade secret protection regime in a country that is grappling with breaking through exceptionally formidable barriers to entry in industries such as semiconductors. To put it another way, if China were to take decisive action against trade secret theft (at home or abroad), it is far from clear that the benefits of stronger trade secrets law would outweigh the benefits of less stringent protection. As Peter K. Yu (2015, 148) summarized the issue: "As much as laws and policies are needed to improve the protection of undisclosed proprietary information, we also need to think more about whether those laws and policies would respond to the divergent local business, employment, and cultural conditions."

Dimension Three: Regulatory and Jurisprudential Measures, Including Competition Law

Chinese policy makers and firms need not exclusively rely on direct (i.e., M&A and JV arrangements) and indirect (patent portfolio purchases) technology acquisitions to facilitate the competitiveness of Chinese high-tech sectors. Technological development is not only about competition between firms but also involves an institutionalized competitive playing field that allows domestic innovation to overcome problems of global market concentration. Competition law enforcement allows Chinese authorities to limit the market power of foreign multinational firms by forcing the latter to divest from existing technology assets and lower licensing fees for proprietary technology used in China. It also allows authorities to guide investment and divestment in China, give domestic firms access to foreign technology and even influence global M&A conducted by foreign firms.

However, allegations of clandestine acquisitions of technology, enabled by a politicized judiciary, are complicated by China's recent and remarkably rapid progress in IP protection and commercialization. This trend has been well documented in recent literature (see, for example, Yu 2018; Malkin 2018). To be sure, not everyone agrees that the reforms have gone far enough to address the concerns of China's trading partners and foreign firms (Brander, Cui and Vertinsky 2017). However, as the data suggests, the Chinese legal system tends to see foreign patent infringement plaintiffs win at a higher rate than Chinese plaintiffs, receive patent injunctions (a court order banning the defendant from continuing to use the IP in question for commercial purposes) at a higher rate than their domestic counterparts, and receive higher than average damages than domestic plaintiffs receive (Bian 2017; Love, Helmers and Eberhardt 2015).

How should China's trading partners reconcile these parallel policy developments? The next section considers Chinese competition policy in order to illuminate what motivates Chinese regulatory authorities and to illustrate the complex set of considerations involved in Chinese authorities' enforcement of competition policy as it pertains to foreign firms and foreign technology.

Antitrust as a Tool of Forced Technology Transfer?

Following the passing of the Anti-Monopoly Law of 2008, China tasked a number of agencies, including the Ministry of Commerce (MOFCOM), the National Development and Reform Commission (NDRC) and the State Administration of Industry and Commerce to police the market for IP to prevent the "abuse of dominant market position" by commercial entities operating either within the Chinese market or globally — so long as global transactions and arrangements have direct bearing on the Chinese market. In 2018, these agencies' competition law enforcement functions were folded into a new agency, the State Administration for Market Regulation (SAMR).

China's antitrust regime is in its early years, is constantly evolving and does not yet foreshadow the triumph of a single legal model or even a definitive policy goal (Ye 2018). Despite scholarly and media focus on antitrust cases against MNCs, most of the defendants of cases administered by the NDRC or MOFCOM have been domestic (ibid.). However, the significance of the handful of antitrust decisions involving foreign firms should not be understated, as they demonstrate how China is able to wield market-based power by setting the terms of competition for foreign MNCs, despite the fact that only a handful of Chinese firms are global rivals to their MNC counterparts in large established industries, such as telecommunications, or completely absent from other established industries, such as semiconductors.

The line defining industrial policy and competition policy is thin across the spectrum of advanced and emerging economies (Sokol 2014). What makes China's case unique is how fast competition policy has developed, how explicitly it is integrated with China's technological acquisition goals (in practice and in law) and how quickly Chinese authorities caught on to the role of competition policy as an extension of innovation and intangible economy development.

China's competition policy as it stands today is the result of a deliberate balancing act involving many interests and considerations. Interests include those of state-owned firms, private domestic firms, MNCs and state bureaucracies. Considerations include preventing foreign mergers from disadvantaging domestic Chinese businesses and fostering technology transfer from abroad. China's competition policy framework is a work in progress and constantly undergoing reform. However, recent reporting suggests that it may be deeply intertwined with China's industrial policy writ large and that Chinese courts may not be shy about using anti-monopoly considerations to foster technology transfer — especially in industries in which barrier to entry is highest, such as industrial and agricultural chemicals and semiconductors.

A recent *Wall Street Journal* investigation into China's technology transfer policies concluded that "China systematically pries technology from U.S. Companies," leading with Chinese antitrust authorities' raid on DuPont's Shanghai offices and demand for access to the company's countrywide research network (Wei and Davis 2018). The article suggests that Chinese JV partners of foreign firms (in this case, US-domiciled firms) rely on various "tactics…using local courts to invalidate American firms' patents, licensing arrangements, dispatching antitrust and other investigators and filling regulatory panels with experts who may pass trade secrets to Chinese competitors" (ibid.).

The *Nikkei Asian Review* also reported that China uses antitrust review to force foreign firms to sell their technology assets to Chinese enterprises (Cheng 2017). The story cited a Taiwanese firm, Siliconware Precision Industries, agreeing to sell 30 percent of its stake in a Suzhou semiconductor manufacturing factory to Tsinghua Unigroup in November 2017. The sale followed MOFCOM's approval of Siliconware's purchase of local rival Advanced Semiconductor Engineering — the world's largest chip assembler (ibid.). The sale was reportedly (albeit not clearly) one of the conditions for MOFCOM's approval of the deal, which would be said to reduce anticompetitive market outcomes of the acquisition. Indeed, both Unigroup and chip assembler Jiangsu Changjiang Electronics Technology had complained that the deal could increase market concentration and hurt their efforts to catch up in the global chip industry (ibid.).

Additionally, Chinese antimonopoly authorities' reach does not stop at China's border. Qualcomm's bid for Dutch semiconductor firm NXP was stymied, perhaps not incidentally in congruence with the US-China trade war, when the firm sought regulatory clearance from the NDRC to acquire the firm in 2017 — which Chinese authorities agreed to approve, conditional on US President Donald Trump's lifting the erstwhile ban on Qualcomm's equipment sales to state-owned telecommunications equipment maker ZTE (King 2018). However, the firm eventually scrapped the offer, as it became clear that Chinese authorities were delaying a response indefinitely (ibid.). The approval was necessary if Qualcomm was to avoid remedies such as divestment from assets in China or further licensing fee reductions, as the acquisition would noticeably affect Qualcomm's share of China's domestic semiconductor market.

At times, China's competition policy regime also makes rulings that not only prevent market concentration but also actively aim to level the playing field among foreign and domestic competitors — particularly in IP-dominant sectors. In March 2018, in the case of Bayer's acquisition of Monsanto, MOFCOM imposed two conditions on the newly formed corporate giant, namely, divestiture requirements and a mandate for the firm to give access to its digital platform to domestic agricultural firms. This example underscores China's willingness to impose more far-reaching behavioural remedies on foreign firms that enter into the realm of monopolistic market dominance, including giving domestic Chinese firms privileges with respect to their foreign competitors (Davis Polk 2019).

Are Chinese Competition Policy Practices Justified?

China's competition policies, when juxtaposed with its goals of helping Chinese firms to acquire a greater share of value in global technology value chains, suggest a contradiction — or at the very least, an inherent tension — within the government bureaucracy's approach to technological competition between Chinese firms and their global rivals. Simply put, while China wishes to create large, globally competitive multinational technology firms, it also wants to create a level playing field in its domestic market, which aims for competitive neutrality among national champions and new market entrants. This contradiction is illustrated in China's ongoing efforts to level the competitive playing field within China while ensuring that the evolving institutional framework for governing competition allows Chinese firms to catch up to their foreign competitors in terms of technological capabilities.

To understand the dilemma faced by China's competition policy makers and to shed light on their high-profile aggressive enforcement measures against large multinational firms, consider the instance of its actions against DuPont following the firm's merger with Dow Chemicals. The MOFCOM decision, discussed above, while easily construed as a case of the government siding with domestic business interests to extract technology from a foreign firm, was far more complicated. Omitted in Lingling Wei and Bob Davis's 2018 *Wall Street Journal* article cited above — not unreasonably, given the tight confines of short-form investigative reporting — is the background in the case.[25]

The most important omitted detail in the article is the reason behind Chinese authorities' decision to force DuPont to divest from some of its technology assets — specifically, those assets owned by the firm via its Chinese joint venture. DuPont's merger with Dow Chemicals, which the

25 To be sure, this paper does not seek to make judgments or conclusions about the improprieties that may have constituted any alleged collusion between private and state actors in China's regulatory process. However, the context adds complexity to the popular narrative about forced technology transfers and the state-enabled technology acquisition activities in which Chinese firms engage in the domestic context.

regulator conditionally approved, stipulated[26] mediating actions by the combined firm to prevent what MOFCOM deemed to be undue market concentration. As MOFCOM documented, "The transaction may lead to both parties' enhanced market control of ionomers. The structures of global and Chinese ionomer markets are so similar that there are only a few competitors and a high level of concentration. In 2015, Dow and DuPont accounted for 1% and 90% market share, respectively, or 91% totally, in the global ionomer market; they accounted for 0.01% and almost 100% market share, respectively, or *100% totally, in the Chinese market*" (MOFCOM 2017; italics added).

Irrespective of domestic firms' jockeying to obtain DuPont's assets in light of the antimonopoly investigation and the central government's alleged aims to transfer the firm's technology to its domestic rivals (all real possibilities), the reality of the firm's dominant market position cannot be swept aside by concerns about the influence of vested interests. As one of the conditions of approval, the merged megafirm would have to divest from some of its IP assets by selling some of its holdings to domestic firms. It should be noted that this "forced" sale of technology assets is not a competition enforcement practice unique to China. The European Union's competition authorities likewise demanded that Dow/DuPont divest several of its global holdings to ensure fair competition post-merger (European Commission 2017).

That said, China's antimonopoly regime differs quite strongly from its advanced economy counterparts. Not only is political independence of China's competition enforcement authorities questionable,[27] but the weight and considerations that China's antitrust authorities must give to China's industrial policy goals (such as domestic industry promotion, agricultural and industrial input prices and the like; see Ng 2013) also create incentives for authorities to transfer foreign technology from foreign to domestic firms. This makes China's antitrust regime distinct from its US counterpart, which, since the 1960s, has sought to ground its decisions in econometric analysis, rather than a broader set of socioeconomic considerations (Sokol 2015). Europe's current competition regime, by contrast, does maintain a strong degree of interventionism in its competition policy-based considerations such as consumer welfare and notions of fair competition in the EU market. It is not surprising that Chinese competition enforcement, which draws more heavily on the Mainland European legal model than on its Anglo-American common law counterpart, maintains a strong degree of overlap between industrial policy considerations and competition law enforcement (ibid.).

As Fuller (2016) has pointed out, Chinese authorities' prioritization for technological development tends to favour those MNCs whose business strategies are seen to be beneficial to China's economic development and those that "localize" most effectively. Indeed, the market participants interviewed for this paper have also commented that success in Chinese courts in IP-related cases is frequently influenced by the degree to which Chinese judges see the foreign litigants' practices to be beneficial to China's economic development.[28]

In 2018, MOFCOM's competition policy authority, as well as that of other agencies, was transferred to the new superagency SAMR. In 2019, the SAMR published a regulatory guide[29] that clarifies the government's attitudes on what the government considers to be instances of abuse of dominant market position (SAMR 2019). It is (perhaps) unsurprising to see that the range of behaviours that Chinese authorities consider to be contrary to fair competition to be broader than those considered by authorities in advanced economies. Notably, the level of development and barriers to entry in an industry are to be considered by regulatory authorities and judges, according to the regulatory guide, as are certain restrictions imposed by one JV partner on the licensing and patenting behaviour of another.

26 Because Dow and DuPont are China-domiciled firms, their merger impacts the competitive environment in China. In this context, China's competition authorities have significant negotiating leverage to legitimately impose stipulations and conditions on the merger in question.

27 In addition to being part of the executive branch of the Chinese government, MOFCOM also consults a variety of government and industry experts to weigh in on its judgment. In the DuPont case, the ministry states that it consulted "relevant government departments, trade associations, downstream customers and industry experts, held several... forums for the knowledge of relevant market definition, market players, market structure and industry characteristics" (MOFCOM 2017).

28 Author's interviews with market participants, February 19, April 10 and December 9, 2019.

29 Since China's three antimonopoly regulatory agencies amalgamated into the SAMR, it could be said that these new guidelines have more teeth than they did when they were first promulgated and opened for comment, in 2015 (see Wang 2017). However, the status of the SAMR in the hierarchy of China's government ministries remains unclear.

Policy Recommendations

This section offers a set of policy recommendations aimed at Canadian policy makers, but also applicable to policy makers in small and medium-sized open economies. It focuses on providing actionable suggestions to addressing a growing array of concerns expressed by many analysts and policy makers in Canada, the European Union and elsewhere with respect to investment and trade relations with China, in light of recent high-profile M&A transactions and investments by Chinese technology firms abroad, as well as by the continued presence of Sino-foreign technology JVs in China.

Policy makers need a holistic understanding of technology acquisitions. Understanding Chinese technological catch-up as stemming entirely from state-facilitated technology acquisition through M&A abroad and across-the-board forced technology transfers domestically obscures the wider array of approaches that Chinese policy makers employ to facilitate technological development in China and the transfer of technology from advanced economy firms to Chinese firms. China's attempts to ascend global value chains through the acquisition of foreign technology assets are not unprecedented and can be likened to the efforts of developmental states of past decades — including Korea, Japan and others.

Many of the tools that Chinese firms currently employ are not necessarily zero-sum in nature and most do not constitute anticompetitive or illicit behaviour. Perhaps more importantly, as Paul Triolo (2019) has pointed out, "supposed shortcuts such as illicitly acquiring technology do not constitute a viable business model and can only provide limited benefits without an innovative workforce, stable and adaptive management, and a realistic long-term business model and strategy."

Indeed, China's industrial policies are evolving to keep pace with China's global economic integration, the rapid growth of its firms and their expansion into global markets, and the country's very recent efforts to protect and commercialize IP. China's technology acquisition regime should not be viewed as an exclusively zero-sum endeavour aimed at raising China's technological capabilities at the expense of its trading partners. To be sure, in key strategic areas, such as semiconductors, China's FDI and financing policies do seek to provide direct state support for technological mastery and acquisition. However, beyond state-owned enterprises such as Ziguang, support is often indirect, targeting the commercialization of IP within China and prompting China's integration into the global intangible economy. As such, policy makers should develop a more nuanced and multi-faceted set of policies to ameliorate their concerns with respect to the acquisition of technology-related assets by Chinese firms.

Approach national security reviews of foreign investment with caution. In recent years, there has been a pronounced tendency in developed market economies — driven in no small part by outbound Chinese investments in technology and critical infrastructure — to legislate additional barriers to foreign investment on the grounds of national security concerns. Essentially, policy makers are worried about sensitive and potentially "dual use" technology leaking into the hands of foreign governments that are not military allies, or even potential adversaries.

However, this paper urges caution in using this approach, for two reasons. First, cutting off the flow of sensitive technologies such as robotics and AI involves more than blocking foreign acquisitions. In fact, M&A deals are just *one of many* channels for technology transfer available to private and state-owned firms in China. For many Chinese firms, patent acquisitions, standard setting and R&D spending (as well as talent poaching) are becoming alternative and perhaps more effective tools for catching up to their foreign market rivals. Moreover, for Canada, depriving our technology firms of capital that competitively bids on their assets puts them at a disadvantage with their US and Asian rivals. If the goal is to address Canada's lack of domestic technology proprietorship, policy makers should consider IP commercialization, VC incentives and other types of industrial policies, rather than blocking foreign acquisitions stemming from one single country.

Second, M&A restrictions create disincentives for Chinese policy makers to open their markets and reinforce existing policies promoting indigenous innovation. China's domestic market is the second-largest and fastest-growing market in the world. Beyond contributing to supply chains, China is a crucial market for the technology that many firms sell. Further, China is no longer the importer of technology across all fields. In AI, ICT

and telecommunications, China is increasingly becoming a net supplier of global technology.

Find areas of common ground: competition policy and FDI liberalization. Chinese firms are growing increasingly less reliant on JVs and restrictive FDI policies to compete with their advanced economy counterparts. Despite headline-grabbing news about China's leapfrogging over technological development stages through forced technology transfers in FDI and global acquisitions, empirical research suggests that the outcomes of these policy tools have frequently been lacklustre. In this context, it is far from surprising that China's new FDI law and amended JV law promise to even the playing field for foreign enterprises. And indeed, recent data suggests that prospects for foreign firms in China are showing significant signs of change on this front (Wildau and Blood 2019). Past practices such as reverse-engineering or forcing the transfer of old technology are far from reliable pathways toward global technological competitiveness. As such, China's commercial legal environment, especially as it pertains to IP, is becoming more transparent, regularized and overall more mature — if not always evenly so.

China's FDI and competition policies are aimed at helping China move up the value chain in global manufacturing, ICT and other industries. They exist to prevent unfavourable (to China) global industrial concentration and to promote the interests of Chinese firms in the global intangible economy. Canada, Europe and other countries face very similar policy dilemmas, and these are fundamental problems of economic globalization — not a China-specific problem. Working with China to outline global rules for competition policy and reasonable conditions that could be placed on global FDI within a global rules-based order presents opportunities for positive-sum global policy coordination. Global economic governance bodies such as the World Trade Organization and the Group of Twenty are appropriate candidates to consider as we seek effective fora for advancing these novel areas of policy coordination.

Work with small and medium-sized open economies to address the intangible asset accumulation dilemma that defines global trade. At the same time, these commonalities do not solve the most fundamental problem facing global trade governance today: as the global economy becomes increasingly defined by the trade in, and appropriation of, IP assets — which is, in many ways, a zero-sum game of technology acquisition and monopoly rents that accrue from said acquisition — there is no global framework that governs interstate competition in the field of intangible asset-dependent technology development. Canada and other small and medium-sized open economies are in real danger of falling further behind in the global race to accumulate intangible assets such as patents, trademarks and data. Canada's natural allies in addressing this dilemma are neither China nor the United States, as these two countries are IP-rich economies with large domestic markets that are, in some ways, self-sustaining. As an IP have-not, Canada should work with countries such as Australia, Singapore, European countries and emerging economies to propose global economic governance solutions in this space that would protect their interests against those of large economies that host IP-dominant firms.

Address the lack of global governance mechanisms for trade secrets and talent poaching and avoid science and technology balkanization. Lastly, talent poaching, trade secret theft and other clandestine forms of IP acquisition remain persistent problems in China. However, these are problems that reach far beyond China, as businesses find it increasingly worthwhile to keep IP private, rather than to register their innovations as patents or trademarks. A cursory glance at legal digests and IP trade publications will reveal that this is a problem that extends beyond China's conflict with its trading partners. That rules and norms governing IP across the globe are more stringent than at any point in human history should give policy makers and businesses some perspective about why evidence of illicit behaviour is so easy to identify in China. Just because the world paid less attention to these issues in past decades does not mean that they grew in tandem with China's global economic emergence.

Moreover, legal and economic research into questions of IP and development have long shown that developing and emerging economies are not necessarily well served by adopting developed economy IP norms and rules at earlier stages of development. China is, not surprisingly, walking a fine line between giving its government space to facilitate technological acquisition and development and enforcing increasingly confining global rules surrounding IP governance.

Therefore, following the United States' lead to extend national security provisions to instances of trade secret theft is not clearly beneficial — and in fact, arguably detrimental — to fostering fair competition and innovation across the world. It is worth considering global institutional solutions to the issue of trade secret proliferation in a way that protects the legitimate interests of multinational firms but does not excessively limit innovation, competition and international cooperation in science and technology.

Conclusion

This paper has sought to investigate China's technology acquisition framework, along three dimensions: the commercial dimension, which involves Chinese firms' outbound technology acquisitions; inbound, JV-based practices; and regulatory and jurisprudential policies employed by Chinese authorities, notably competition law. The paper has found that the practices that comprise Chinese firms' acquisition of foreign technology is not necessarily a top-down government-driven effort aimed at giving Chinese firms an unfair advantage vis-à-vis their foreign counterparts. Rather, IP commercialization and competition policy play important policy roles along traditional policies such as FDI restrictions and fiscal subsidies and policy guidance for strategic industries.

China's technology acquisition tool kit comprises a complex policy mix of state guidance and funding, independent agency on the part of Chinese and foreign firms, and a desire to level the playing field between global oligopolistic and monopolistic business interest and China's technological development. Outbound acquisitions are but one of many options available to Chinese technology firms in acquiring strategic technology assets, which also include patent purchases and R&D partnerships with foreign universities. Moreover, this paper has shown that many of the high-profile outbound M&A transactions (attempted and completed) by Chinese firms do not break with market-based corporate strategies to reach higher quality technological components and consumer electronics markets and to capture a greater share of value added in global trade.

While unfair practices and coerced technology acquisition remain significant issues, policy makers in Canada and elsewhere should develop a more nuanced understanding of China's drive to catch up to developed economies in terms of technological capabilities. As China's FDI policy regime, competition policy, and IP protection and commercialization frameworks continue to evolve, China's trading partners should find areas of common concern. These include global concentration of corporate and IP assets in the hands of ever-fewer firms — the need to determine mutually agreed-upon global trade rules governing industrial subsidies, as well as talent poaching and trade secret theft. This paper shows that China is unlikely to remain a net technology importer for very long and Canada should prepare for the not-too-distant future when technology transfer flows from, not just into, China. To respond, Canada should embrace China's drive to create a more innovative economy and to scale up its manufacturing sector. Canada should seek cross-border agreement on competition policy, cross-border IP and data flows, technological standardization practices, and IP norms generally.

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