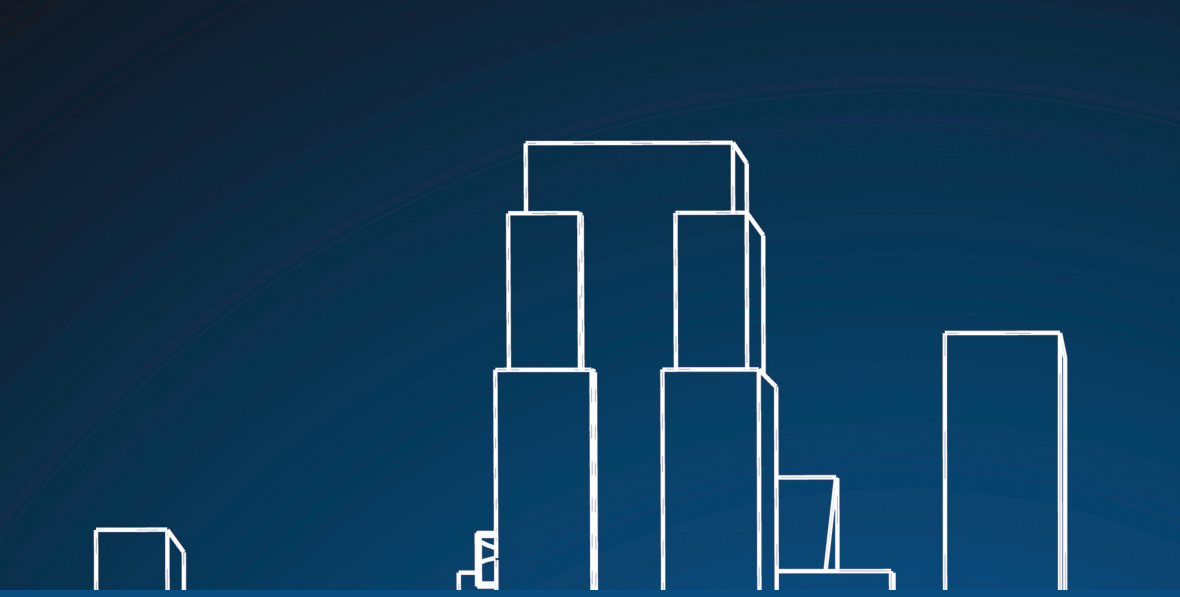
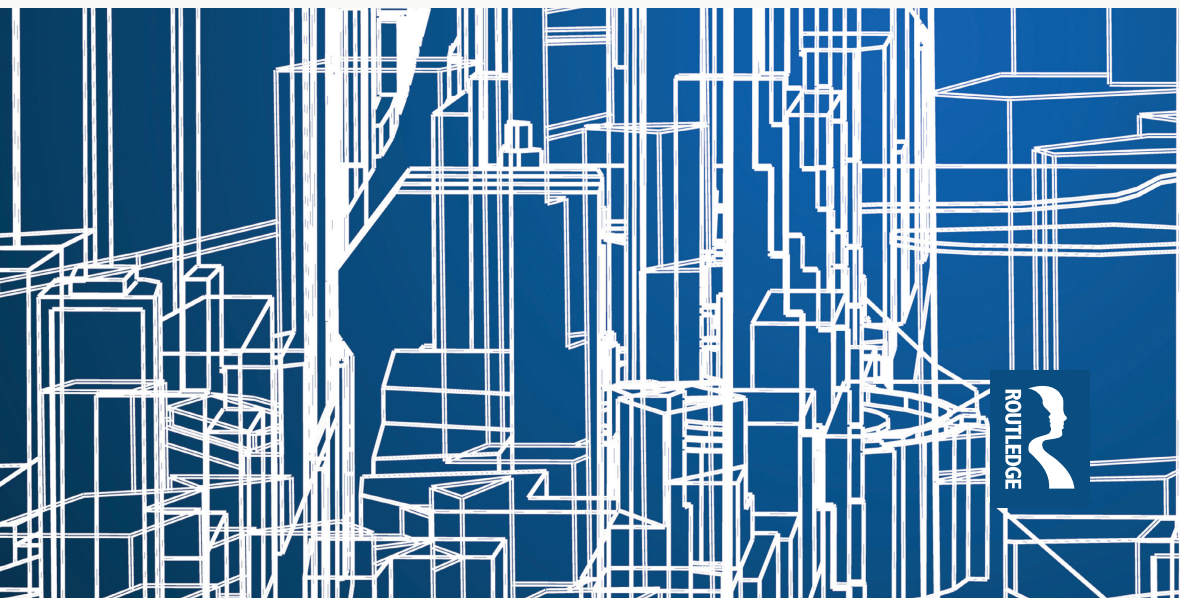


Routledge Studies in Policy and Power

CONTESTED DEVELOPMENT IN CHINA'S TRANSITION TO AN INNOVATION-DRIVEN ECONOMY

Yvette To



Contested Development in China's Transition to an Innovation-driven Economy

This book investigates how technology and innovation policies in contemporary China are impacted by collaboration and conflicts between different classes and interests in a world economy, in which competitiveness is defined by the successful leverage of emerging technologies.

Focusing on the actual processes and outcomes of technological upgrading in three dynamic sectors, the book presents an alternative approach to understanding China's industrial upgrading strategies, by examining the ways in which the making and implementation of policies are shaped by political struggles between state actors and dominant capitalist interests in the context of global capitalism. In doing so, the book challenges influential institutionalist approaches as explanations of institutional change, positing instead a political economy framework grounded in social conflict theory to reveal how power relationships and politics are intrinsic to the evolution, form, and function of institutions.

This book will be of key interest to scholars and students of international political economy, development studies, globalisation and innovation, China and Chinese politics, and public policy.

Yvette To is a Postdoc at the Department of Asian and International Studies, City University of Hong Kong, Hong Kong.

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To Roger, Isabel, and Aaron

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List of Acronyms and Abbreviations

5G	Fifth-generation
AAPC	American Automotive Policy Council
ACEA	European Automobile Manufacturers Association
AI	Artificial intelligence
API	Active pharmaceutical ingredient
BAIC	Beijing Automobile Industry Corporation
BAT	Baidu, Alibaba, Tencent
BRI	Belt and Road Initiative
CAS	Chinese Academy of Sciences
CATL	Contemporary Amperex Technology Co. Ltd
CCP	Chinese Communist Party
CFDA	China Food and Drug Administration
CII	Critical information infrastructure
CM	China model
CME	Coordinated market economy
CPPCC	Chinese People's Political Consultative Conference
CPTPP	Comprehensive Progressive Trans-Pacific Partnership
CSIS	Centre for Strategic and International Studies
DS	Developmental state
EMA	European Medicines Agency
EU	European Union
EV	Electric vehicle
FAW	First Automotive Works
FDA	Food and Drug Administration (US)
FDI	Foreign direct investment
FIE	Foreign-invested enterprise
FYP	Five-year plan
GDP	Gross domestic product
GVC	Global value chain
GM	General Motors
GMP	Good manufacturing practices
HI	Historical institutionalism
HKSE	Hong Kong Stock Exchange

ICH	International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use
ICT	Information and communication technology
IMF	International Monetary Fund
IoT	Internet of Things
IP	Intellectual property
IPO	Initial public offering
IT	Information technology
JAMA	Japan Automobile Manufacturers Association
KAMA	Korea Automobile Manufacturers Association
LME	Liberal market economy
M&A	Merger and acquisition
MIC2025	Made in China 2025
MIIT	Ministry of Industry and Information Technology
MITI	Ministry of International Trade and Industry (Japan)
MLP	15-year Medium- to Long-term Plan for Science and Technology (2006–2020)
MNC	Multinational corporation
MOST	Ministry of Science and Technology
NASDAQ	National Association of Securities Dealer Automated Quotation System
NDRC	National Development and Reform Commission
NRDL	National Reimbursement Drug List
NEV	New energy vehicle
NIE	Newly industrialised economies
NMPA	National Medical Products Administration
NNI	National Nanotechnology Initiative
NPC	National People's Congress
NRDL	National Reimbursement Drug List
NYSE	New York Stock Exchange
OECD	Organisation for Economic Cooperation and Development
PLA	People's Liberation Army
POOE	Private obscurely-owned enterprise
PRC	People's Republic of China
QBPC	Quality Brands Protection Committee of China Association of Enterprises with Foreign Investment
R&D	Research and development
RCEP	Regional Comprehensive Economic Partnership
RMB	Renminbi (Chinese currency)
S&T	Science and technology
SAIC	Shanghai Automobile Industry Corporation
SEI	Strategic emerging industry
SEZ	Special Economic Zone
SGCC	State Grid Corporation of China

SIPO	State Intellectual Property Office
SOE	State-owned enterprise
SUV	Sports utility vehicle
TPP	Trans-Pacific Partnership
TNC	Transnational corporation
TRIPS	The Agreement on Trade-related Aspects of Intellectual Property Rights
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
USTR	Office of the United States Trade Representative
VoC	Varieties of Capitalism
WHO	World Health Organization
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

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1 Introduction: Understanding China's Transition to an Innovation-driven Economy

Politics, History, and Context

Introduction

> No one is in a position to dictate to the Chinese people what should or should not be done… Socialism with Chinese characteristics provides a broad pathway for China to advance with the times and steer the course of development today… We will resolutely reform what should and can be reformed, and make no change where there should not and cannot be any reform.
>
> *–President Xi Jinping, speech delivered at a conference celebrating 40 years of reform and opening, 18 December 2018*

> The Chinese government continues to resist—and in some cases reverse progress on—many promised reforms of China's state-led economic model. Repeated pledges to permit greater market access for private domestic and foreign firms remain unfulfilled, while the CCP instead enhances state control over the economy and utilizes mercantilist policies to strategically develop domestic industries.
>
> *–US-China Economic and Security Review Commission 2018 Report*

For many countries, cultivating innovation and investing in science and technology are key to development. Leading economies, such as the United States, Germany, and Japan, have become economic powers at different times in history through harnessing opportunities presented by technological advances and globalisation. For late-industrialising economies (those whose modern development began at a later stage than the more advanced economies), spurring innovation, acquiring 'leapfrogging' technologies, and nurturing competitive enterprises have become the default path to catching up with leading nations. China is no exception. From the 'Four Modernisations' adopted in the late 1970s to the controversial Made in China 2025 (MIC2025) programme announced in 2015, industrial upgrading policies have been integral to China's reforms, notwithstanding their varying content and results. While science and technology (S&T) development has been an important element in the country's reforms for decades,

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technological upgrading has in recent years drawn unprecedented attention. To some countries, China has become a 'strategic rival' (The White House 2017) and an 'economic competitor in the pursuit of technological leadership' (European Commission 2019, 1).

Yet many remain sceptical about China's technological capacity and its prospects for becoming a global technology power, for reasons which include the inherent shortcomings of Chinese state capitalism, the lack of human capital within the country, and various other complex internal challenges. Questions have also been raised about China's approach to technological upgrading and to market reforms more broadly. The leadership's new emphasis on 'dual circulation' (announced in the Politburo meeting in May 2020) and supply-chain independence (emphasised in the 14th Five-Year Plan (14th FYP, 2021–2025)) is meant to strengthen domestic capacity for developing core technologies and to achieve a greater degree of self-sufficiency. Yet aiming for technological self-sufficiency could end up compromising the benefits of technological diffusion in the long term, not to mention the feasibility of such a strategy given that many modern technologies are products of combining specialised components and technologies in different localities. Further adding to the scepticism towards China's technological progress is the changing political climate in the country, which has seen a host of regulatory measures against leading domestic internet technology companies since late 2020. In preparation for his third term as the President of China,[1] Xi Jinping has campaigned on his vision of 'common prosperity' and shared development (China Daily 2021), allying himself and the Party with common people and the underprivileged to curb the power of the monopolistic class, which is particularly associated with Chinese tech giants. These regulatory policies, which some have dubbed Xi's 'Red New Deal' (Kuo and Goldkorn 2021), were promoted as part of Xi Jinping's new development philosophy to eradicate undesirable social behaviour and to redirect productive resources in the society for a thriving, more equitable China. Yet the repercussions of these measures are potentially profound. There are fears that the regime's tightening grip on private capital and civil society, from imposing restrictions on the entertainment industry to curtailing working hours in the tech industry, will stifle innovation and undermine the confidence of investors. Whether or not these policies address immediate problems at the expense of longer term development remains to be seen.

In addition to addressing issues of political legitimacy, social inequality, and economic restructuring at home, China continues to rely on a friendly and liberal external environment to provide markets and capital for the country's development. On several occasions, Chinese leaders, with different political and economic motives, have pledged their commitment to international free trade and multilateralism. One notable example is Xi Jinping's inaugural speech at the World Economic Forum at Davos in 2017

(CGTN America 2017), which presented China as a defender of globalisation. Even amidst talk of a new Cold War, decoupling, and trade disputes with countries including the United States and Australia, China submitted a formal application in September 2021 to join the Comprehensive Progressive Trans-Pacific Partnership (CPTPP)—a regional trade pact involving 11 countries, created after the United States withdrew from the Trans-Pacific Partnership (TPP). One could argue that Xi Jinping wanted to reap political gains at a time when the United States, under the Trump administration, was adopting a more protectionist stance and appeared to be taking a step back from its global role. As for the CPTPP, Chinese leaders could be hoping to influence regional trading policies and standards, should it become a member. Yet these political moves also reflect China's developmental needs and the country's reliance on economic globalisation working in its favour. For China, joining a regional trade pact with higher entry requirements could be a vehicle for stamping out domestic opposition to the introduction of tougher economic reforms.

The political and historical contexts are important to understanding China's contemporary reform in relation to industrial upgrading. Clearly, the measures needed to strengthen industrial and manufacturing capacity in Deng Xiaoping's era were very different from those involved in leveraging frontier technologies in Xi Jinping's time. Notwithstanding multiple forms of new technology, which are often underpinned by complex production chains, the conditions in which China pursues development and the manner in which Chinese policymakers communicate their national plans to domestic and international audiences, are very different in the contemporary context. Although the country might have weathered the storm of COVID-19 rather better than many advanced economies, the fact that Xi Jinping is taking controversial steps to reset the unbalanced economy while cementing his political legitimacy is a telling sign of the complex challenges facing China and its elites. The ruling party is fighting a two-pronged battle. Internally, it is contending with the middle-income trap, rising debts (as seen in the Evergrande debt crisis in September 2021), an erosion of the demographic dividend, social unrest, and potential threats that undermine political legitimacy. Externally, it faces a more hostile environment which has arisen, in part, in response to Beijing's assertiveness in technology policies and foreign relations. Amongst various actions taken by the Chinese Communist Party (CCP), Beijing's 'wolf warrior diplomacy' (Martin 2021), which was evident for much of 2020 and was adopted by some Party officials to serve certain domestic audiences, has damaged China's relations with a host of countries. One of the impacts has been a stronger push by foreign political and economic interests to counteract the overseas expansion of Chinese tech capital. Souring external relations have also generated pressures that impact China's attempts to move up global value chains (GVCs). In this context, no analysis of China's development processes can ignore the close interactions between domestic forces and

external dynamics, or the impact of political and economic interests on institutional forms. Indeed, it is the goal of this book to explain precisely how these interactions have shaped contemporary Chinese innovation and technology policies.

China under Xi Jinping has been explicit about its technology ambitions. The policies adopted by the CCP to achieve its ends have drawn criticism, while the country's technological progress has received a mixed assessment. Yet Breslin (2021) also reminds us that some dominant discourses about Chinese global power and the 'threat' it represents (and could pose in the future) tend to be built on China's aspirations—in other words, what Chinese policymakers hope to see—rather than China's actual capabilities. At a time when China's assertive, and sometimes impulsive and unpredictable, actions have triggered much speculation over its projected and actual technological capabilities, this book aims to offer new insights into the complexity of innovation and technology policies in contemporary China, by explaining the divergent interests that drive policy direction and outcomes, and by analysing the impacts of global capitalism on national development in contemporary China. Here the case of China's technological upgrading serves as an analytical focus to explain, both theoretically and empirically, the dynamics of innovation-related institutional transformation in late capitalism. Covering the period from the beginning of the 11th FYP (2006–2010) until the end of the 13th FYP (2016–2020), the case studies in this book demonstrate the motives and forces shaping national policies aimed towards spurring innovation and facilitating technological advances in key industries in China.

Overall, I detail a complex developmental story embedded in an age of hyperglobalisation, where liberalised international trade and capital flows, alongside integrated global production chains and the race for emerging technologies, are making national development increasingly complicated. These forces, coupled with internal challenges faced by China, impact innovation and technology policies and their outcomes. It appears that, as state actors strive to create the domestic conditions to promote competitive enterprises, their attempts are mediated by pressures from foreign actors and by domestic political considerations, not to mention the decentralised nature of the Chinese state which gives important powers to provincial and local governments to implement policies on the ground. In many cases, ruling elites are responding to rival demands from different fractions of interests which negotiate rules related to market access and technological transfer. The results are variegated reform processes and outcomes across sectors, as a diverse set of interests exercises varying degrees of power and leverage to contest institutional rules. It is the interactions between these interests to make gains in emerging technologies in the context of competitive global capitalism, which explain much of China's industrial upgrading efforts.

Themes and arguments

Given China's global economic influence, its authoritarian political structure, and the legacy of its copycat culture, the prospect of China becoming a global technology power, as envisioned by Chinese leaders, has attracted a lot of scholarly interest.[2] Yet equally important, but less adequately addressed in most of the literature, is what China's pursuit of technological progress tells us about the sources and workings of institutions in relation to sustaining development in the context of highly competitive late capitalism. For example, are policies made independently to meet the functional needs of China's development, or do they rather reflect the immediate interests of some actors over others? How much autonomy do policymakers have in implementing policies to promote industrial upgrading, as well as in achieving anticipated outcomes? This book answers these questions by analysing attempts to advance innovation and technological upgrading in China. What becomes evident from the analysis is the contingent nature of development and, indeed, its relationship to patterns of contestation and collaboration between state actors, new and established economic players, as well as domestic and multinational interests, when it comes to the control of competitive resources.

There are three central themes in this book. Each of them responds to past and current understandings of institutional transformation in China, and explains why these need to be re-examined. The first relates to understanding the relationships between institutions and development. Many critiques of China's industrial and technological upgrading centre on the question of whether its political and economic institutions facilitate or hinder innovation and technological development. Some argue that massive state subsidies and the rote learning culture have hindered Chinese innovation (Abrami, Kirby, and McFarlan 2014; Kennedy 2017; Kennedy and Qiu 2018), while others suggest that favourable government policies have nurtured the rapid growth of domestic enterprises in the tech sector (Tse 2016; Fan 2018). These works tend to assess China's reform outcomes largely in terms of technology 'scorecards'. While such an approach is helpful in providing a picture of how certain institutions in China facilitate or hinder innovation, it nonetheless distracts us from other factors which affect development, particularly those which influence the identification of development objectives, and the setup and evolution of particular institutions.

To address this limitation, this book examines China's contemporary industrial upgrading reforms from a different perspective, seeking to explain reform processes and outcomes in terms of interactions between state actors and various forms of capital at particular junctures. Importantly, these interactions evolve in a highly competitive environment dominated by global capitalist relations; it is these exchanges that shape institutional change and continuity along the state–market spectrum. Therefore, the clues to innovation-led development are neither solely to be

found in identifying desirable types of capital, nor in optimising institutions for industrial upgrading; rather, the key is understanding political and economic contests among important interests (political elites, domestic- or foreign-linked capital) and how these interactions shape policies and rules. The political motives that drive institutional change are also critical. When the Trump administration labelled China a revisionist power that sought to rewrite international rules for its own interests (The White House 2017), and subsequently implemented policies to restrict the export of US technologies to selected Chinese firms, this narrative served the political interest of the administration at the time, creating an enemy to blame for America's problems and to unite the country. Meanwhile, Xi Jinping's initial support for internet technology development can be contrasted with the regime's more recent chastising of its own internet technology conglomerates; changes in policies are often driven by elite interests motivated by political considerations. Institutions evolve and their processes of change are often contested by political and social actors. Therefore, any analysis of China's efforts in industrial upgrading requires an understanding of the political, economic, and social relationships involved in reform strategies in an interrelated sense.

Given this understanding of institutions and development, which is applied throughout the book, the second theme offers an assessment of different theoretical positions on the relationship between institutions and development. The influential institutionalist approaches, such as new institutional economics and historical institutionalism, and other state-centric analyses, such as the developmental state and the China Model literature, have analysed the relationship between institutions and development in different empirical settings. Despite their important contributions in analysing institutional variables and their effects on policy outcomes (such as the impact of market-promoting policies advocated by new institutional economics, different types of capitalist systems explained by historical institutionalism, and the function of the state in advancing development championed by developmental state advocates), these positions are often grounded in different forms of reductionism such as methodological nationalism and cultural and historical empiricism. The conditioning effect of path-dependency on policies, and the emphasis on institutional continuity over change, hamper certain institutional approaches in their explanations for divergent patterns of development which are evident in modern-day China. Institutional change is not only shaped by processes within the narrow national context, but also by forces that span across territories. The broader context in which various interests interact is crucial as structural forces influence the relative power of different social groups within and beyond national territories. Furthermore, the political motives of dominant elites can play an oversized role in driving institutional change at particular points in history. In sum, institutionalist positions variously neglect the role of class conflict in conditioning development outcomes and fail to map out

the precise political, social, and historical conditions (particularly those in relation to late capitalism) that extend well beyond any individual nation-state and that make certain developmental processes possible. Addressing the limitations of some existing theoretical approaches to institutional development, this book adopts a critical political economy approach to understand institutional processes in China that aim at boosting competitiveness and innovative capacity. It draws upon the Murdoch School of political economy and its prioritising of the role of conflict and cooperation between class and other social forces within the dynamic and contradictory context of late capitalism to explain institutional development. This is an approach that begins with social forces, the interests that they pursue at particular junctures, and the impact this has on development. This theoretical component will be explained in detail in Chapter 2.

The third theme explores the conception of the Chinese state with respect to its role and capacity in promoting innovation-led development. Many earlier efforts have been made to understand China's mode of development at different periods, resulting in various classifications of the Chinese state and its relations with the market. Some notable descriptions include the 'socialist developmental state' (White and Wade 1988), the 'entrepreneurial state' (Blecher 1991), a 'diffuse developmental state' (McNally and Chu 2006), 'state-led capitalist developmentalism' (Gallagher 2005), 'state capitalism' (Bremmer 2009), and the 'regulatory state' (Hsueh 2011), among others. While these descriptions capture some characteristics of the Chinese party-state, they are less successful at accounting for the forces which have shaped the divergent approaches of the Chinese party-state (illustrated in the sectoral case studies discussed in this book) as it attempts to accelerate development through various forms of industrial upgrading. As this book reveals, rigidly pigeonholing China into a particular 'type' of state oversimplifies the pattern of ongoing reassessment of national priorities and shift of policies by the CCP to meet new demands.

This book argues, instead, that the Chinese state responds differently to market forces and capitalist interests across different sectors. State actors sometimes overrule these interests; while at other times, acquiesce to their demands or work with particular actors who have leverage over assets that are considered vital to national development. The contribution of this book is to explain these uneven, and sometimes unpredictable, responses. As China's political economy becomes more complex and expands to include an increasing number of actors with divergent interests, there are dispersed sites of power (both within the party-state apparatus and beyond it) contesting policies and rules. In this sense, Chinese state actors at national and local levels have become part of a multitude of interests, rather than being dominant players with firm control over policies. While the CCP is consistently portrayed, and sometimes even understood, as an omnipotent hand manipulating institutional rules to push development objectives, and consequently subordinating the interests of other states in the context of

advancing national technological progress, the capacity and controlling power of the Chinese state has been overstated.

The battlegrounds on which state actors and different fractions of capital interact are examined in the three sectoral case studies discussed in the book. These cases examine the various ways in which institutions are created by political elites (influenced by vested interests and structural forces) to facilitate favoured actors to acquire technological capacity and the extent to which policies and rules are contested by competing interests. What is particularly interesting in China's case is that while there is an ongoing claim by politicians and transnational capital that the Chinese state favours domestic capital at the expense of foreign capital, this is not a constant rule. In some cases, state actors alter market access rules in favour of competitive foreign companies in order to meet important development goals. In a fluid, competitive institutional setting, actors collaborate and compete for power, resources, and market access, with some enjoying a stronger capacity to influence the policy agenda than others. These complex relationships are evident in contemporary China; unpacking them is critical to understanding the making of innovation and technology policies in China, and China's development trajectory more broadly.

To support the above arguments, the following sections offer some background to understanding the relationship between innovation and development, and examine how such a relationship has evolved over time with the rise of new competitive forces. In addition to providing some key working definitions, I introduce an alternative perspective of China's institutional development that focuses upon various patterns of conflicts and collaboration among different interests under global capitalism.

New dimensions of growth and competitiveness

Innovation underpins a nation's competitiveness. This has been historically proven, most notably by the Industrial Revolution, which gave rise to leading industrial powers. The history of development has suggested, among other things, that technological innovations fuel competitiveness among enterprises, with resulting spillover effects further driving national development. The positive correlation between innovation and development has been studied at length. According to Schumpeter (Schumpeter 1989, 104), development is a historical process of structural changes that is substantially driven by innovation. Innovation often creates new production functions, while entrepreneurs, defined as those who carry out innovations, create new opportunities for investments and employment. The apparent link between innovation and economic growth has prompted national governments to introduce innovation-led strategies and increase investments in technology and human capital to drive growth. Some examples of these strategies include *A Strategy of Innovation* for the United States; *High Tech 2020* and *Industry 4.0* for Germany; the *Science, Technology, and*

Innovation Comprehensive Strategy for Japan; and MIC2025 for China. For late industrialisers, like China, ongoing changes at the leading edge of economic development imply that different catch-up strategies are required at different conjunctures (Jessop 2016, 35). Two recent developments further explain why the acquisition of technological capabilities and control over innovation-linked assets have become vital to advanced economies and late developers alike in the 21st-century economy.

First, revolutionary advances in information technology (IT) and machine learning in recent years have radically transformed physical products into intelligent ones increasingly powered by data, networks (the 'Internet of Things'), and automation. For example, a modern vehicle can be more than just a machine driven on a road. A sophisticated and 'smart' vehicle can potentially be equipped with wireless and networked communication, navigation, and self-driving capabilities, as well as energy-efficient, energy-saving, and energy-generating mechanisms. This signifies an expansion and transformation of the scope of capabilities and skills that auto manufacturers now require to produce a modern, competitive vehicle. Manufacturers have to either develop or acquire these capabilities themselves, or partner with other firms that specialise in these areas. IT, network communication, data storage and delivery, automation, and artificial intelligence (AI) have all emerged as frontiers of technology over which rival firms and nations battle to gain control and dominance.

Furthermore, the transformation of global production chains, made possible by advances in transportation and communication technologies, has further fragmented processes of production, which now entail the manufacturing of product parts and components in multiple locations before they are finally assembled. For late developers, acquiring stronger capabilities in emerging technologies in the context of fragmented global production chains provides a breakthrough opportunity that allows them to leapfrog and play a role in the manufacturing process of a range of physical goods traditionally belonging to the strongholds of advanced economies, such as automobiles. As Van der Pijl (1998, 84) points out, the global political economy is characterised by the transnational, albeit uneven, penetration of capital, giving rise to 'contender states', such as China and other late industrialisers, who aim to catch up with advanced, dominant states.

Second, related to the points on emerging technologies above, there has been a shift of focus among firms towards acquiring intangible assets in addition to tangible ones. These are assets that do not take any physical form, for instance, new ideas, brand names, and data; their value is hard to determine because it is embedded in the potential benefits they can bring in the long run.[3] The rise of intangibles has made some firms more valuable and competitive than others, while the global economy is becoming increasingly intangible-intensive (Haskel and Westlake 2017). Traditionally, firms have succeeded on the back of new and competitive products such as personal computers, cars, and televisions. Nowadays, a number of companies

accumulate wealth not by producing physical products but by leveraging off digital platforms and data that connect providers and users. Immaterial objects have become more important than material ones for profit accumulation in the contemporary global economy (Haskel and Westlake 2017).

The increase of investments in intangible assets has buttressed the growth of tech capital, making it a dominant fraction of global capital. Today, a number of the world's top ten companies by market capitalisation, including Apple, Microsoft, Amazon, Alphabet (owner of Google), and Meta (Facebook), are technology companies with a rich portfolio of intellectual property (IP). Their value is generated not by physical assets such as production plants and machinery, but rather by intangibles such as software, design, data, branding, business processes, and corporate know-how. These global tech companies have displaced traditional conglomerates, such as those in the banking and energy sectors, to become the world's richest enterprises. Leading firms have also shifted to new accumulation strategies that place a greater emphasis on acquiring and profiting from intangible assets. Licensing out IP has become an important source of revenue for leading global tech companies. As the *Financial Times*' Martin Wolf (Wolf 2017) notes, 'we live in a world where many of our best ideas remain disembodied'. The great ideas that generate value nowadays do not take physical form. China's pursuit of technological advancement needs to be understood in terms of these changing dynamics in technology and the global economy.

In the realm of highly competitive global capitalism, the growth of Chinese tech-linked capital within and beyond national borders is a new disruptive force causing contention. At the policy level, Chinese state actors have allocated generous credit to targeted domestic manufacturers and protected them from external competition through investment rules that disadvantage foreign capital. This, in part, strengthens the capabilities of Chinese tech-linked capital. Several Chinese companies have managed to leapfrog current developments to produce competitive technologies, for example, wireless network equipment, following an initial stage of production imitation and second-generation innovation (Fan 2018). The fact that Huawei Technologies (hereafter 'Huawei'), a Chinese manufacturer of mobile handsets and wireless network equipment, has overtaken the US and European tech leaders in terms of market share of vital competitive technologies has alarmed advanced economies. Yet Huawei is not a product of pure government design. Its growth has in part been facilitated by revolutions in global production processes, whereby the fragmentation of production offers the opportunity for Chinese manufacturers to become lead suppliers in certain tech products. Again, it would be simplistic to assume that industrial upgrading could happen simply by investing the right capital and making institutions functional for their purposes. The pursuit of 'catch-up competitiveness' (Jessop 2016) is associated with a harsh reality. As late industrialisers (including both states and firms) gradually move up GVCs, they encounter increased pressures from their key rivals and heightened

political scrutiny from the foreign governments that represent them. This is evident in the tension around Chinese tech capital and the trade friction with the United States. These confrontations suggest that explaining development patterns related to China's technological upgrading requires more than simply identifying the presence and evaluating the efficiency of institutional arrangements in which upgrading takes place. Instead, the conflictual nature of acquiring tech-linked assets—along with the ways in which these assets bring other material and non-material gains—should be carefully considered. Global social structures (e.g., financial institutions and rules that govern trade and investment) and their impacts on technological upgrading processes are also important considerations when it comes to understanding China's development opportunities and constraints.

Institutions and hyperglobalisation

The process of China's contemporary technological upgrading illuminates much about the formation and evolution of policies and rules. This book employs a common definition of institutions that includes formal political, legal, and economic institutions (government structures, the legal system, and the arrangement of the markets) along with informal ones (commonly accepted forms of behaviour, norms, practices, and narratives). Douglass North (North 1990, 3) defines institutions as the 'rules of the game in society' or, more formally, 'the humanly devised constraints that shape human interaction'. While not getting into the who and why of institutional form and function just yet, institutions are created by humans to fulfil specific purposes for structuring life. For example, collective institutions such as laws, the market, and multilateral rules (such as those governing trade) coordinate the behaviour of large numbers of actors, although in many instances, these institutional structures also convey certain preferences and objectives. By coordinating strategic interaction among actors within a political economy, institutions have the effect of empowering and constraining actors through the incentive structures they construct. They therefore characterise various political, economic, and social relationships within and between polities. For some, institutions 'are the fundamental cause of economic growth and development differences across countries' (Acemoglu and Robinson 2008, 1), although cross-country variations in endowments also play a secondary role. The functioning of economic institutions has also been found to be responsible for a wide range of development outcomes (Djankov et al. 2002; Acemoglu and Robinson 2008).

In this respect, institutions are prioritised in studies of late development, among other things, for their apparent roles in facilitating investment, presenting the necessary conditions for innovation and industrial upgrading, and, of course, making trade patterns possible. It is generally understood that any transition from imitating existing technology to producing and diffusing new knowledge involves significant institutional changes (e.g.,

relating to property rights and market entry) at both the firm and national levels. A late-industrialising economy which embarks on industrial upgrading cannot rely on its existing institutional setting—arrangements that served very different purposes in the past—but instead generally needs to experience institutional overhauls. The purpose of these changes is to reform existing institutional structures and develop new ones to facilitate processes of technological learning, provide sources of financial support, and ensure that innovators are incentivised to innovate. All countries have various structures, either inherited or newly built, that promote or inhibit innovation, consequently shaping the processes and outcomes of technological upgrading. In this light, studies on innovation patterns and catch-up strategies generally centre on the resources that latecomer firms and nations need to amass, in addition to the various forms of political, economic, and social organisation that provide the basis for building effective innovation systems in a changing global environment (OECD 2002; Lundvall et al. 2011; Nathan, Tewari, and Sarkar 2018). Critiques of institutions in economics and political science vary considerably in terms of their foci and the specific aspects of institutions they aim to address. This divergence, along with the respective contributions and weaknesses of different approaches, will be discussed in Chapter 2.

A key aspect shaping China's trajectory of technological catch-up is the political–economic context. China's catch-up development is occurring in the age of hyperglobalisation—a deeper and more extensive form of globalisation—which sets its development patterns apart from those of its predecessors, such as Japan. Hyperglobalisation, which emerged in the early 1980s, has been driven by extensive deregulation and market liberalisation (UNCTAD 2017) as proponents of neoliberalism sought to maximise free trade, encourage unfettered capital flows, and create 'seamlessly integrated world markets' (Rodrik 2017, 267). The turn to market fundamentalism, championed by Ronald Reagan and Margaret Thatcher in the 1980s, initiated a surge in cross-border flows of goods, services, and capital, and the establishment of global integrated supply chains by multinational corporations (MNCs) and transnational corporations (TNCs). Under hyperglobalisation, trade has grown more rapidly than world GDP (Subramanian and Kessler 2013). Trade as a percentage of world GDP rose from 27.3 percent in 1970 to 38.7 percent in 1990 and 60.3 percent in 2019 (World Bank 2021). Hyperglobalisation is characterised by the ease and availability of various channels for capital transfer, which has facilitated increased financial flows across markets and the growing influence of financial markets globally. According to the McKinsey Global Institute, the global stock of foreign investment relative to global GDP stood at roughly 180 percent in 2016 (Lund et al. 2017). With financial flows outpacing production and exchanges in the real economy, economies have become increasingly dependent on a vibrant financial sector. For example, the finance, insurance, and real estate sector in the United States has grown to account for around 20 percent of

the country's GDP, compared with only 10 percent in 1947 (Witko 2016). The increased mobility of finance capital and the availability of various financial instruments have made it easier for corporate actors to access finance, reap profits through speculative activities, and fund their research and development (R&D) and other expensive projects. In China, marketisation and regulatory reforms have led to the country's deepening financial integration with the world. This is indicated by a continued rise of foreign direct investments (FDIs) into China (except in 2019 and 2020 when the global economy slowed down due to COVID-19) and portfolio investment in Chinese stocks and bonds (Lardy and Huang 2020).

The increase in global capital flows in the contemporary world economy is in part driven by a reorganisation of global production, which can be understood in terms of GVCs. These are integrated networks of production processes which are organisationally fragmented and geographically dispersed (Gereffi et al. 2001; Gereffi, Humphrey, and Sturgeon 2005; Gereffi 2014, 2018). A different value is added at each phase of production, from conception to production and, finally, delivery. Lead firms—branded companies that outsource certain segments of production to other suppliers—directly and indirectly construct these value chains as they organise global production and sourcing networks, resulting in the fragmentation of global production activities (Arndt and Kierzkowski 2001). The reduction of trade barriers (advocated by neoliberals), improved production methods, enhanced logistical means, digitalisation, and more efficient communication have made such fragmentation possible and commercially competitive. Added to this is the advancement in digital technology which helps to reduce transaction costs significantly. 'Digital wrappers'—such as trackers and sensors supporting logistical arrangements—have enhanced the speed and service of the delivery of cross-border flows of traditional goods. A study suggests that 12 percent of the global trade of goods is now conducted via international e-commerce (Woetzel et al. 2017, 4). As a result, TNCs have become increasingly disintegrated while, globally, a more integrated world market is created by the expansion of trade and capital flows (Gereffi et al. 2005).

What does all this mean for development and for China's endeavour to catch up with advanced economies? Under hyperglobalisation, the functioning of GVCs has important implications for innovation and development. Many global industries now operate through extensive and sophisticated supply chains, with lead firms, mostly MNCs and TNCs, supported by a group of tiered suppliers. While GVCs have empowered lead firms to accumulate capital, they are also said to have contributed to global prosperity (World Bank 2020). Hyperspecialisation of firms drives the efficiency of production. Close inter-firm relationships, for example, between lead firms and their suppliers, allow transfers of technology and capital along chains. The ways in which TNCs organise production and construct value chains will impact the prospects for national development

(Gereffi et al. 2001). GVCs are characterised by a division of knowledge and capabilities across territories where different production segments take place (Nathan et al. 2018, 2), and they feature various levels of knowledge intensities. Generally, the higher end of a GVC is dominated by lead firms, who gain higher rents through higher-level inputs and knowledge intensities (Nathan et al. 2018, 3–9). As income is unevenly distributed along a GVC, with higher rents concentrated on its upper end, firms and nations on the lower end—which perform routine, standardised tasks requiring lower skill levels—strive to expand capacities and migrate to the higher end—knowledge-intensive, innovation-driven production—in order to capture more profits. As Nathan et al. (2018, 13) note, 'there is a connection between the knowledge base of production segments, rents earned and employment quality, including wages and even overall development outcomes'. Importantly, in a GVC-driven world economy, an industrial policy that aims at cultivating comparative advantages based on factor endowments is no longer adequate. Upgrading within GVCs requires the presence of national resources, a strong governance network, and the capacities to pursue knowledge-intensive, innovation-led production on a broader scale. Nathan et al. (2018, 268) argue that late-industrialising states should formulate a GVC-appropriate industrial policy, one aiming to bolster a nation's capabilities in higher-end GVC production segments instead of a whole sector or value chain.

While market proponents emphasise the crucial roles of trade liberalisation and GVCs in facilitating the diffusion of innovation and, thus, contributing to development, developing countries gain from trade differently (Ernst 2018). Such variations are attributed to the availability of certain domestic determinants. In China's case, its progressive integration into the global production networks (in part pushed by its World Trade Organization (WTO) commitment), as well as supportive state policies to invest in R&D, education, and infrastructure, are the conditions that help accelerate its upgrading in the electronics industry (Ernst 2018). The successful liquid crystal display (LCD) industry in South Korea owes a lot to the state acting as a proactive inter-scalar mediator to facilitate strategic couplings between global lead firms and local actors (Lee, Heo, and Kim 2014, 108). That being said, in the transition from simple manufacturing to more advanced manufacturing and even innovative production, firms and nations encounter greater hurdles involving inputs of knowledge and skills, capital, and regulatory issues (Figure 1.1). Over the decades, forces of hyperglobalisation have created competitive markets and nurtured profit-maximising players, leading to the concentration of economic power, influence, and wealth in some players (UNCTAD 2017, I).[4] Concentration of industrial power, monopoly of knowledge and markets by lead firms, along with the political capital that dominant market players use to block competitors, constitute major impediments to efforts of late developers to move to high value-added segments of value chains.

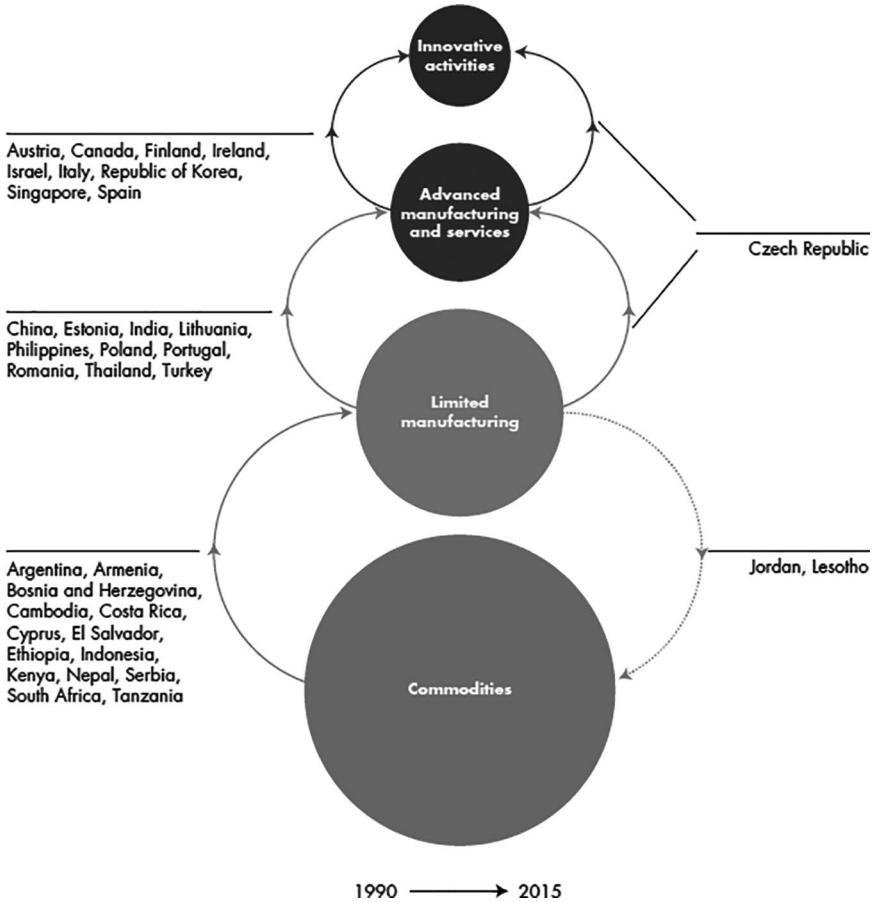

Figure 1.1 Country transitions between different types of GVC participation, 1990–2015

Source: World Bank, *World Development Report 2020*. Creative Commons Attribution CC BY 3.0 IGO

Large corporate actors amass economic power and influence by exploiting various financial instruments and restructuring GVCs. Following decades of market deregulation, global capital enjoys more leverage to act beyond state parameters to sustain its own interests. Overall, institutions that have been built to maximise global free trade and eliminate barriers for financial and capital flows have reduced policy space for domestic governments (Rodrik 2011). State policymakers struggle to implement nationally specific economic policies in the face of external pressures from other governments and powerful corporate actors. In this sense, hyperglobalisation presents both opportunities and challenges for late developers like China. While the

openness associated with a deregulated global market offers a number of avenues for China to tap foreign capital and technological know-how, in a hyperglobalised economy where the elimination of trade and capital barriers is treated as the norm, late developers face constraints on industrial policies, making it difficult for them to emulate the strategies pursued by their predecessors. Chinese state actors have to make tough decisions over safeguarding domestic key interests and accommodating the demands from external, competitive multinational corporations. Such development constraints are clearly elaborated in the case studies included in this book.

Understanding the condition of hyperglobalisation is therefore critical, as the interactions of social forces at particular historical junctures have impacts on development outcomes. In a hyperglobalised world economy, economic interdependencies between firms and nations have also become sources of political friction. Farrell and Newman (2020) call such a contradictory interconnectedness 'chained globalization', where states are bound together by economic ties and information networks, but economic competition and political tensions remain. China's case shows that specific historical junctures play an important role in driving development outcomes. Accounting for China's rapid economic growth, Rosenberg and Boyle (2019) assert that China has enjoyed what Trotsky (2008) called 'the privilege of historic backwardness' during its modernisation. China's early industrialisation benefited from its interactions with advanced capitalist economies that were much more mature and technologically advanced (Rosenberg and Boyle 2019, 35), which provided essential investments in capital and technological capabilities, as well as large export markets, to support China's industrialisation. China's economic transition, at least for most of its duration, took place within the context of 'neoliberal deregulation of the international economy that enabled the elements of historical privilege to operate with unusual freedom' (Rosenberg and Boyle 2019, 44), thus allowing China's early industrialisation to take off more rapidly and extensively. The historical timing of China's industrial take-off and the advantages it gained from 'historical belatedness' has set it apart from the classic developmental states of Japan and South Korea (Rosenberg and Boyle 2019).

Nevertheless, certain historical contingent factors, such as the abundant supply of cheap labour and a highly liberal global economy, that facilitated China's past development are either no longer available or inapplicable to the present circumstances. The favourable conditions that allowed China to pursue rapid industrialisation through state-led, market-intervening, and protectionist measures—namely a low growth base; decades of social upheaval prior to reform and opening; a huge, underdeveloped market with a large pool of cheap labour; and relative insulation from the outside world—have given way to rising production costs, a shrinking labour pool, new demands from private capital, and intensified international pressures on China to play by the rules. The context in which China's contemporary industrial transformation is taking place differs markedly from that of the

1980s and 1990s. At the same time, the Chinese political economy is evolving from a relatively simple structure to a multidimensional and complex one that comprises often-fragmented interests. Despite continued efforts by the Chinese government to exploit its political prowess in creating comparative advantages for priority sectors, its capacity to successfully accomplish development objectives is subject to multiple variables. Though China has successfully transitioned from exporting limited manufacturing products to making and selling more advanced manufacturing goods, the next step towards creating innovative, higher-value products is far from straightforward. The country now faces different opportunities and challenges, including the advent of IT, growth of tech and finance capital, regulatory constraints, intense market competition, and heightened political scrutiny. New contingencies have also risen following changing power structures in the global economy—which, to some extent, have been driven by China's ascendancy in the past decades. China also has to deal with new domestic conditions, as well as the emergence of technologies that have revolutionised modern industries and redefined the frontiers of competitiveness. The interactions between these forces thus demand very different responses from and capacities of the state.

Understanding China's industrial upgrading

With its focus on the contentious nature of technological upgrading in late development, this book adopts an analytical framework that draws on the Murdoch School's emphasis on social struggles, capitalist forces, and the changing nature of modern states within the context of global capitalism (see Chapter 2 for detailed discussions). These concepts are helpful in capturing the relationships between state actors and different forms of capital, including domestic state-owned firms, domestic private enterprises, domestic–foreign hybrids, and multinational corporations, as they seek to dominate important technologies. The changing relationships among these players, and the increasing power and influence of technology capital, have resulted in fierce competition among these interests in some areas but strategic collaboration in others. It is the synergies and conflicts generated by these interactions that explain processes of institutional reform in China. In this sense, the analysis in this book challenges influential institutionalist approaches on their explanations of institutional change, which broadly treat institutions as apolitical constructs and reduce the explanations of development outcomes to the types of institutions. Instead, the theoretical approach adopted here emphasises the power relationships and politics—including those extending beyond the nation-state—that are intrinsic to the development, form, and function of institutions. This is a form of politics that varies between sectors, yet has discernible characteristics attendant to late-developing state capitalism. The making of innovation and technology policies in China reveals such dynamics.

This focus on different interests and their interactions is important when explaining development patterns because it helps us better understand how the relative power and influence (and the actions) of different actors or alliances affect policies in relation to industrial upgrading, as well as how the promotion of certain institutions serves not only development needs but also particular interests, such as elite interests. In China's case, market transition and further integration with the global economy have given rise to a diverse set of actors, both internal and external (such as foreign companies and their states), which form fluid alliances and seek to defend or alter economic practices in their favour. For example, one broad category of capitalist interest encompasses foreign think tanks, chambers of commerce, and lawmakers, who are vocal about their demands. They are critical of China's mercantilist policies for discriminating against foreign companies, and they contribute to the discourse about the economic and security threats posed by China's industrial plans (Wübbeke et al. 2016; Atkinson, Cory, and Ezell 2017; EU Chamber of Commerce in China 2017; US Chamber of Commerce 2017; Glaser 2019; Schell and Shirk 2019). These non-state actors work closely with their respective governments, and the CCP is exposed to demands from these interests over a range of policy areas. Even the CCP cannot be understood as a unitary whole but as comprising different, sometimes competing interests, particularly when one considers the various centre–periphery tensions within China. It is also fragmented and decentralised in terms of policy implementation. This is not to dismiss entirely the ability of the CCP to set rules which govern markets and economic players: the Party is still able to impose market barriers across sectors to protect vested interests (as will be shown in Chapters 4–6). However, its capacity and governance objectives are subject to new and evolving global developments, including changing global production patterns, intense technological competition, and financialised economies.

Furthermore, China's strategies to improve technological innovation are complicated by its extensive ties with the global economy and its relations with other economies. During most of the reform period, institutional reforms in relation to facilitating technology transfers met with opposition from foreign capital over market access and protection of valuable assets; yet such resistance was largely placated by foreign capital reaping significant material benefits from gaining access, albeit partial, to the Chinese market. In other words, mutual gains trumped disagreements over institutional arrangements. There was also some tolerance of China's adoption of protectionist economic policies, as long as certain interests of foreign governments and multinational capital were met. Yet, with China beginning to strengthen its acquisition of vital emerging technologies, what China sees as a logical step to further strengthen its national competitiveness has provoked resentment and political backlashes, particularly from the United States, Western European states, and multinational capital, all of which see their interests threatened. Tensions began to build around successive

development plans of the Chinese government, which aimed at doubling down on the country's S&T investment, pushing patent applications, and encouraging mass innovation. For foreign capital, there are grievances about unequal trading and the imposition of investment terms; for liberal democratic governments, there are concerns about the ways in which vital technologies owned by China will be used and, geopolitically, how the liberal international order might be disrupted (Campbell and Ratner 2018; Mearsheimer 2019). A strong China is also seen as exporting political authoritarianism, as other countries purchase Chinese-made surveillance systems powered by AI technologies to tighten censorship and monitor citizens' behaviour. The country's military build-up, Xi Jinping's assertive foreign policy, and his strengthened political control at home all pose threats to international security and liberal democratic ideals which Western states have fought for decades to protect and promote.

Alongside the key tenets of the Murdoch School—the role of conflict and collaboration among interests within competitive globalism in driving institutional change—this book adds another dimension to understanding China's development. It stresses the forces that have been shaping the reorganisation of interests in China as its development progresses, namely the need to combat development challenges and the rise of tech-linked capital. Together, they provide the conditions for new struggles, where old and new interests fiercely contest prevailing rules and practices. Domestic pressures in China have taken new forms—for example, an ageing population leading to a declining workforce, rising wages, environmental degradation, and inadequate medical care. These trends propel China to cultivate new productive resources by accelerating industrial upgrading. In addition, technological advancement needs to be integrated into the analytical framework of institutional change in late-industrialising economies. The scramble for tech-linked assets in the global economy plays an important role in defining political–economic relationships among firms, economies, and states. In a tech-driven international economic landscape, tech-linked assets and capital have expanded, becoming important inputs for generating productive gains. The ability to harness these new technologies, either as a lead innovator or a key supplier, has become an important condition for continued profit accumulation (for firms) and continued development (for nations).

This book analyses institutional transformation in three sites of contestation in present-day China, namely internet technology (Chapter 4), new-energy vehicles (Chapter 5), and cutting-edge pharmaceuticals (Chapter 6). These analyses lead to three important observations. First, contemporary industrial upgrading in China illustrates patterns of both institutional persistence and transformation. For example, there are continued efforts by Chinese policymakers to control market rules to protect domestic state-linked actors. Yet in certain sectors, some of these rules have been relaxed in recent years to attract more competitive external capital to help address

development challenges. These processes and patterns are best explained according to efforts made by competing interests that leverage technological developments to negotiate state–market arrangements favourable to them. A good example is the way that Tesla overcame institutional hurdles to build a manufacturing plant in Shanghai, producing made-in-China Tesla electric vehicles (Chapter 5). Being an innovative global enterprise, Tesla outcompetes Chinese domestic electric vehicle start-ups in terms of brand influence, production sophistication, and production capacity. Its increasing presence in China has disrupted the balance of power between established automakers and newcomers in the Chinese automotive sector. In the area of healthcare reform, the public outcry over the domestic shortage of cancer drugs, along with the potential threat this could impose on the regime, prompted decisive actions from the government to expedite the approval of imported patented drugs (Chapter 6). Among various interests that influence the making of policies, CCP policymakers' overriding concern—to sustain political legitimacy through achieving important development outcomes—remains key. Institutional change occurs in response to the assessment made by policymakers of the priorities of development and how best to achieve important goals; yet various pressures exerted on policymakers affect how such assessment is made.

Second, China faces multiple dilemmas of growth at its current development juncture. Tensions between safeguarding state-linked interests and accommodating demands from external, competitive MNCs have increased, and so has the friction between empowering technology capital and maintaining political control. Despite its widely propagated international aspirations, this late-developing country remains largely inward-focused. Contemporary institutional reforms to bolster technological competitiveness are, above all, attempts by CCP central leaders to fix the political–economic system in order to perpetuate Communist rule. This suggests that a more profound, internally driven political agenda lies behind the quest for global technological dominance. The recent series of crackdowns on domestic internet technology companies indicates that the goal of encouraging technological innovation can still be subordinated to more important political objectives defined by the ruling elites.

Third, China's path to pursuing sustainable economic growth and national competitiveness against the backdrop of a fiercely competitive yet interdependent global production system is by no means simple or linear. The more hostile external environment that China is now encountering explains why certain policies in relation to industrial upgrading are constructed, maintained, or resisted. Intense competition for the control of valuable assets and markets has led to tensions on numerous fronts, for example, between new non-state capital and established state-owned players within China, as well as domestic tech- and innovation-linked conglomerates and multinational economic players. Some of these are manifested in the current geopolitical rivalry between the United States and China. A variety of interests are at

stake in the US–China trade dispute which broke out in July 2018, including elite interests on both sides that seek to safeguard national competitiveness and security—not to mention the profitability of individual companies on which national competitiveness depends. An analysis of China's changing institutions hence demands a critical examination of the global context in parallel with an understanding of various domestic forces at work, along with the mutually reinforcing or opposing relationships between the external and the internal.

Methodology

The research in this book employs a qualitative, case study approach to investigate institutional change associated with China's industrial upgrading. It aims to draw facts and observations from the real world to explain other subtle and unobserved, yet nonetheless important, phenomena (King, Keohane, and Verba 1994). Such real-world evidence includes, among others, written texts, individual behaviours, human interactions, and material and non-material outcomes. The adoption of a qualitative approach, represented by the use of within-case analysis to make inferences about specific events and processes that produce outcomes (Goertz and Mahoney 2012, 48), helps to achieve the goal of this book to explain the institutional processes and outcomes of China's technological upgrading. Specifically, the use of a qualitative approach helps explain outcomes of individual cases by analysing the factors that are conducive to them (a 'causes-of-effects' approach). It also helps explain how and why certain relationships work and studies their effects on the cases examined, while generalising patterns and developments through historical analysis and case studies (Elster 2007). Such an approach offers a multivariate explanation for observable facts, given the complexity of social, political, and economic interactions in the real world.

The utility of case studies lies in the in-depth analysis of the areas being studied. They offer a 'holistic' analysis with a 'thick' description of events (Gerring 2006, 50). Observations made in a case study can be used to generalise patterns that take place across a larger set of cases of similar type (Gerring 2006, 65). In this research, the theoretical analysis and empirical examination of China's economic restructuring may inform upgrading experiences of other late-industrialising countries. Furthermore, this research focuses on cross-sectional covariational patterns within the overarching case of China's industrial upgrading (Gerring 2006, 29–30). In other words, while the nation-state remains the primary level of analysis, a secondary level of analysis focusing on sectoral characteristics and development also constitutes a key component in the research. In addition to highlighting general patterns and trends, one of the benefits of these within-case sectoral examples is their contextual sensitivity (Gerring 2006, 50); they provide the evidentiary basis for explaining circumstantial specificity (Schwandt 2007, 27) and permit the detailed investigation of general concepts (Evans 1995, 11).

The data in this book come from three main sources, namely literature review, extensive field research, and case studies. Primary data are drawn from documented texts and interviews with relevant personnel. Together, they provide the data for content and discourse analysis. Referenced documented texts include government policy papers and statements, data sets from multinational organisations (e.g., the World Bank and the WTO), consultancy firms (e.g., McKinsey & Co.), and civil organisations (e.g., trade associations). Statistical data are sourced from both English and Chinese publications and websites. These include official government documents, government pronouncements, corporate publications, and news sites. Financial publications were also consulted for data regarding business activities and the performances of individual companies selected as case studies for this research. Chinese sources, particularly those related to CCP policy strategies, speeches, and industry statistics, have also been consulted. Cross-checking between versions of the same source in both languages helps mitigate the incidence of translation errors. In some cases, the use of Chinese sources also fills information gaps when their corresponding English versions are unavailable or incomplete. Secondary data in this research comprise mainly scholarly publications and media reports. Published academic works that examine China's institutional reforms and sectoral developments, along with those that explain theoretical approaches to understanding institutional form and dynamics, are particularly relevant to this research. In terms of media reports, both English and Chinese sources from mainstream news sites and magazines have been surveyed. Observations and conclusions are made after analysing and triangulating material (Berg 2009, 5–8) available from existing literature with data collected from interviews and written documents.

Seventy-eight interviews with relevant personnel were conducted during field research carried out in Shanghai, Guangzhou, Beijing, and Hong Kong between 2016 and 2018. Interviews were conducted via face-to-face meetings and online platforms. All interviews were semi-structured and each lasted for at least an hour. In this case-study-based research, the primary aim was to collect opinions from a small number of carefully selected informants, rather than a large, representative group of respondents (Vogt, Gardner, and Haeffele 2012, 128). Personnel from targeted industries and organisations were approached and interviewed. They include members of Chinese state-sponsored think tanks (e.g., the Chinese Academy of Social Sciences and the Chinese Academy of Sciences), representatives of trade organisations (e.g., the American Chambers of Commerce in both Shanghai and Hong Kong), chief information officers, senior-level corporate executives of foreign businesses operating in China, and specialised industry consultants. Some of these targeted interviewees, such as think tank members, are close to the CCP policymaking apparatus and can therefore be treated as credible sources on official CCP perspectives. For instance, one interviewee at the Chinese Academy of Sciences in Beijing introduced himself as one

of the authors of the 15-year Medium- to Long-term Plan of Science and Technology (MLP, 2006–2020). Other respondents, in the course of managing their businesses in Hong Kong, Shanghai, Beijing, and Guangzhou, have witnessed key transformations and policy shifts in their respective industries.

In addition to verifying secondary material, another purpose of conducting interviews is to obtain data not available from extant primary and secondary sources. Interview questions centred on exploring the manner in which contemporary technological developments affect the power relations between different key players in selected sectors of China. Interviewees were asked how and why CCP policies related to their areas of business have persisted or changed, how their operations have been affected, and how they have responded to these changes. They were also probed to share their thoughts on the changing dynamics of their specialised industries and how they compete with other key players in the sector. The use of semi-structured interviews in this research provided the author with the flexibility to tailor questions to individual respondents' areas of expertise without giving up some degree of consistency across the sample. In addition to asking predetermined questions, the author was able to probe respondents in great detail to obtain from them more comprehensive accounts on sectoral characteristics (Berg 2009, 109). All the interviews were transcribed. They provide important materials that verify and complement other primary and secondary data collected. As the questions concerned CCP policies and China-related topics, most interviewees requested that their identities remain anonymous. In some cases, interviewees did not want their personal opinions to be associated with the organisations they work for.

Structure of the book

Following this introductory chapter, the book comprises six further chapters. The first of these (Chapter 2) discusses the theoretical framework adopted in the book. It introduces the key contemporary schools of institutional analysis relevant to this study, namely new institutional economics and historical institutionalism. It also reviews the body of literature that analyses China's institutional change and development, particularly works that relate to China's state-led capitalism. While these perspectives offer certain insights into the relationship between Chinese capitalism and its growth dynamics, they fail to adequately consider conflictual relations between social forces under hyperglobalisation and China's changing development needs, thus rendering them less effective in explaining the push behind China's pursuit of technological upgrading, the processes involved, and the subsequent outcomes. An alternative explanatory framework that draws upon critiques by the Murdoch School offers significantly stronger analytical purchase in explaining the complexity of institutional transformations in China. In explaining the sources and pattern of institutional

change in relation to technological upgrading in China, the emphasis is placed on domestic development needs, power rivalries among fractions of interests, the impact of technological breakthrough, and the interactions between all these in a hyperglobalised world economy.

Chapter 3 then places China's technological upgrading efforts in historical context. Through an analysis of the historical evolution of China's S&T programmes, the chapter explains the objectives of different state-directed initiatives, and the forces and motives that drive them. Importantly, as these high-profile strategies and industrial policies draw criticism from foreign capital and governments, there are pushbacks that circumvent their execution. The chapter explains how the pursuit of post-high-growth modernisation and technological superiority in China is used as a narrative to justify different development objectives and the promotion of special interests. In assessing the outcomes of these state-led programmes, the chapter pays attention to how certain interests are privileged at the expense of others, in many cases leading to tensions and confrontation.

Chapters 4–6 form the case study section of the book. The three sectoral case studies—internet, automotive, and pharmaceutical—offer insights into, and are representative of, institutional reforms associated with industrial upgrading in China. These sectors sit within the ten priority industries identified in MIC2025, which policy architects of the plan consider crucial to China's ongoing economic success.[5] As a result, the ruling elites roll out supportive policies to nurture particular fractions of capital and encourage technological breakthroughs, in order to meet development objectives. Importantly, technological advances in digitalisation, automotive manufacturing, and drug development offer valuable opportunities for Chinese firms to leapfrog more basic stages. The timely and successful exploitation of these emerging technologies on the back of state support could be a game changer, and the results could impact the global distribution of economic power and influence. These sectors therefore represent important aspects of China's contemporary upgrading experiences. Furthermore, the three chosen sectors feature competitive markets at both national and global levels. They are crowded with contesting parties and interests that strive to maximise their gains through leveraging new technologies. Their interactions, which very often blur the boundaries of the 'national' and 'global', feature different forms of power relations not just between fractions of capital (domestic, foreign, state-linked, state-owned, private, and joint ventures (JVs)), but also between capital and the state as the latter interferes in the rules of the game from time to time. These sets of relationships, shaped in part by contextual characteristics, make these sectors good candidates for examining institutional variation in China's contemporary reforms.

Chapter 4 analyses the shifting relationships between leading Chinese internet technology companies and the CCP. The past decade was significant for China's pursuit of internet-related and emerging technologies.

The decade not only saw tremendous growth in the variety and intensity of online activities by Chinese citizens, but also witnessed the emergence of several home-grown internet and tech giants that have become increasingly influential both economically and politically. Unlike the automotive industry and the pharmaceutical industry, the Chinese internet sector is largely closed to foreign capitalist players. To set the scene, the chapter explains the rise of Chinese Big Tech, relating it to technological advances and favourable conditions at both global and domestic levels. A shift of national strategy towards promoting innovation and digital technology in the 2010s further cemented the power of this fraction of capital domestically. With the construction of institutions that favour the accumulation of domestic tech capital (such as the state apparatus of censorship and policies to promote digital technology infrastructure), the growth of domestic internet conglomerates appears, in some ways, not so much a by-product of the development process, but rather the outcome of deliberate attempts to advance the regime's political and economic needs. Alignment of interests between domestic tech firms and political elites is evident in accelerating AI development and safeguarding cybersecurity. However, given that the sector's leading players are non-state enterprises, which have common but also conflicting interests with the political regime, interactions between Chinese Big Tech and the CCP are problematic. Such interactions, sometimes benign and sometimes antagonistic, reflect the manipulation of power and leverage on both sides at different development junctures. Furthermore, the rise of second-generation internet technology firms and their competition with the more established internet giants have created a fiercely competitive market. The CCP's recent regulation of online activities and overseas listing of tech firms is testimony to the ongoing struggle of state actors to manage new, powerful economic contenders whose ascendance challenges state–capital boundaries within China. As the Chinese government promotes innovation and internet technology, it is also caught in a development dilemma between growth and control.

Chapter 5 examines various sources of contestation in the CCP's policies and rules to construct a domestic new-energy vehicle (NEV)[6] market. The automotive industry has long been regarded as an important sector for growth in an economy. Upgrading the automotive industry and pushing the shift from traditional vehicles to NEVs serves important national objectives, namely alleviating worsening air pollution in Chinese cities that poses serious health issues, and reducing reliance on oil imports. The controversies around the state-protected NEV market serve as an instructive lens for understanding the effects of competing interests over market rules. Car manufacturing in China has often been linked to heavy Chinese state intervention in the form of different incentive structures for domestic capital and market restrictions imposed on foreign capital: this is the only sector in China that requires foreign enterprises to set up JVs with

local producers to facilitate technological transfers from the former to the latter. The NEV market has thus become a battleground for various interests and their alliances, namely state-owned enterprises (SOEs) and their foreign partners, domestic private carmakers, multinational car manufacturers, and foreign finance capital, to compete for resources and market share. On the one hand, to meet the objectives of promoting indigenous innovation, Chinese state actors privilege domestic players, who receive various forms of state subsidies, at the expense of foreign automakers, who remain subject to different import barriers and domestic content regulations. On the other hand, there have been important policy shifts on the part of the government, partly in response to demands from influential multinational capital and foreign governments that have built up pressures on the regime to relax foreign investment restrictions in the industry over the years. The scaling back of NEV subsidies to domestic automakers and the delay in implementing the target of the zero-emission vehicle (ZEV) mandate are cases in point. Chapter 5 includes a section that explains the recent expansion of Tesla into China, following the government's abolition of foreign investment restrictions in the industry. The Tesla case demonstrates that globalised economic relations, competitive pressures, and the domestic demand for inputs of innovation-linked capital have made Chinese state policies to shield indigenous NEV makers from external competition increasingly difficult to sustain. With leverage over important emerging technologies, innovative, competitive fractions of capital could be an important force behind policies.

The third case study (Chapter 6) focuses on China's efforts and struggles in revamping its pharmaceutical industry. This is a sector that has seen important transformations in recent years. Globally, the pharmaceutical industry features cutting-edge scientific research and innovation. It is a dynamic industry that demands ongoing advances in R&D and capital investment to develop solutions that meet evolving medical needs. Because of these requirements, global pharmaceutical companies are concentrated in several advanced economies. Widening shortfalls between domestic medical needs and the provision of suitable and adequate medicines have exerted new pressures on the government to change institutional rules with regard to market access for foreign pharmaceutical capital. Unlike the automotive industry, where foreign capital is regulated by state-imposed market restrictions, foreign pharmaceutical capital has important leverage in much-needed advanced biological drugs, thus exerting certain pressures on Chinese political elites to relax restrictions and speed up the introduction of these medicines to Chinese patients. Moreover, new players, particularly the 'sea turtle' companies (domestic biotech start-ups set up by foreign-educated Chinese returnees), have become a new competitive force shaping institutional rules related to advanced biological drugs. These players have benefited from state support, venture capital funding, and forming partnerships with global biopharmaceutical companies. Social

demands and the leverage of global pharmaceutical capital form a strong driving force behind policies, while interactions between incumbent interests and new actors within and around the industry also shape narratives, rules, and practices.

The final chapter summarises the arguments of the book and discusses the theoretical implications of the empirical findings. The three case studies show that China's ambitious acquisition of emerging technologies and pursuit of scientific discovery has generated varied outcomes, and the processes by which such outcomes are achieved are conditioned by competing interests intertwined with development objectives. Differences in reform outcomes across the sectors are accounted for by divergent patterns of state intervention, as well as historical and sector-specific contingencies. Despite these divergences, there are discernible patterns across the three industries studied and their interactions with the state, revolving around political struggles among social forces and the pressures of global capitalism. The chapter concludes with a discussion of the prospect of China's technological upgrading in the three sectors examined in the book.

Notes

1. Xi Jinping's next term as the President of China will be decided in the 20th Party Congress in autumn 2022.
2. The literature includes industry-specific analyses on biotechnology (Petr 2017; Ibata-Arens 2019; Wang, Chen, and Knell 2019), nanotechnology (Appelbaum, Parker, and Cao 2011), electronics (Fuller 2016), telecommunication equipment (Fan 2006, 2018), internet technology (Kennedy 2017), automotive industry (Kennedy 2018), information technology (Ernst 2018), semiconductors (Lewis 2019), and other analyses on China's institutional reforms in relation to promoting innovation and S&T development (Hu and Jefferson 2009; Breznitz and Murphree 2011; Rein 2014; Ding and Li 2015; Suttmeier 2015; Gupta and Wang 2016; Zhou, Lazonick, and Sun 2016; Schmid and Wang 2017; Appelbaum et al. 2018; Dai 2019).
3. Haskel and Westlake (2017) identify four features of intangible capital which are fundamentally different from physical assets. They refer to them as the 'Four S's of Intangibles': sunk, spillovers, scalable, and synergies (Haskel and Westlake 2017, 58).
4. UNCTAD also notes the imbalances and unevenness of hyperglobalisation and the ways in which this has perpetuated inequalities and injustice (UNCTAD 2017, 2018).
5. The ten strategic sectors include robotics, maritime equipment, railway transport, new-energy and energy-saving vehicles, aviation and aerospace equipment, biopharma and hi-tech medical devices, new materials, new generation information technology, energy equipment, and agricultural equipment.
6. The term 'new-energy vehicles' (NEVs) is generally used in China rather than 'electric vehicles' (EVs). NEVs refer collectively to fully battery-powered, plug-in hybrid, and fuel-cell vehicles. The book uses NEVs when referring to the segment of the automotive industry targeted by the CCP. The term EV is used when describing the technology, the global market, and other non-China-specific situations, in line with the majority of the literature on the industry.

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2 Theorising Institutions, Innovation, and Development in China

Introduction

China's ambitious pursuit of technological upgrading has important implications for international power politics and global supply chains. The policies, rules, and practices that have been created to promote the acquisition of technology capital also have theoretical importance. In the context of understanding institutions, influential theoretical approaches such as new institutional economics and historical institutionalism (HI) have sought to explain the relationship between institutions and development. To some extent, their focus on institutional types and development outcomes is relevant for understanding certain strengths and limitations related to technological upgrading in China. For example, adopting an institutional approach, some scholars attribute China's shortcomings in innovation to the lack of interlocking social, legal, financial, and cultural institutions supporting innovation (Feola and Pettis 2016). China's economic success over the past few decades has also prompted other influential literature, namely the developmental state (DS) and the China Model (CM), which attribute the country's economic performance to institutional arrangements that depart from the neoliberal standard advocated by advanced economies. Crucially, all these positions emphasise the importance of institutional arrangements in economic development outcomes; however, a critical review of the literature reveals that an explanation which is built on rigid institutional structures, but lacks a thorough understanding of the dynamic role that social forces play in shaping institutions, will remain partial and limited. In particular, such analytical approaches struggle to capture the structural shifts that have promoted the ascendancy of key interests (e.g., tech- and innovation-linked capital), along with the impact this has on existing rules and practices. This chapter surveys key institutionalist explanations on development. It makes the case that the Murdoch School analytical framework provides a stronger account that makes clear how China's innovation and industrial upgrading efforts can be better understood through addressing the *politics* (understood here as the conflict and cooperation between interests) associated with its contemporary reforms. China's innovation and technology policies have

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demonstrated the workings of new forces and broader structural shifts—phenomena that the above-mentioned approaches neglect in their accounts.

New institutional economics

New institutionalism in political science and economics emerged during the 1980s, and has since been an influential approach in explaining the formation and organisation of both internal and external structures of a polity, as well as the ways they affect political behaviour and economic outcomes. New institutionalism places an emphasis on how formal and informal rules, as well as historical tendencies within a political economy, shape policy, and behavioural outcomes. According to March and Olsen (1989, 21–6), an institution goes beyond a formal political structure to include norms, rules, and routines. New institutionalists also consider informal conventions and broader structural constraints on governance to be features of institutional arrangements (Lowndes and Roberts 2013). By defining the incentive framework within a polity, institutions are understood to have an enabling and constraining effect on human behaviour as an individual makes decisions. In sum, new institutionalists are concerned with, among other things, state–market relationships and the arrangements that surround them.

The institutional approach to explaining political and economic outcomes encompasses different variants that sit within the broader school of institutionalism, with considerable overlap often evident between variants. For example, Hall and Taylor (1996) identify three main schools of thought within new institutionalism, while Peters (2005) identifies seven.[1] It is beyond the scope of this chapter to review all such variants within the new institutionalism school; however, it suffices to say that all these different approaches seek to elucidate the role played by political and economic institutions, how they influence actor interactions and distribute power, as well as how they evolve over time. These rules and practices have different effects on human behaviour and political outcomes. According to March and Olsen (2005, 9), institutions define and organise political settings, and have an 'ordering effect on how authority and power is constituted, exercised, legitimated, controlled and redistributed'. In a highly competitive environment where resources are scarce, institutions—in the form of rules, practices, and narratives—distribute power amongst various actors, empowering some while discriminating against others (Hall and Taylor 1996; Lowndes and Roberts 2013). Overall, institutionalists investigate the various ways in which state and societal arrangements influence how 'political actors define their interests and structure their relations of power to other groups' (Thelen and Steinmo 1992, 2).

Besides occupying prominent positions within the study of institutions, both new institutional economics (also known as 'neoclassical institutionalism' or 'rational institutionalism' in the language of Hall and Taylor 1996) and HI are relevant to the study of China's technological drive, given their

primary focus on and explanations of institutional arrangements. Both approaches focus on understanding the role and function of institutions and their effects on political and economic behaviour, as well as the relationship between certain forms of institutions and patterns of development. More importantly, they analyse institutions and their dynamics, and advocate the creation of certain institutional prototypes to achieve development outcomes. In doing so, they each suffer—though not to the same degree—from treating institutions as rather static entities that exist merely to perform certain functions closely tied to national development.

New institutional economists—by far the most influential scholars in policy circles, with many leading figures being Nobel laureates—see institutions as the 'rules of the game' (North 1990, 3) that constitute the incentive structures of a society or economy. These theorists, represented by leading economics scholars including Douglass North, Michael Spence, Oliver Williamson, and Elinor Ostrom, are predominantly concerned with the operation of the 'market' and the arrangements that underpin its efficiency and effectiveness. They have also been incredibly influential on public policy, directly and indirectly influencing vast policy projects within multilateral organisations such as the World Bank. Theorists of new institutional economics make two important assumptions which are relevant to our analysis here. The first is that the market, an important institution in a polity, is a self-regulated entity; it works best at distributing gains and losses efficiently when it is insulated from unnecessary political intervention.[2] The second is that a close association exists between institutional arrangements (how political and economic spaces are organised) and the economic performance of a civilisation, polity, or nation. From this perspective, political and economic institutions are important as they constitute the incentive structure of societies and economies, being 'the underlying determinant of economic performance' (North 1993). In addition to capital accumulation, economic success is also contingent on effective economic institutions (such as the enforcement of property rights), which have to be supported by political institutions (such as constitutional constraints on the separation of powers).

What do these assumptions mean for development? For new institutional economists, the key to growth lies in the organisation of institutional arrangements to achieve market efficiency by offsetting 'transaction costs' and 'information asymmetries'. Importantly, the presence of the 'right' set of functioning political and economic institutions is a necessary condition for economic development. For North (1990), wealthy states and poor states are outcomes of different institutional settings.[3] It follows that one of the key explanations for the varying economic progress of different nations lies not in the travails of colonialism or uneven development more generally, but rather in the presence (or absence) of the 'right' institutions. Technological innovations alone do not promise economic growth; as a key economic institution, the market needs to be kept neutral and *independent* of politics.

If political institutions have any role to play, it is that they are required to ensure the efficient functioning of the market, together with the enforcement of property rights to increase incentives for economic activities that bring higher private returns (North and Thomas 1973). They are important as they define the context in which different actors bargain among commercial activities, in addition to promoting fair competition to avoid monopolies. New institutional economists remain preoccupied with the design of institutional features that promote development goals both at the domestic and global levels; much of their work therefore has strong normative overtones.

In some ways, new institutional economics provides a valuable analytical tool for understanding development in China, raising important questions as to whether China has the right set of functioning economic and political institutions to bolster innovation-led and technology-driven growth. In fact, among both scholarly and policy circles where the approach has been highly influential, new institutional economists would vehemently disapprove of the market-distorting measures adopted by the Chinese state, such as the use of credit and subsidies, to protect state-linked enterprises and tech-linked capital deemed central to MIC2025. They would go on to attribute the inefficiencies of Chinese SOEs and the unsustainability of the Chinese economic system to a distorted state–market relationship constraining the market's inherently positive forces for driving growth. Indeed, a lot of works on China that have generated heated debates show a bias towards evaluating the functions and efficiency of the country's political and economic institutions, and hence, the impact on China's prospects. One common observation among scholars is that China's state-controlled institutions have produced a large but inefficient economy which will hamper future growth. Yasheng Huang's *Capitalism with Chinese Characteristics* compares and contrasts an entrepreneurial rural China in the 1980s with an urban China characterised by heavy state interference in the 1990s (Huang 2008). Huang argues that state-controlled measures have undermined the fundamentals of the Chinese economy while resulting in widening inequalities, depletion of resources, and uncompetitive enterprises. Thus, reforming China's political and economic institutions is necessary to sustain economic and social development. In *Red Capitalism*, Walter and Howie (2012) point out that China's rise is based on a fragile financial system, in which banks and equity markets serve the interests of leading state enterprises and the CCP. The arrangements of these economic institutions have conditioned the country's policy choices and development path (Walter and Howie 2012). More recently, Kennedy (2017, 2018) has studied China's tech companies and NEV industry, and concluded that interventionist policies overriding market signals have produced large but inefficient industry players.

While there is nothing wrong in analysing the relationship between institutions and development outcomes, a preoccupation with market efficiency and its connection with economic growth prospects overlooks other important factors that mediate development patterns. New institutional economics,

along with the literature on China's political economy mentioned above, has avoided messy questions of history, politics, and ideology, and often reduced development to a simple normative position centred upon putting the right institutions in place, with the right institutions being those deemed appropriate for market efficiency. In fact, the construction of markets and the rules around institutions are politically driven, and that tensions and contradictions resulting from the 'disembedding' of markets from social relations inevitably generate political and social backlash (Polanyi 2001). As Rodan, Hewison, and Robison (2001, 4) put it, 'all neo-classical theorists understand development as a technical question', with many adherents in this camp intent upon separating politics from markets. As to how institutions arise in the first place, as well as how and why they change across time and space, new institutional economics offers little helpful advice. In this sense, its position is a politically denuded one that fails to adequately account for the power of particular groups (such as classes or other social amalgams) to establish and maintain specific economic orders.

Historical institutionalism

HI shares a similar approach with new institutional economics in focusing upon the importance of institutions in a given polity or polities. However, rather than a preoccupation with market efficiency, HI puts more emphasis on explaining how institutions are rooted in historical forces, whereby past experiences tend to shape their ongoing evolution. One of the key propositions of HI is that institutions affect political outcomes not only by influencing power relations among players but importantly shaping how political actors define their interests and thus determine their strategies (Thelen and Steinmo 1992, 8–9). HI scholars have made two key propositions that are relevant for our analysis here. First, institutions tend to persist; changes only occur very rarely at particular historical junctures. HI theorists including Peter Hall, Rosemary Taylor, and David Soskice invoke the analytical notion of 'path dependency' to explain the tendency of institutions towards continuity and stability. Organisational structures and rules are established in the past, while the path-dependent tendency of policies often shapes or conditions the ways in which institutions develop and evolve in their present forms (Hall and Taylor 1996; Pierson and Skocpol 2002). It follows that the initiation of a policy and the creation of an institution will have some enduring influence on future policy (Peters 2005), leading to unintended consequences and, in some cases, making it difficult to reverse course (Hall and Taylor 1996). In this sense, agents are subject to constrained path-dependent choices. The occurrence of institutional overhauls is restricted to 'critical junctures', when revolutionary processes or exogenous shocks and crises prompt agents to reconfigure institutions.

Second, based on their analysis of the impact of historical processes on institutional development, HI scholars are interested in conceptualising and

explaining variation among national political economies (Hall and Soskice 2001). This method challenges the absolute view of neoclassical theorists that the 'free-market' institution is the preferred arrangement in all settings. For example, HI's 'varieties of capitalism' (VoC) framework stresses that institutionalised relationships between firms, the state, and other actors within an economy have strong impacts on development patterns, resulting in different forms of capitalism. Capitalist economies can be split into two distinct types: liberal market economies (LMEs), represented by US capitalism, and coordinated market economies (CMEs), epitomised by Germany.[4] Ultimately, historically rooted institutions influence policymaking processes. Instead of focusing on the equilibrium achieved through strategic choices made by each individual, HI stresses the conditioning effect of historical processes on patterns of development.

Can HI explain the institutional transformations that have taken place in China over the course of 40 years of reform and opening? The answer is yes, but only partially. The institutionalist focus on the power-distributing effect of institutions draws attention to the ways in which various interests and players benefit or lose out as a result of sector-specific industrial policies targeted at promoting innovation. In addition, path-dependent tendencies, as stressed by HI, are evident in shaping China's pattern of development, as they are almost everywhere. The Communist legacy of a large state sector conditions the CCP's market reform on SOEs and privatisation. Another example is China's accession to the World Trade Organization (WTO) in 2001, which transformed China's economic relations with other economies and deepened its integration into the world economy. Self-reinforcing processes in these new institutional arrangements (e.g., policies that are friendly to Chinese exports and foreign direct investment), together with vested interests that tend to support prevailing rules and policies, will make it difficult and costly for China to substantially alter the direction of its reforms (Hall and Taylor 1996; Peters, Pierre, and King 2005). The 40 years of reform and opening in China can be viewed as a historical process in which prior developmental legacies continue to constrain contemporary reform process and outcomes.

Despite their contributions, the analyses of political and economic behaviour in new institutional economics and HI suffer from several deficiencies. First, the overwhelming attention given to sets of institutions and their functions, in addition to the preoccupation with the functional efficiency of institutions (in the case of new institutional economics) has precluded more in-depth understanding of interests (such as class interests) that are embedded within institutional settings. How are institutions constructed in the first place? Do they reflect the preference and agenda of any one individual or social group more than another? Focusing on the structural effects of institutions overlooks political conflicts that could be important determinants of the construction of specific institutions and forces for bringing about institutional change. The truth is that institutions also serve to promote and

rationalise these behind-the-scenes interests. Consider the case of China: internally, political elites construct market rules in favour of domestic tech capital at the expense of certain foreign enterprises; such strategies have been rationalised in the name of achieving development objectives. Externally, examples of strong global backlash against the Chinese government's technology programme and the narrative of China constituting a 'technological threat' can largely be explained by unsatisfied foreign tech capital and the governments behind that capital, who see their commercial and national interests being undermined by China's mercantilist policies and the rapid growth of Chinese tech capital. By stressing the functionality of institutions, new institutional economists have given insufficient attention to actors in the system, who constantly manipulate the rules and the organisation of institutions.

Second, HI stresses institutional inertia and stability, thereby leaving little optimism for agency affecting institutional change (see Thelen and Steinmo 1992; Peters et al. 2005; Peck and Theodore 2007). The failure to consider subtle forces that drive institutional change leads to a somewhat 'sticky' view of institutions that privileges structural conditions over the capacity of agency (Bell and Feng 2013, 15). Institutional theories are thus more adept at addressing institutional persistence rather than institutional change (Thelen and Steinmo 1992). Even on that issue, HI only considers transformative changes brought about by exogenous shocks, neglecting the possibility of gradual processes taking place endogenously. More attention needs to be given to addressing the potential for gradual institutional change with transformative effects (Hysing and Olsson 2018). It is the ongoing efforts by individuals, groups, and states to reconfigure rules and practices in their favour that constitute the sources of gradual and endogenous institutional change.

Third, the state-centric approach of HI undercuts its capacity to identify and explain more complex sources of institutional change. For example, when explaining the relatively poor development progress of certain developmental states in Asia, state-centred historical institutionalists argue that poor institutional arrangements are largely responsible for limited development. An example cited is the Philippines. The country's less-than-satisfactory developmental progress compared to other newly industrialised economies (NIEs) is attributed to a 'weak' or 'patrimonial' state (Hutchcroft 1991)—in other words, a functionally less efficient state compared to the ideal type as promoted by new institutional economics. Equally problematic are the attempts of some HI scholars to theorise national capitalist systems into binary forms, thus assuming the coherence of capitalist practices at the national level (Brenner, Peck, and Theodore 2010). When capitalist systems are understood to be nation-centric, there is little consideration of historically unique junctures within the global political economy—such as the Cold War context and the golden age of capitalism—that allowed certain countries to achieve phenomenal growth. Moreover, despite offering

useful comparisons between two different modes of capitalism, the dichotomy between LMEs and CMEs does not seem to apply meaningfully to China's developmental pathway, as China does not fit neatly into either of the two camps (see Peck and Zhang 2013; Zhang and Peck 2015). In fact, when adopting a comparative lens, China exhibits similarities and differences both with political economies that are established and those that are in transition (see Kennedy 2011). The Chinese political-economic system is complex; for example, the country's economy and regulatory system are better understood as multi-tiered with different extents of state intervention (Pearson 2011). In addition, the institutional arrangements that have contributed to China's economic miracle do not fit comfortably within various Western models of the 'free market'. Quite the contrary: the defining features of China's capitalist transformation have been the periodic strengthening and relaxation of state intrusion into markets, along with the blurring of the boundaries between private and public ownership, which have been largely driven by changing circumstances and the corresponding distribution of interests.

Lastly, the institutionalist perspective significantly overlooks the interactivity between endogenous and exogenous forces, as well as their effects on institutional arrangements, and is often characterised by methodological nationalism. Methodological nationalism refers to an approach which treats 'nationally bounded societies…as naturally given entities to study' (Wimmer and Glick Schiller 2002, 304). When national systems are taken as given analytical units, less attention is paid to coalitions of parties and broader movements which have become increasingly internationalised and transnational, and have crucial impacts on national and international institutions. In China's case, understanding institutional change requires careful consideration of rising domestic economic and social challenges, in addition to their interactions with a dynamic and extremely challenging global context. Competing demands articulated by different social agents (some of them are transnational in nature), and their interactions with sector-specific structural conditions in global capitalism, give rise to varying patterns of institutional development and outcomes. Putting China's reforms in a broader global context of competition and dependence within specific historical junctures, is essential to understanding the sources, processes, and effects of institutional reform.

The developmental state

Another way to explain the relationship between institutional types and development outcomes is the DS literature, which was widely adopted in the 1980s and 1990s to address the economic miracles of late industrialisers, primarily those in Asia. Through analysing the connection between institutional forms and economic performance, DS theorists describe and explain the successful economic transition of post-war Japan and other NIEs in

East Asia. Chalmers Johnson (1982) first coined the term 'developmental state' to explain the ways in which Japan's Ministry of International Trade and Industry (MITI), staffed with technocratic elites, played a dominant role in orchestrating the country's rapid industrialisation in the post-war period.[5] The Japanese exemplar was emulated in varying degrees by other developing East Asian countries including South Korea, Taiwan, Singapore, and later China, which all succeeded in upgrading and diversifying their industries, thereby achieving rapid economic growth in the latter half of the 20th century (White and Wade 1988; Wade 1990; Amsden 1992; Chang 1994).[6] The frenzy of state-led industrialisation also sparked debate in the United States in the 1980s and 1990s over the applicability and merit of an explicit, targeted industrial policy to build national competitiveness (see Philips 1992).

The DS concept has evolved over the decades, and within the DS literature, different scholars tend to emphasise different dimensions of the concept. While there are divergences, one thing that most scholars agree on is that the DS depicts a set of institutional arrangements that facilitate national capitalist economic growth (Castells 1992; Johnson 1995, 1999; Woo-Cumings 1999). Fundamentally, DS literature typically adopts an institutional perspective to explain national developmental outcomes (see Stubbs 2009). However, in stark opposition to new institutional economists who posit an efficient market (which is free of rent, transaction costs, and information asymmetries) as a necessary condition for economic growth, DS scholars present a counter-critique that stresses the enhanced role and capacity of the state in steering successful industrialisation among late developers. Market forces, which serve as the only reliable signals for effective economic decision making according to new institutional economists, are to be constrained by purposeful state intervention led by an autonomous state, together with its elite and meritocratic bureaucracy.

Certain DS studies explore the ways in which the state harnesses industrial policies, injects subsidies, and coordinates investment decisions to engineer growth (Chang 1994; Rodrik 1995; Woo-Cumings 1999); others examine the institutional contexts that favour development (Evans 1995; Woo-Cumings 1999). Notwithstanding the various tactics used to promote growth, central to the DS literature is the strategic role of the state in amassing resources and exploiting them to advance economic growth. Instead of instituting top-down strategies that contain the state to make way for more market-oriented incentives, the success of a developmental state lies in state-engineered industrial policies that *govern* market forces (Wade 1990) and guide them towards developmental objectives, including productivity growth and export-oriented industrial upgrading. Consequently, beyond providing basic infrastructure and assuming a regulatory role, the state under late-development conditions is normatively seen as being actively involved in creating—or at least strategically nurturing—the productive and competitive capacities of an economy, for example, through turning

unproductive resources into viable investments, in addition to allocating capital towards targeted industries that induce overall national economic growth and industrial competitiveness. DS adherents emphasise the close, symbiotic relationship between the state and the market (as opposed to the neoliberal proposition of insulating the market from the fetters of the state), which is said to have largely contributed to the rapid rise of East Asian developmental states.[7] For some scholars, the success of East Asian late developers in achieving economic growth is attributed to the adoption of development strategies that depart from the one-size-fit-all neoliberal schema (Rodrik 1995, 2007; Levitt 2013).

For the developmental state to manage the market and produce growth-oriented results, it needs to possess certain institutional characteristics. Johnson emphasises the importance of a high-capacity bureaucratic elite to make decisions on long-term industrial policies, and argues that these elites should have the capacity to fend off contesting political interests that would otherwise compromise broader economic objectives (Johnson 1987). Peter Evans' concept of 'embedded autonomy' suggests that successful states have dual qualities, enjoying the autonomy to serve national goals on the one hand, while still being embedded in social ties that connect them with industrialist elites to enhance productive capacities on the other (Evans 1995). In having this capacity of 'embedded autonomy', a state can become developmental rather than predatory. Furthermore, an effective developmental state is sufficiently autonomous and strong to distort the market when necessary—in Amsden's terms, to 'get relative prices wrong' (Amsden 1992)—in order to build up a nation's comparative advantage. Indeed, East Asian developmental states in the late 20th century all pursued growth-oriented economic strategies to nurture and develop competitive domestic exporters, very often at the expense of local market distortions and short-term inefficiencies (Bello and Rosenfeld 1990). In China's case, massive subsidies and credit were given to state-linked enterprises despite their relative lack of productivity and efficiency.

China's developmentalism since reform and opening in 1978 indeed manifests certain attributes of a developmental state in terms of institutional arrangements and policy orientation (Oi 1995; Kroeber 2011; Knight 2014). For the most part, the Chinese party-state assumes a pivotal and active role in directing the economy to strategically develop the country's capacities for catching up with more advanced economies (see Woo-Cumings 1999). Instead of constructing a fully fledged market as the linchpin of the economy, the CCP manages currency value, capital flows, resource allocation, and technology transfer (as in the case of JVs) to protect infant domestic enterprises from external competition and facilitate their industrial catch-up. The state also maintains control and influence over SOEs in strategic sectors including energy, banking, security, telecommunications, and transport, while permitting private firms to compete in other sectors. The state continues to act as a visible hand to create an international

competitive advantage, pushing broad sets of industries towards areas of growth and technological change in the world economy (Wade 1990). For those who champion free-market principles as the linchpin of economic growth, China is an anomaly, as 'the relative success of the Chinese reforms directly contradicts the neoliberal emphasis on speed, comprehensiveness, and the incentive generating powers of private property' (Chaudhry 1994, 3). However, the differentiated institutional setup and international context within which it pursued rapid development has made the China case a distinct variation of the classic developmental state as exemplified by Japan. China is more open to foreign direct investment (FDI) and relies heavily on it to support its industrial transformation, as opposed to the strong domestically cultivated export sectors and the large conglomerates present in Japan and South Korea during their fast-growth years (Lardy 2002; Huang 2003). Other notable differences also exist between the pioneer (Japan) and the follower (China) in terms of drivers of growth, state capacity, modes of regulation, and external geopolitical and economic environments (Gallagher 2002; Beeson 2009; Kroeber 2011; Rosenberg and Boyle 2019). This sets the Chinese party-state and the Chinese mode of development apart from the key tenets of the Japanese developmental state prototype originally proposed by Johnson (Johnson 1982, 1995).

Nevertheless, describing the actual facets of the state in a descriptive sense, with little attention paid to its politics and context, remains inadequate for explaining what is going on developmentally in a holistic sense. To do this, we need to focus on the power and leverage of particular social forces fighting over resources and institutional form and function at certain junctures, while also remaining mindful of the wider context within which development pursuits are nested (i.e., the consolidating relations of globalised capitalism). When we fail to do this, it is all too easy to fall into the trap of adopting methodologically nationalist and politically denuded models that are automatically conflated with particular development outcomes and, in the process, overlooking vital components in particular developmental stories.

The China model

Another approach worth examining is what is known as the China Model (CM). Building on the argument that China adopts a set of different strategies and embraces different political and economic institutions to spur economic growth, CM scholarship, which draws upon notions of the so-called 'Beijing Consensus', further suggests that China's success in embracing market reforms without full-scale political liberalisation constitutes an alternative 'model' to Western liberal democracies (see Zhao 2010, 2017). From this perspective, China's combination of political authoritarianism and (partial) market freedom delivers not only impressive economic growth, but also political stability. This alternative model challenges the Western orthodox

view that liberal democracy and capitalist market institutions together are the best arrangements for bringing about national progress and prosperity. The CM concept originates from John Cooper Ramo's short book (Ramo 2004) that presents China's distinctive approach to modernisation—which he labels the 'Beijing Consensus'—as an alternative development approach for emerging and developing countries. According to Ramo (Ramo 2004, 11–2), the 'Beijing Consensus' is defined by the state's continuous pursuit of innovation and experimentation with reforms; the employment of new tools to promote social sustainability and equality to promote broader objectives of growth; and a strong focus on the doctrine of self-determination. In other words, the state retains a key role in steering reforms and development. The Chinese way to modernisation is thus characterised by 'a socialist party-state juxtaposed with economic internationalization and marketization' (Hsu 2011, 3).

The Chinese approach to development is considered the antithesis of the prevailing set of economic policy recommendations generally known as the 'Washington Consensus' (Williamson 2014). These are policies prescribed by Washington-based multilateral organisations as a one-size-fits-all recipe for promoting modernisation in developing countries. The Washington Consensus prescriptions maintain that economic growth in late development is best promoted by neoliberal market-oriented economic principles with the state assuming a reduced role. In stark contrast, China's economic growth has been steered by the state, which plays a more active role in managing the economy compared to governments upholding laissez-faire principles. China's reforms also involve heavy investment in state-owned financial institutions to spur growth, which depart from the World Bank and IMF advice that prioritises the private sector. Two additional features define the Chinese model, the first being the adoption of partial economic freedom in an authoritarian political setting, and the other being the state's pragmatic approach to managing change, rather than replacing existing market and political institutions overnight. For some CM adherents, China's experimenting with market mechanisms while retaining a high degree of political centralisation has created conditions for rapid economic development (Blanchard and Shleifer 2001), though others remain concerned about the political aspect associated with the Chinese way of development. Halper (2012) argues that China's rise to a global economic power has in many ways justified 'state-directed capitalism' and 'market authoritarianism'. He comments:

> Beyond everything else that China sells to the world, the country functions as a global billboard for 'going capitalist and staying autocratic'. Thus, Beijing provides a compelling demonstration of how to liberalize economically without surrendering to liberal politics. In this respect, China presents the challenge of a new type of corporate state. China has, in effect, legitimized authoritarianism in our time.
>
> *(Halper 2012, xxi)*

Since Ramo's (2004) endorsement of China's new development approach, scholars and policymakers have expanded the concept of the CM in various forms, using it to account for China's economic success in undertaking market reforms without full-scale political liberalisation.[8] For the most part, China has demonstrated that developing economies can achieve growth and success by pursuing their own development paths instead of relying on neoliberal prescriptions (Breslin 2018, 68). Specifically, Chinese reformers have adopted a gradual and pragmatic approach to managing change, rather than abruptly overhauling established market and political institutions. Partial economic freedom is permitted, but only in an authoritarian setting where civil liberties are circumscribed. Interest in the CM has since intensified, particularly after the global financial crisis of 2007–2008 discredited Western capitalism. The United States, the epicentre of Western capitalism for many, was also home to the financial crisis. Global capital mobility, coupled with financial deregulation in the United States, had encouraged spiralling borrowing and financial speculation that ultimately brought about vast numbers of individual defaults and company bankruptcies. The crisis that originated in the United States subsequently sent ripple effects towards other economies through the integrated global economic networks.

Both the DS and CM literature are somewhat useful for explaining China's economic rise since its reform and opening in the late 1970s. In particular, the emphasis on state activism in directing and implementing growth strategies through largely unorthodox means suggests that development in late-industrialising economies may require alternative institutional arrangements outside of neoclassical economic prescriptions. These institutional conditions revolve around giving the state and its apparatus primacy in setting the economic policy agenda, channelling national resources into targeted sectors, and equipping the state bureaucracy with the capacity to implement growth-promoting policies. In a state-directed economy, market signals can be distorted, while particular interests and practices are suppressed for the sake of meeting broader development goals. So far, China's four decades of reform have demonstrated that state capitalism has its merits. Alongside authoritarian, centralised political control, market liberalisation has delivered positive development outcomes in terms of growth, improved livelihoods, expanded infrastructure and record levels of poverty reduction.

Nevertheless, both DS and CM have serious deficiencies when it comes to analysing China's institutional reforms. For the DS approach, the capacity of the Chinese party-state to effectively manage the reform processes, a key feature of the ideal developmental state, is questionable. As Naughton (1995) notes, despite the periodic promulgation of strategic grand plans at the national level (namely the five-year plans), most of the CCP's economic decisions are made in an ad hoc and experimental fashion. This is echoed by Breslin (1996), who, through his observation of China's earlier reforms until the mid-1990s, describes China as a 'dysfunctional' state lacking a

coherent economic strategy. China's reforms are seen as more responsive to political demands than the logic of long-term economic necessities. Many policies are the result of compromises and negotiations between different interests, and they are often leveraged to address immediate, short-term problems (Breslin 1996; Kennedy 2010). Breslin further argues that 'the model described by Ramo looked more like the aspirations that China's leaders were espousing for what a future model might look like, rather than an accurate reflection of the nature of the political economy at the time' (Breslin 2021, 227). In addition, it is doubtful that the Chinese bureaucracy enjoys the embedded autonomy suggested by Evans (1995). Quite the contrary, 'fragmented authoritarianism' (Lieberthal 1992; Mertha 2009; Brødsgaard 2017) and economic decentralisation in China have made policymaking and implementation highly subject to provincial and local priorities, as well as political rivalries (Shih 2004). For example, in the area of IP reforms, where China has consistently been pushed by the United States to strengthen protection, intense inter-bureaucratic rivalries over divergent interests result in weak IP enforcement (Mertha 2007).

Several mechanisms, which are beyond the control and influence of the state, are responsible for gradual institutional change in China. In accounting for the spontaneous rise of the private enterprise economy in China under capitalist transition, Nee and Opper (2012) argue that it is bottom-up entrepreneurial action, rather than state-led reform, which has given rise to various new forms of capitalist economic institutions in China. In the absence of codified property rights, these entrepreneurs spontaneously develop informal rules and norms to overcome collective action problems. They establish networks with other economic actors, such as suppliers and distributors, build industrial clusters, and through trial and error, develop informal arrangements to grow private manufacturing business (Nee and Opper 2012, 9). These rules and practices, which emerge from below, enable, motivate, and guide start-up firms, allowing private firms to survive and even overtake state-owned behemoths, while establishing the institutional foundations of China's emergent capitalist economic order (Nee and Opper 2012, 8).

While statists credit the Chinese state for presiding over the country's capitalist transition, just as DS and CM scholars did, in creating a private capitalist economy, the role of Chinese state actors is largely reactive (Nee and Opper 2012). Yet this is not to ignore the role of the central government in de-collectivising agriculture, which helps promote small-scale private household businesses. More importantly, it is only after these new economic players have emerged as an important economic and social force that political elites begin to implement structures to legitimise private enterprises (Nee and Opper 2012, 261). In this regard, state-centred theories have exaggerated the agency of state actors, whereas in fact: 'political actors maintained a wait-and-see position, moving only when economic powers had already shifted so pronouncedly that institutional adaptions could no longer

be postponed' (Nee and Opper 2012, 262). Another factor—evolving global capitalism—also plays an important role in driving China's institutional change. For McNally (2007), China is developing a unique form of capitalism—one that blends standard capitalist characteristics with elements of its own historical and socialist heritage, and supplements bottom-up network capitalism with state-led development (McNally 2007, 11). The interactions of dual dynamics have characterised China's emergent capitalism: 'a state dominant mode from above juxtaposed with an increasingly globalized and highly networked capitalist mode from below' (McNally 2007, 13). Such interaction has reinforced the role of the market and strengthened private capital in the political economy. McNally (2007) further posits that China's capitalism develops as a result of three distinct forces: a long history of petty capitalism which provides opportunities for networks of small capitalists to shape the system from below; global capitalism that accelerates China's integration with the capitalist world economy; and the dominant role of China's Leninist state in orchestrating and managing the development process from the top (McNally 2007, 13). All of this challenge the capacity of state-centred theories in explaining institutional development in China.

If state-led industrialisation is a development model for late industrialisers, what accounts for the demise of the Asian economic miracle in which fast-growing East Asian developmental states were successively hit by a credit crunch and a recession in the late 1990s? When one examines the circumstances that have helped produce the particular institutional settings stressed in both DS and CM, it is not difficult to notice that the favourable conditions available in the past are either non-existent or irrelevant in the present. With the exception of Japan, East Asian developmental states achieved astonishing growth in the 1980s largely through the mobilisation of resources—massive increases in human and capital inputs—rather than increased efficiency in productivity (Krugman 1994). From this perspective, input-driven growth could not deliver sustainable growth in the long run when compared with efficiency-driven growth. This is because, in the absence of innovation and technical change, an uptick in human and capital inputs will result in a productivity increase in terms of quantity but not necessarily in terms of quality. To maintain sustainable economic growth, developing economies need to establish conditions that can contribute to higher value-added production; that is, the domestic innovation and production of goods and services at the higher end of value chains. Another explanation is that the internal and external conditions that helped fuel the growth of these late-industrialising economies have since largely disappeared. For example, in South Korea, the 'insulation' from class interests that the state enjoyed in its early phase of development has dissipated (Minns 2001). As industrialisation opens new avenues for different social classes to influence and exert pressures on the ruling elites, the state is confronted with clashes of different factions, and is consequently forced to step back from its dominant role in governing the market. Fast-growing East Asian economies in

the late 20th century benefited from an external environment that was conducive to rapid industrialisation. Specific historical circumstances led to 'very distinct international economic engagement patterns' in East Asian fast-growing economies which could hardly be emulated elsewhere (Gereffi 2018, 13). Their growth was contingent upon particular geopolitical settings at the time, namely the Cold War context in which the United States tolerated a more interventionist and neo-mercantilist Japan (Stubbs 2005), the availability of the US market, and—in the case of the NIEs—their production and trade relationships with Japan. As Hoogvelt (1997, 23) puts it: 'The historical specificity of the "model" relates to the external environment of the geo-politics of the Cold War and its unique conjunction with a certain phase in the development of capitalism on a world scale'.

These external contingencies inevitably changed over time; as the Cold War threat dissipated, the United States was more willing to exert pressures on Japan to open up its domestic economy (Beeson 2009). In addition, as NIEs further integrated into the global economy, experiencing the disruptions brought by a growing China that absorbs massive inflows of capital and churns out low-cost manufacturing products, new regional and international forces meant that the old tactics driving growth no longer worked. In some cases, the toolkits that had previously proven effective have even become liabilities for further development. For example, the developmental state's patronage of the state–big business relationship, as advocated by free-market supporters, is now seen as untenable. After a period of impressive growth, many of the Asian states that displayed developmentalist orientations are now beset by multiple challenges that impair growth: income inequality, falling productivity, declining competitiveness, inadequate social benefits, and many more.

Importantly, China is not immune to these challenges; it too needs new strategies to respond to new circumstances. Major transformations in the global economy such as the dominance of finance capital and changing means of production, in addition to the continued diffusion and practice of neoliberal, capitalist market principles on a global scale, have made the adoption of classic developmentalist approaches to national growth and prosperity increasingly problematic (Carroll and Jarvis 2017).[9] The gradual erosion of historically contingent conditions favouring state activism indicates the limits to understanding development and institutional transformations from a strictly nationally oriented perspective—the methodology adopted by HI. To overcome the rigidities of methodological nationalism (see Wimmer and Glick Schiller 2002), the evaluation of institutional processes and change requires a sensitivity to the interactions (both collaboration and confrontation) between multiple, potentially conflicting interests which operate both within and beyond national boundaries. Furthermore, in addition to its conditions for national development, China displays political-economic institutional capacities and patterns that diverge from those of other Asian developmental states. To equate

China's growth-promoting institutional arrangements with those of Japan, South Korea, Singapore, and Taiwan is therefore an over-simplification. Consequently, a more critical understanding of contextual differences experienced by these late-industrialising economies, along with the roles played by different agents at given times as they respond to changing circumstances, is required.

The CM literature, which appraises the Chinese route to modernisation as an alternative to 'Washington Consensus' prescriptions, also suffers from several limitations. First, its analysis is methodologically nationalist and it lacks sufficient consideration of the broader global context impacting institutional outcomes. Moreover, it is unclear that there is an actual 'consensus' among Beijing's leaders, economists, and academia that agrees upon the set of guiding principles generally included in the 'Beijing Consensus' (Kennedy 2010). In fact, even CCP leaders are cautious about the term 'model' and its ideological implications (Halper 2012, xx). On the other hand, China's key economic policies, such as the liberalisation of inward FDI and privatisation, largely follow eight out of the ten principles enshrined in the Washington Consensus (Kennedy 2010, 470). While some of China's reform policies fit the 'Beijing Consensus' description in several dimensions, the state does not consistently undertake 'Beijing Consensus' policies (Huang 2010). China's state capitalism permits political objectives to trump economic imperatives, as 'the ultimate motive is not economic (maximizing growth) but political (maximizing the state's power and the leadership's chances of survival)' (Bremmer 2010, 4–5).

Others still doubt that the China model is durable and replicable elsewhere to serve as a recipe for economic success (Naughton 2010; Zhao 2010). This is because, fundamentally, the so-called 'model' lacks a specific set of clearly defined policies to adequately inform reform strategies (Williamson 2014) for others to follow. The varied initial conditions of China and other developing countries make it difficult for the latter to successfully replicate the former's institutions and policies to produce similar developmental outcomes (Naughton 2011, 69). Lastly, the multiple developmental challenges that China currently contends with undermine the optimistic view that the Chinese mode of development can deliver sustainable growth, especially given that the Chinese political economy is showing multiple signs of instability. In the absence of further institutional reforms, the Chinese growth model is said to be deficient in terms of supporting the country's march towards prosperity (Pei 2006; Rodrik 2007; Huang 2008; McGregor 2012; Walter and Howie 2012; Beardson 2013; Shambaugh 2016), let alone making China a dominant regional power (Dibb and Lee 2014). Managing the economy during good times is different from tackling sudden, unexpected crises and propelling development to another level. Kick-starting and sustaining economic growth require different institutional arrangements and capacities. In particular, sustaining economic growth is seen by many scholars as demanding more sophisticated institutional arrangements to support

ongoing productive strength, as well as effective mechanisms to insulate the economy from sudden shocks and crises (Rodrik 2007, 16).

Ultimately, the hype about the Chinese development model was undoubtedly driven by China's rapid economic growth throughout the 1990s and 2000s. The Chinese economy consistently recorded impressive GDP growth rates, including double-digit figures in the early 1990s and between 2004 and 2007. In 1993, China became the world's second-largest recipient of FDI, behind only the United States (UNCTAD 1995).[10] China also managed to recover from the global financial crisis of 2007–2008 with the help of massive stimulus measures from the state, leading it to exhibit a new assertiveness in foreign policy over diplomatic issues regarding Taiwan, the South China Sea, and multilateral governance. Scholarly attention to China's ascendancy and its implications are reflected in titles such as *The Rise of China: How Economic Reform is Creating a New Superpower* (Overholt 1993), *The Rise of China and the Capitalist World Order* (Li 2010), and others. Nonetheless, in recent years the tide seemed to be turning, with the emergence of more and more social and economic problems associated with China's market transition, prompting opinions that the Chinese economy is running out of steam and dimming its prospects of escaping the middle-income trap (Dibb and Lee 2014). The Chinese economy has been showing signs of slowing down since 2012 (see Figure 2.1). It was against this backdrop that President Xi Jinping announced that China had entered a 'new normal condition' of moderate, lower-than-expected growth. As China approaches middle-income status, it becomes increasingly difficult to sustain the high growth rates it enjoyed in the past. CCP leaders thus attempt to maintain legitimacy by normalising and justifying less satisfactory economic growth. This

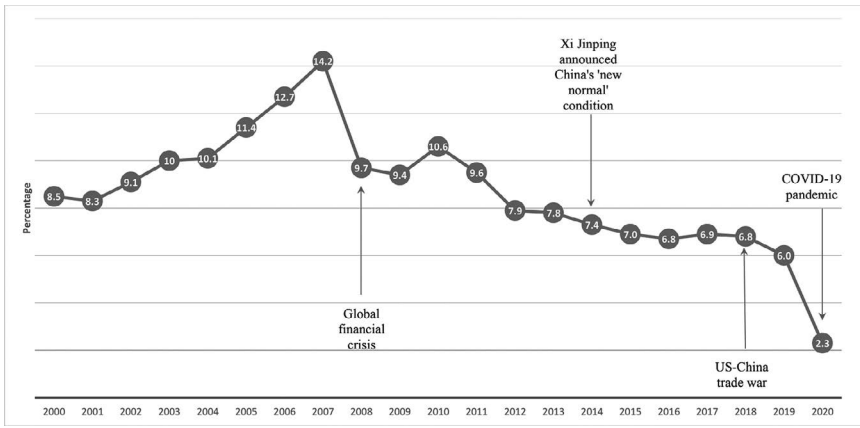

Figure 2.1 China's annual GDP growth rate (percentage), 2000–2020

Source: World Bank open data; compiled by author

'normalisation' of developmental trends and outcomes can be understood as an institutional process by which CCP ruling elites attempt to create a new narrative justifying fresh initiatives to address growth-related challenges.

The 'new normal' also suggests that the CCP needs to take drastic measures to tackle long-standing structural problems present in China's growth model. Although the CCP will tolerate slower growth to slow the pace of credit expansion (Shih 2019), addressing the structural problems associated with China's economy will require more drastic reforms. China's growth model relies heavily on ever-increasing fixed investments. As the ability of these investments to produce significant outputs drops (that is, the investments yield diminishing returns), the Chinese economy is becoming increasingly wasteful, inefficient, and unsustainable (Huang 2008). A massive state sector funding and supporting profit-losing enterprises also means that China has been achieving significant GDP growth at low efficiency. In addition, the recovery measures previously adopted to reverse economic crises have brought other problems in their wake. Strong state stimulus packages (totalling US$580 billion) in the aftermath of the 2008 financial crisis, together with credit-fuelled growth, have led to soaring national debt, which reached 270.1 percent of GDP by the end of 2020 (Lee 2021).[11] The rapid increase of the debt-to-GDP level from 162 percent in 2008 is particularly concerning.

Widening social inequality is another ticking time bomb. Globalisation and other rapid economic transformations have led to what Shaoguang Wang (Wang 2000) calls 'distributive conflicts' as different social groups and regions benefit from globalisation in a highly uneven manner. These social divisions have triggered unrest and weakened the legitimacy of the state.[12] Around 130,000 local protests are recorded each year in China, covering issues spanning wage disputes, social security, land seizures, and environmental concerns (Headley and Tanigawa-Lau 2016); in response, the CCP has increased its budget for maintaining social stability (*weiwen*). Such internal vulnerabilities put pressure on the CCP and constrain its efforts to pursue certain agendas. The China model that once worked—if indeed such a thing ever existed—no longer delivers today.

In sum, when explaining institutional outcomes in China, it would be a mistake to simply focus on the construction of ideal state–market mechanism while ignoring structural forces, agents, and their interactions that produce variegated policy outcomes. For the DS and CM literatures, their state-centric focus on institutions and development has done little to explain variation in policy strategies and institutional patterns across industrial sectors and national–subnational governmental relationships. Nor do these literatures inform our understanding of what precisely constitutes the momentum that supports or resists certain institutional changes. By directly linking particular state forms, and a set of ostensibly growth-enhancing principles, to economic outcomes, both the DS and CM

approaches have paid insufficient attention to contingent forces at work that could affect development. As Jessop (2016a, 33) points out, it is important to understand the 'specific economic, political, and social conditions and particular balance of social forces that enabled an autonomous but embedded state to promote developmental policies or to guide interdependent actors to the same end'. Economic development would not have resulted without concomitant changes in class relations, private property ownership, and accompanying institutional arrangements that provide the necessary conditions for marketisation to take place (Harvey 2006, 35). The different rounds of reforms that have taken place in China in recent decades, the cycles of tightened and loosened control, as well as the oscillations between market liberalisation and its opposite, have all been driven by a conjuncture of historical, political, economic, and social forces; their outcomes are often mediated by changing power configurations among key actors. Institutional outcomes in China are in large part driven by an ongoing competition of interests among different fractions of capital, rather than the successful operation of embedded autonomy by a meritocratic bureaucracy 'ideally' insulated from, yet also somehow 'perfectly' connected to, capital.

The Murdoch School

Another approach concerned with understanding institutional dynamics is the Murdoch School, which has a fundamentally different perspective on institutions compared to neoclassical institutionalism and HI. Also known as 'social conflict theory', the Murdoch School is associated with the research and theoretical traditions of a group of political economy scholars originally affiliated with the Asia Research Centre at Murdoch University in Perth, Western Australia. These scholars reject both market-centred explanations for institutional development and the statist approach to institutional formation and change (Carroll and Jarvis 2017, 6–7) in favour of analysing and explaining institutional outcomes with reference to political struggles between different fractions of interests within a polity. The various interests articulated within a polity are primarily delineated in relation to class and other constellations of social forces, with the latter including groups with ethnic, religious, and gender affiliations, as well as sub-class categorisations such as fractions of capital. Social and political forces are important, as they shape the form and function of both the institutional terrain and patterns of behaviour. Social relations of production (Cox 1987) and the conflicts that social classes engage in inform much of the course of national development; social class divisions should therefore not be overlooked. Interactions between social groups take various forms, including fluid coalitions to collectively defend sectoral interests, lobbies to influence policy choices, and outright confrontation in situations where interests are perceived to be threatened. Ultimately, social forces compete for resources, power, and influence, with their ongoing struggles to defend particular

political, economic, and social interests shaping institutional development (Hameiri and Jones 2020).

Focusing on social forces and their differential interests, Murdoch School scholars further argue that institutions—encompassing the formulation of rules, changes in policies, and the continuation of particular political and economic practices—should be understood as variable outcomes of contestation over resources, power, and influence among different social groups. From this perspective, understanding institutions does not centre on mapping typologies or their apparent relationships to market efficiency and industrialisation (Rodan et al. 2001, 7), projects that both historical and neoclassical institutionalists have variously been associated with. Nor should institutions ever be treated as neutral entities that are insulated from social relations (Carroll and Jarvis 2017; Hameiri and Jones 2020). The Murdoch School seeks to explain institutional arrangements and their operation *in their own terms*; that is, they are essentially outcomes of socio-political struggle (Carroll, Hameiri, and Jones 2020).

While class interests and struggles are important, one should not lose sight of the macroscopic context in which institutions operate. For the Murdoch School, institutions are not only driven by social conflicts, but are also shaped by changes in the broader environment in which they evolve. Here the theoretical underpinnings of the Murdoch School demonstrate an orientation towards the neo-Gramscian conception of hegemonic power structures and historic blocs of capitalist interests that are buttressed by a dominant ideology accepted by subordinate classes (Cox 1987).[13] Local struggles do not occur in isolation, but are immersed within a global structure of power relations that shapes how these struggles and interactions play out (Rodan et al. 2001; Carroll 2017; Chacko and Jayasuriya 2017). In the words of Cox (1987, 105): 'The actions of a state… are, in turn, conditioned by the manner in which the world order impinges upon the state. Thus any attempt to explain the transformations of production relations must refer to states and world orders'. Any understanding of local institutional change thus demands an enquiry into the development and constitution of power relations at the global level.

It is precisely the neglect of the structural effects of global power relations on institutional change that limits the capacity of influential institutionalist approaches to explain key institutional dynamics. Institutionalists primarily concerned with delineating institutions in a normative sense are not well positioned to analyse the character and power of the state as a fundamental bundle of institutions. This limitation is addressed by the Murdoch School, which emphasises that 'policy and institutional transformations take place within broader patterns of social and political power' (Rodan et al. 2001, 7). More specifically, the battles between competing interests to influence institutions occur within a wider political-economic setting—one where capitalist interests and their coalitions have gained prominence as the process of economic globalisation permeates and accelerates. The spread of the

neoliberal agenda has further consolidated and extended capitalist interests and practices, reshaped institutional frameworks, and intensified uneven development across time and localities (Brenner, Peck, and Theodore 2010, 184). Yet instead of producing uniform neoliberal states, the confrontation between social forces that promote and resist neoliberal policies has created variegated market states (Carroll 2017).

Following the analysis that capitalist processes reconfigure social classes and institutions, some scholars of the Murdoch School seek to further understand how global capitalism under the condition of globalisation has altered the structural power and actual capacity of the modern state. Various influential scholars have examined the changing nature and capacity of the state under globalisation (Cox 1987; Strange 1988; Shaw 2008; Evans and Heller 2015). They generally posit that structural forces of globalisation—in the form of enhanced mobility of capital and labour, deepened interdependence between political economies, and the emergence of powerful new agents—propel us to re-think the organisation and capacity of the modern state, as well as the challenges it faces in the 21st-century political economy. Murdoch School scholars also alert us to the multiple ways in which social relations and state power are reorganised as globalisation advances. To begin with, the state does not comprise only the government apparatus, but rather a structure constituted out of various social relations (Jessop 2003) that have become transnational under globalisation (Chacko and Jayasuriya 2017).

Modern states experience changes and encounter all sorts of pressures as both domestic and external contexts shift. Using China as an example of an influential rising power, Hameiri and Jones (2016) suggest that emerging powers—the more advanced and powerful late industrialisers—have experienced three major transformations as they deepen their integration into the world economy. First, modern states are highly 'fragmented, decentralised and internationalised' (Hameiri and Jones 2016, 7) as a result of the multidimensional systemic forces they are subject to. The result is the retreat of control and power of the central authority. Any analysis on the function of the state therefore can no longer assume that the state is coherent and unitary (Hameiri and Jones 2016); such a view has also been articulated by Breslin (2002) and Dimitrov (2009) in reference to the Chinese state.

Second, modern states under globalisation are compelled to reconfigure state apparatuses to strengthen national competitiveness. This often involves purposely creating institutions and incentives to facilitate new accumulation strategies, empowering competitive fractions of capital while inevitably marginalising others. The conflict of interest between social groups is emphasised by critical political economists, who see state responses as political struggles between different actors in a neoliberal-dominated global setting—one in which the consolidation of the world market and the dominance of neoliberalism have displaced former national policy sets with neoliberal principles (Cammack 2017; Gonzalez-Vicente and Carroll 2017). These struggles have resulted in the prevalence of dominant interests and

practices at the expense of others, as reflected in the reconfiguration of states and their relationships with different players in a political economy. For catch-up economies overwhelmed by the imperative to sustain growth, most state apparatuses have been significantly 'repositioned, repurposed and redeployed in instrumental ways to support marketisation and reflect the transforming interests of specific classes and capital' (Carroll and Jarvis 2017, 9). For late industrialisers, steering development under hyperglobalisation entails nurturing competitive fractions of capital and resources; such processes inevitably generate economic conflicts and political tensions that stem from varying access to resources and the protection of key interests.

Transnational state projects, such as the Belt and Road Initiative (BRI) and the Trans-Pacific Partnership (TPP) are contemporary examples of efforts made by modern states to pursue growth and global competitiveness, while also managing domestic political and economic problems associated with uneven development caused by capitalism (Chacko and Jayasuriya 2017).[14] As states vary in terms of their resources and abilities to promote capital accumulation and govern capital relationships (Jessop 2016b), the interaction between states and capital often gives rise to different patterns in power structures across polities.

Third, in addition to global competitive forces, the complex interdependence among states in an integrative global economy shapes the development trajectories of late industrialisers such as China. Late developers encounter the proliferation of political, social, and economic actors (both internal and external to the state) who, to varying degrees and with differential resources, are able to challenge prevailing power structures and influence political outcomes. These actors, including sub-national authorities, commercial players, professionals, and technical experts, have formed transnational networks to try to overcome the challenges of globalisation and pursue their own diversified goals (Hameiri and Jones 2016).[15] For example, Chacko and Jayasuriya (2017) note the emergence of a middle class which is closely tied to transnational, rather than national, capital. Some of these transnational sectoral interests have 'disembedded' from national interests (Carroll and Jarvis 2017, 7). Meanwhile, in battling for their interests, these transnational influences are also mediated by contentious local power politics and social forces, further complicating policy implementation.

In a number of ways, the Murdoch School's approach to explaining institutional transformation offers a powerful analytical lens through which to view sources of institutional change and their associated impact. The focus on class conflict is particularly relevant to analysing China's struggle in industrial upgrading and its varied outcomes. By giving primacy to the activities of key social forces and the ways in which they are intertwined with the formulation and application of rules and policies, the Murdoch School approach not only helps to explain institutional processes as observed today, but also how they are constructed in the first place. The creation and evolution of institutions are understood to be rooted in

ongoing struggles between different social classes. This explains why ruling Chinese elites strive to defend the overarching institutional framework—one that is characterised by state capitalism and the so-called 'socialism with Chinese characteristics'—even when certain aspects of it are no longer productive and efficient. The pursuit of industrial upgrading through large-scale technological enhancements reflects the endeavour of ruling elites to sustain the existing institutional framework, in which the market remains subordinate to political objectives and top-down control, by reforming and enhancing it.

Furthermore, the Murdoch School's attention to the macro-level distribution of power highlights the relationships between local struggles and broader systemic forces, yielding productive insights into the political-economic patterns of national development in Asia. This perspective overcomes the limits of HI, which deals with the broader context in which agents interact in an *ad hoc* manner (Hameiri 2020). Instead of analysing how the wider environment impacts power relations between actors in a case-by-case manner (as HI scholars tend to do), the Murdoch School approach identifies precisely the environment in which political struggles are enmeshed in, and explains how such a condition (i.e. global capitalism and the various forces emerged from it) shapes the preferences and behaviour of actors. For example, Murdoch School scholars attribute the boom period enjoyed by a number of Southeast Asian economies from the mid-1980s to 1997 to structural changes on the global scale, with Japan in particular seeking new outlets for low-cost manufacturing at that time (Rodan et al. 2001). In the case of Japan, the global power configuration during the Cold War had provided the security and economic safeguards for the country to pursue catch-up development. One should not ignore:

> [the] combination within a specific historical period (the expansion of the US market during "the golden age of capitalism" and the Cold War) that translated into sophisticated exports, significant aggregate economic gains and the globally recognised brands that would make Japan the world's second largest economy and see South Korea join the ranks of the OECD in 1996.
>
> *(Carroll 2021, 210)*

As a result of the favourable conditions, a key part of Japan's rapid development was achieved through mercantilist policies that were tolerated by the United States and its Western allies (Beeson 2009). As Woo-Cumings (1991, 2) noted, Japan's developmental experience demonstrated the 'exigencies and requirements of national survival and mobilization in a 20th century dominated by bigger powers in Europe and America'. The overarching objective of the Western bloc to defend liberalism and capitalism, as well as its geopolitical interests, created the necessary momentum that helped sustain the national development of Japan. Examining evolving global forces

and their interaction with local struggles to pursue growth are thus essential to explaining patterns of national development.

One can also apply changes in global dynamics to understanding major institutional developments in modern China. The initiation of China's reform and opening—a major institutional change in terms of the reorganisation of market–state relationships—was rooted in an international context in which the Sino–Soviet split during the 1960s made China turn to the United States, resulting in the normalisation of US–China relations in 1973. Deng Xiaoping was a key figure in directing China's experiment with capitalism, albeit with Chinese characteristics. Internal troubles, manifested in the country's backwardness and state of shambles after the Cultural Revolution, reinforced Deng's justification for breaking from the past and embarking on a new strategy to construct a modern China. Chinese reformers began to adopt market-friendly strategies to drive development, albeit in a partial, selective, gradual, and experimental manner. Given the advent of neoliberal policies in the advanced economies since the 1980s, China's opening-up and new engagement with the international economy inevitably involved adapting its socialist institutions to international practices. Taking a Murdoch School approach, such a turn to market-conforming policies does not necessarily reflect ruling elites embracing capitalist doctrines. Instead, it suggests that ruling elites have succumbed to the continuous build-up of systemic pressures that 'required the state [to] support private enterprise' (Rodan et al. 2001, 8).

Conclusion

The above discussions demonstrate the preoccupation of some analyses of China with the relationship between the forms of institutions and development. Even when it comes to promoting development through innovation, the dominant question continues to be, what *type* of institutions and what *kind* of policies are conducive to innovation-oriented growth? Yet the relationship between innovation promotion and development in China has never been a straightforward, linear one. Constant power struggles between various social groups and fractions of capital have continually influenced development outcomes. Focusing on the *politics* surrounding the relationships among innovation, institutions, and development thus helps to explain why certain policies have gone awry, very often due to actions by social actors who are motivated by agendas that deviate from those of the policymakers.

In response to the deficiencies of institutionalist analyses—namely a depoliticised understanding of institutions, an unsatisfactory treatment of agency and institutional change, a methodologically nationalistic analysis, and a lack of consideration of the interactions between endogenous and exogenous forces—the Murdoch School approach promises a more sophisticated understanding of the processes of change and continuity. It emphasises the changing pattern and scale of capital accumulation, focusing on

analysing important political and social forces that seek to establish institutions to extend accumulation activities in their interest. In the contemporary setting of China, industrial upgrading efforts are associated with prioritising the power and leverage of tech- and innovation-linked capital, along with the political interests of the regime. There are different situations in which domestic players are favoured over foreign ones and vice versa. Power relationships are contingent on specific conditions of competition that vary across sectors and often do not hold indefinitely. An institutional analysis alone does not offer the panoramic view of the multiple forces and actors involved in pushing, changing, and resisting the course of development occurred within evolving global capitalism. To better capture China's contemporary developments, a more dynamic approach which is sensitive to the workings of social forces and global structural changes is needed.

Notes

1. Hall and Taylor (1996) classify rational institutionalism, historical institutionalism, and sociological institutionalism as the three main strands under new institutionalism. The seven strains of new institutionalism identified by Peters (2005) are normative institutionalism, rational choice institutionalism, historical institutionalism, empirical institutionalism, sociological institutionalism, institutions of interest representation, and international institutionalism.
2. While markets are important, it is essential to note that they are imperfect. New institutional economists are concerned about the occurrence of various conditions, especially information asymmetries and high transaction costs, which hinder the optimal operation of the market. Information asymmetries and high transaction costs will lead to 'market failures'—situations in which the market does not produce the most efficient outcome (Stiglitz 1989). Therefore, institutions are created for the purpose of reducing transaction costs and overcoming difficulties arising from imperfect information.
3. From this perspective, the explanation for lower income levels in the less developed countries lies not only in their relative lack of endowments of factors of production, but more importantly in the functioning of markets in their economies, which hinder the ability of these economies to ameliorate market failures (Stiglitz 1989). Effective economic institutions, which include the enforcement of property rights and the honouring of contractual commitment, will help overcome those conditions which impede efficient market operation.
4. In LMEs, activities of firms are primarily coordinated by competitive pressures of markets. Firms in these economies respond to market signals and adjust their responses and build core competencies accordingly. In CMEs, firms coordinate their activities mainly through non-market mechanisms such as formal and informal networks. They also rely heavily on collaborative arrangements and strategic interaction to build competencies (Hall and Soskice 2001).
5. MITI is now known as the Ministry of Economy, Trade and Industry (METI).
6. The alternative, neoliberal position argues that the NIEs achieved rapid growth in the late 20th century as they embarked on free trade, export-oriented growth strategies in a liberal international order led by the United States.

7. For a comparison of the key differences in institutional settings between the East Asian development model and Western liberal capitalism, see Rodrik (2007, 17–9).
8. For discussions on the China model, see Zhao (2010, 2017).
9. Some scholars are more optimistic about the future of Asian states which continue to display developmentalist qualities. Singapore and Hong Kong are described as having wisely adapted to new economic and political challenges by turning themselves into smart cities, as states use more subtle means to achieve developmental objectives (Woo 2018).
10. In 1992, Deng Xiaoping made a southern tour to Guangdong, Shenzhen, Zhuhai and Shanghai during which he reaffirmed the CCP's commitment to deepen market reforms. This political move signalled a triumph of the reformist faction over the conservatives, who had been pressing for the scaling back of reforms, within the CCP. The southern tour helped restore confidence of foreign capital in China's market reform and triggered massive flows of FDI into China.
11. For an analysis of the roots of China's debts, and the political and financial implications of this, see Huang (2016) and Shih (2019).
12. For a survey of development challenges encountered by China, see Huang (2008), McGregor (2012), Dibb and Lee (2014), Li (2016), and Shambaugh (2016).
13. Robert Cox defines historic blocs as 'the configurations of social forces upon which state power ultimately rests' (Cox 1987, 105).
14. In explaining the imperatives behind the Trans-Pacific Partnership (TPP), Regional Comprehensive Economic Partnership (RCEP), and the Belt and Road Initiative (BRI), Chacko and Jayasuriya (2017) reject the claim that these foreign policy initiatives are tied to the realist motives of securing economic and security interests. Instead, they argue that these transnational state projects are driven by changing internal social relations of production which occur within a broader process of global capitalist expansion, and the need by the United States and China to overcome the contradictions of uneven capitalist development.
15. A detailed study by Mulvad (2015) reveals that local elites in two Chinese provinces—Chongqing (under the leadership Bo Xilai) and Guangdong (under the leadership of Wang Yang)—created different, and to some extent competing, experimental models of capitalist transition between 2007 and 2012, driven by local economic endowment, political rivalries, and the ideational influences of respective leaders.

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3 China's Pursuit of Technological Upgrading in Historical Perspective

What Drives Institutional Change?

Introduction

> Indigenous innovation is the backbone that supports the rise of a country… It is only with the possession of strong technological and innovation power and indigenous intellectual property that we will be able to enhance our nation's competitiveness and command international standing and respect.
>
> *–Wen Jiabao, speech delivered at the National Science and Technology Awards Ceremony, Beijing, 28 March 2005*

Since the introduction of Deng Xiaoping's market reform in the 1980s, there have been ongoing efforts by the CCP to modernise China through strengthening its S&T capabilities. These followed the earlier S&T development plan under Mao Zedong's leadership in 1956, which largely mimicked Soviet-style industrialisation. For decades, then, S&T strategies and policies have been constructed to increase production capacity and enhance national competitiveness, although the effectiveness of these state-led measures is subject to debate. How do we understand the adoption, implementation, and outcomes of innovation and technology strategies in China over the past 40 years? This chapter provides an overview of some of the key initiatives and analyses the drivers behind them. A simple account would attribute China's reform policies to achieving development goals, strengthening national competitiveness, and, importantly, maintaining CCP political legitimacy. However, unpacking these policies will allow us to see beyond their stated goals, to uncover complex interactions between the key players and structural forces that shaped them, and the related institutional changes over time. The conditions of globalisation and hyperglobalisation have further bearing on policymaking. As this chapter will reveal, as far as industrial upgrading is concerned, late developers have to adapt to various opportunities and obstacles that are linked to the reorganisation of production, the rise of global capitalist interests, and the successive practices that privilege particular interests over others. This chapter shows that institutions related to industrial upgrading are hardly insulated from various

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political-economic battles, which have taken on new forms and patterns in the context of late capitalism.

China's industrial upgrading efforts since the launch of market reform can be broadly divided into three phases: the dual strategies for the period 1980–2000; the establishment of a new narrative for the period 2001–2012; and the race to the future from 2013 onwards. Although it is beyond the scope of this book to examine in detail all the S&T and innovation policies of the CCP since reform and opening, for the purpose of analysing the fundamentals of institutional change, the chapter focuses on several major high-profile national strategies throughout this era. The Murdoch School framework, which prioritises the conflict and collaboration between social forces under late capitalism, is adopted to account for the mechanisms that affect policy change (particularly those related to market access, indigenous innovation, and technological transfer) and the variegated outcomes associated with each phase. Empirical evidence drawn from various aspects of China's state-led economic liberalisation, IP reforms, and innovation drive is cited to illuminate the political conflicts, interest alignments, and embedded economic interests surrounding institutional formation and change under late development. The chapter concludes that the making of an innovation nation, in the case of China, is far from being a straightforward formula designed by the seemingly omnipotent CCP to achieve development goals. Instead, China's bumpy journey of technological upgrading offers important lessons on the fluid and dynamic nature of institutions: that they are subject to negotiation, contestation, and reconstitution by different actors who have various degrees of power at their disposal as the contours of global competition evolve.

Dual strategies: Foreign technology and domestic R&D (1980–2000)

Prior to Deng Xiaoping's market reforms which began in 1978, innovation activities in China were locked in a hierarchical system whereby the state controlled all research activities through national and regional government research institutes (Schmid and Wang 2017). Apart from some technological transfer from the Soviet Union in the 1950s, exchanges between China and the outside world were limited, given that economic self-reliance was the overriding objective of the CCP. When Deng came to power, he prioritised S&T, alongside agriculture, industry, and defence, as key developmental goals under China's 'Four Modernisations', with an overarching aim to catch up with the advanced economies.[1] As part of Deng's economic reforms, market mechanisms were introduced, which gradually dismantled the planned system and reduced the extent of state control over economic activities. China also gradually opened up its market and began to integrate with the global economy through trade and investment liberalisation.

One of the purposes of integration was to attract foreign capital and technology, which China desperately needed for modernising its manufacturing sector. Given China's relative backwardness in the early 1980s, the CCP's S&T policies at the time aimed at boosting productivity in manufacturing, increasing the generation of primary energy sources, and improving communication networks that were crucial for supporting production and exports (Lardy 1988). In short, S&T policies were pursued to meet economic goals.

One significant impact of Deng's economic reform was the opening up of the Chinese market to foreign capital. In contrast to other East Asian developmental states such as Japan, South Korea, and Taiwan, which largely protected their domestic industries from foreign competition at earlier phases of reform, China's relative openness to foreign investment at this stage was a defining feature of the country's market reform process (Kroeber 2011). In fact, one of the principal aims of 'openness' (*kaifang*) was to establish channels for Chinese enterprises to acquire better and more advanced technology, alongside the capital necessary for increasing competitiveness. Building a modernised industrial economy, which would result in an improvement in the overall material wealth of society, was essential, as this imperative formed the basis for CCP legitimacy. With the broad objective of boosting industrial production capacity, CCP reformers introduced what was widely known as the 'Market Access for Technology' policy as part of its FDI liberalisation policies in 1984.[2] Under this policy, segments of foreign capital that were linked to advanced technology, mainly through TNCs, were encouraged to form JVs with Chinese SOEs in national strategic sectors such as the automotive industry (see Chapter 5).[3] Chinese policymakers anticipated that the JV arrangement would provide SOEs with foreign manufacturing know-how and capital, and that these spillovers would gradually help upgrade domestic industrial production.

Opening up the Chinese market to foreign capital and technology was not a decision reached without dispute within the CCP central leadership. The greatest tension lay behind reconciling the national interest to modernise the economy—an important basis for party legitimacy—and the elite interests which were determined to preserve their power and influence. Interests of the ruling elite were divided from the onset of reform. Though Deng and some other like-minded reformers shared the understanding that market mechanisms, rather than central planning, would be the effective trigger for economic growth (as demonstrated by the developmental experiences of industrialised economies), there was considerable disagreement among the reformers and other leaders over issues such as the extent of market regulation and the degree of diffusion of economic power to subnational governments (Solinger 1982). In this context, Deng's gradual and experimental approach to reform and opening—one that is often described, in the famous words of Deng himself, as 'groping the stones while crossing the river'—represented a contingent institutional arrangement to reconcile

conflicts of interest among important Party members. Introducing capitalist mechanisms in a step-by-step manner would protect the vested interests of key Party members, contain resistance from Party conservatives, and ensure that the CCP still retained influence over key sectors of the economy despite marketisation.

Consequently, while imports of foreign technology were deemed crucial to modernise China's industries, they were only permissible under the condition that the CCP could determine and regulate the terms of market entry. Crucially, these terms, such as restrictions on sectors and foreign ownership, in addition to the requirements of local content, were negotiated to protect the interests of SOEs which were tied to Party members. On the other hand, foreign capitalist interests, represented by the US, European, and Japanese TNCs along with their governments, also fought for more favourable terms of market entry, in the context of technology asymmetry giving foreign capital an unparalleled advantage in the negotiation process. In this sense, these external actors were by no means passive rule-takers. Not only were they able to negotiate the terms of market entry, they also embodied various forms of privileged interests that benefited commercially from a large, yet highly protected market. For foreign capital, China's largely untapped market and its huge, relatively cheap labour pool represented considerable commercial potential. At a time when transnational capital faced strong market competition and suffered from declining margins in more established markets, China presented a timely and irresistible opportunity. For example, in late 1970s and throughout the 1980s, TNCs of US and European origin were challenged by the rise of prominent Japanese companies in industries such as electronics, automobiles, and household products. The rising economic power of Japan in the 1980s had threatened US national economic interests and subsequently led to US–Japanese trade frictions. Pressured by rising competition both at home and abroad, TNCs had to look for new means of accumulation. Hence, competitive pressures emanated from economic globalisation in large part accounted for the changing interests of capital during this period which, in return, shaped institutional rules relating to technological upgrading in China.

Although China's opening up to the outside world owes much to the ideology and pragmatism of Deng Xiaoping (Shambaugh 1995), the influence of capitalist interests, represented predominantly by TNCs and their respective governments, in conditioning policies should not be discounted. Supported by the then-nascent neoliberal political agenda to create market-based economies, competitive fractions of capital in the developed world began to make considerable gains in the 1980s, constituting an emerging organised interest that pushed market liberalisation onto a global scale. The shifts in the external environment aided and abetted by neoliberal reforms, coupled with the reorganisation of production, had underpinned China's integration with the world economy. As Harvey (2007, 121) puts it:

> [China's] reforms would not have assumed the significance we now accord to them, nor would China's extraordinary subsequent economic evolution have taken the path and registered the achievements it did, had there not been significant and seemingly unrelated parallel shifts in the advanced capitalist world with respect to how the market worked.

The formulation of the 'Market Access for Technology' policy ultimately embodied a mixture of interests of CCP ruling elites (as well as the divisions among them over the form and extent of reform), the demands of Chinese state-linked capital, and those of foreign capital. It was the influence and interactions of these interests in the context of a changing global environment geared towards market liberalisation that underpinned the form and process of FDI liberalisation in China. Initially, FDI liberalisation and the setup of JVs were limited through ownership and sectoral restrictions to safeguard the commercial interests of SOEs and the CCP. Yet as the foreign-invested sector and JVs grew, regional and inter-firm competition for capital inflows intensified, increasing the pressure towards further liberalisation (Gallagher 2002, 350). In addition to market access and preferential treatment on taxes and land use, TNCs also benefited from a protected market where competition was limited. Although foreign capital was only permitted to own up to a 49 percent stake in any JV, as Chinese ruling elites tried to protect SOE interests in strategic industries, market rules were pivoted towards favouring local state-owned interests, thus creating room for the JVs and their foreign partners to enjoy first-mover advantages, becoming dominant players in targeted sectors at an early stage of reform. For instance, in the automotive sector, the SAIC-Volkswagen JV between Shanghai Auto and Volkswagen monopolised the Chinese passenger car market from its formation in 1985 until 2000 (Zhou and Liu 2016, 41). In this context, state-directed marketisation, with respect to the acquisition of foreign technology, was characterised by the favouring of state-linked and foreign advanced capital, as well as their hybrid form. The result was the domination of selected players and an early consolidation of monopoly power in the industry.

Strengthening domestic research capabilities from within was another pillar of China's S&T policies in the 1980s and 1990s. After the havoc of the Cultural Revolution (1966–1976), during which many intellectuals were purged and scientific research came to a halt, rebuilding research talents became critical for long-term S&T development. Notably, some key players and agencies within the state apparatus began to influence policy direction and push for the allocation of state resources, both to nurture domestic R&D talents and to establish institutions facilitating the commercialisation of public research. A group of special interests, comprising local and overseas Chinese scientists and technical experts, emerged as advisors and architects of top-down, high-profile national plans. They included scientists in the Chinese Academy of Sciences (CAS), a national think tank

established in 1949, and bureaucrats in the Ministry of Science and Technology (MOST); together they influenced the direction of national developments regarding R&D.

The role of CAS was to provide advice to the CCP ruling elites and prepare national S&T strategies. Under the auspices of MOST and CAS, several high-profile programmes were implemented to fund domestic research that would benefit industrial modernisation. For example, the National High-Tech Research and Development Programme (also known as the '863 Programme'), introduced in 1986, provided grants for SOEs and state-linked research entities to conduct research in target sectors such as biotechnology, electronics, and information and communication technology (ICT). The National Torch Programme, introduced in 1988, represented the first concerted efforts to establish high-tech zones and S&T parks. These sites were set up to facilitate ongoing research and the diffusion of technologies to industrial production. In 1995, the CCP promulgated the strategy of 'rejuvenating the country with science, technology and education' (*kejiao xingguo*), rolling out policies that facilitated the industrialisation and commercialisation of research outputs, and strengthened higher education. Further efforts to promote research were coordinated by the National Basic Research and Development Programme (also known as the '973 Programme') introduced in 1997. Lastly, the Knowledge Innovation Project launched in 1998 mobilised state resources to strengthen the CAS as an internationally competitive research centre (Ding and Li 2015, 22). As a result of these initiatives, MOST and CAS, along with the bureaucrats, researchers, and scientists attached to them, gained a more prominent social status, marking the beginning of the rise of these interests in shaping the national policy agenda.

While these programmes were aimed at nurturing local S&T talents and developing domestic R&D to upgrade industrial output, they also became sites that drew tech-linked FDIs (So and Chu 2016, 120–1). This was supported by the broader economic policy pushed by the reformers within the Party, which continued to gradually relax FDI restrictions in order to capitalise on foreign investment and technology. Deng Xiaoping's southern tour in 1992 reaffirmed the regime's Open Door policy; politically, it signalled that the faction of reformers had regained power and influence over the conservatives whose hardline position won much support after the Tiananmen massacre in 1989. Subsequently, more coastal cities were opened up to foreign capital, while more local and regional officials, as well as domestic firms, joined the race to lure in much-needed capital and technology to benefit their localities. A hike in FDIs occurred in 1992 and 1993 which registered an annual growth rate of 155 percent and 146 percent, respectively (World Bank 2021). At this stage, China still lacked fundamental research and product innovation capabilities; consequently, foreign capital, technology, and managerial know-how became vital resources for boosting domestic innovation capacity and the industrial upgrading of Chinese enterprises. Foreign investment was highly sought-after. Provincial and

local governments provided incentives for foreign-invested R&D centres, including exemptions from customs duties on imported equipment, as well as business and income tax deductions. During this period, US and Western European investment was concentrated in basic manufacturing that used high-end technology, including metals, machinery, oil refineries, and transportation equipment (Xie and Dutt 1993, 394–5). As experimental sites for Chinese capitalism, capital-friendly cities in China such as Shenzhen, Shanghai, and Zhuhai competed among themselves to offer preferential policies for foreign capital, creating a competitive environment that further increased the autonomy and bargaining power of tech-linked foreign capitalist interests.

A new narrative: Indigenous innovation and leapfrog development (2001–2012)

The early 2000s marked a turning point in China's capitalist transition and its strategy of industrial catch-up. Among various factors shaping institutional change, the most significant catalyst was China's admission to the WTO in 2001 after 15 years of negotiations. As a WTO member, China was obliged to further liberalise trade and investment, in terms of reducing tariffs and unifying the treatment of domestic and foreign firms, in addition to adopting regulations and practices, such as reformed IP laws, that were in line with international standards. Though foreign firms still faced various bureaucratic and regulatory issues when doing business in China, the new WTO-related institutions further opened the Chinese market, permitting more foreign and multinational capital to establish and strengthen its interests in China. Meanwhile, the first decade of the millennium also witnessed a shift in China's industrial catch-up strategy, from heavy reliance on importing foreign technology to a greater emphasis on boosting domestic capacity for indigenous innovation and 'leapfrog' development. Again, these institutional changes can be explained in part by the activities and leverage of powerful interests that had emerged as a result of changes in global production relations. Moreover, China's further marketisation, its admission to the WTO, and continued economic decentralisation also unleashed competitive pressures that had the effect of reorganising social forces, reformulating their bargaining positions, and restructuring alliances among different organised interests. Importantly, institutional change during this period was associated with the construction of a new narrative of national development pushed by dominant elite interests, framed in terms of the active acquisition of tech-linked assets and the robust generation of indigenous innovation, all to be pursued under state guidance. This narrative justified the prioritisation and favouring of tech-linked capital and talent, together with the institutionalisation of policies to support these interests.

As China entered the new millennium, CCP policymakers reformulated its industrial catch-up strategy to centre on 'leapfrogging development'.

The narrow focus of strengthening S&T capabilities, which dominated much of China's technological upgrading strategy in the first two decades of reform, was reoriented towards building a broader national innovation system. The 11th FYP (2006–2010) and 12th FYP (2011–2015), unveiled by the Hu Jintao–Wen Jiabao leadership, encapsulated the new development strategy to move China's economic model from being export- and investment-driven to one that would be supported by stronger consumption and innovation (Naughton 2015). Though political elites played an important role in promoting new development strategies, such a shift in development focus was also partly driven by the emergence of an information-driven global economy, along with an accompanying redistribution of power relations in favour of IT-linked capital and intangible assets. Moreover, after more than two decades of pursuing modernisation under the premise of 'Market Access for Technology', uneven and unexpected outcomes resulting from the policy also generated pressures on policymakers to rethink the effectiveness of their former strategies.

The pressure to reformulate catch-up strategies stemmed from multiple sources. First, playing an important role was the uneven distribution of gains among key players, largely along the lines of domestic state-linked capital versus transnational and foreign capital, as China's market liberalisation deepened. There was growing dissatisfaction among reformers over the progress of technological upgrading following market reforms. While exports grew exponentially, the technology importation policy was less successful (Zhou and Liu 2016). As pointed out by a CAS member in an interview with the author, reformers began to question the wisdom of pursuing industrial and technological catch-up by relying on imported foreign technology and greater integration with the world. Policymakers originally anticipated that the introduction of market mechanisms would generate a business environment in which competition between firms would bring about enhanced innovative capacity, increased productivity, and overall growth and prosperity. Not only was progress in technological upgrading disappointing, however, but the narrow focus of S&T policies in the 1980s and 1990s had fallen short of significantly enriching the country's innovation capacity (Cao and Suttmeier 2017). Despite increases in industrial output, Chinese firms often copied foreign goods and obtained quick profits at the expense of investing in researching and developing inventive products. Research breakthroughs were scant, and when these happened, they relied on ideas that had already been applied elsewhere (Suttmeier 2015).

The 'Market Access for Technology' policy was thrown into question as foreign capital had benefited significantly from the new institutional design. Enjoying preferential policies on taxes, foreign exchange, and licensing requirements, TNCs captured lucrative profits, but held back from transferring key technologies and skills to the JVs in return. Retaining their core technology to remain competitive, TNCs only shared secondary, and in many cases outdated, technology with their Chinese partners. For example,

in the Chinese automotive industry, despite the JV arrangement, most Chinese SOEs were still trapped in low-end manufacturing processes that generated only thin profit margins. By the end of the 1990s, half of the Chinese automotive market was represented by three dated, imported car models—Volkswagen's Jetta and Santana and Citroën's FuKang, production of which had ceased in 1988, 1992, and 1998, respectively (see Feng 2016, 135). Although a handful of large central SOEs also benefited from growing industrial output and sales through JVs, a lack of competition meant that SOEs were not incentivised to invest in developing new products. Thus, contrary to the expectations of Chinese reformers, SOEs fell short of developing the kind of innovation capacity necessary to bring about qualitative upgrading in the industry: most products produced by JVs were not competitive enough for exports (Yeh 1993, 138–9). In the interest of domestic state-linked capital, changing prevailing policies had become necessary in order to tilt the balance of knowledge- and tech-linked assets towards state-controlled economic players.

In addition, socio-economic conditions within China also fomented pressures to reassess industrial catch-up approaches. Though the Chinese economy was shown to be more resilient to the global financial crisis of 2007–2008 compared to other advanced and emerging economies, ongoing state intervention that disregards market signals, along with continued financial patronage to SOEs regardless of output efficiency, have resulted in immediate and long-term economic problems such as overcapacity and alarming hikes in corporate debt (Lynch 2016). The deficiencies of the Chinese growth model have in fact been acknowledged by Chinese leaders themselves. Since 2007, successive Chinese leaders have been stressing the need to restructure and rebalance the Chinese economy. Former Premier Wen Jiabao once remarked that the Chinese economy was 'unstable, unbalanced, uncoordinated and unsustainable' (CCTV 2007). Reform and opening had raised the overall living standard of Chinese society as a whole, yet also brought many socio-economic challenges that posed threats to CCP legitimacy. These included energy and water shortages, serious air pollution, infrastructure falling short of surging demands, rising production costs, and increases in the wealth gap and social inequality. The development strategy of export- and investment-led industrialisation, which exploited China's relatively cheap labour force in low-cost manufacturing, would be difficult to sustain as China began to lose its demographic dividend. Rising production costs also undermined the country's competitive advantage as a manufacturing and investment location vis-à-vis neighbouring Southeast Asian countries. Pressures to overcome developmental bottlenecks, coupled with dissatisfaction over technological progress made during previous phases of opening-up, were key imperatives underlying the CCP's turn to prioritising indigenous innovation. The introduction of the MLP in 2006, followed by a range of S&T-focused development plans, marked the beginning of China's new development strategy (Table 3.1). Boosting China's innovation capacity

Table 3.1 Major S&T and innovation policies and initiatives in China, 1985–2018

Year of introduction	*Major initiatives*
1985	Decision Concerning the Reform of Science and Technology Management System
1986	National High-Tech Research and Development Programme (836 Plan)
1997	National Basic Research and Development Programme (973 Plan)
1998	National Torch Programme
2006	15-year Medium- and Long-term Plan (MLP) for Science and Technology Development 2006–2020
2008	Thousand Talents Programme
	Outline of the National Intellectual Property Strategy
2010	National Medium- and Long-term Talent Development Plan (2010–2020)
	Outline of Strategic Emerging Industries
	National Patent Strategy
	Broadband China Strategy
2014	Outline of the Program for National Integrated Circuit Industry Development
2015	Internet Plus
	Made in China 2025
2017	Next-generation Artificial Intelligence Development Plan
2018	Guidelines by the State Council on deepening 'Internet Plus Advanced Manufacturing Industry' and Developing 'Industry of Internet'

Source: State Council of the PRC and media reports; compiled by author

became a central theme of both the 11th FYP (2006–2010) and the 12th FYP (2011–2015). Innovation and technological advancement were stipulated as instrumental in building China into a 'moderately prosperous society in all aspects', a national development goal further emphasised by Xi Jinping in the 13th FYP (2016–2020).

The MLP represented a major S&T development plan with broad principles and guidance towards establishing China as a technology powerhouse under the strategic leadership of the CCP. Some targets set out by the MLP included: by 2020, investment in R&D would reach 2.5 percent of GDP; China's reliance on foreign technology would be reduced from 60 percent in 2006 to below 30 percent; and the number of patents and academic citations originating in China would be in the world's top five (State Council of the PRC 2006).[4] In some ways, the MLP departed from the prior approach of accelerating industrial upgrading through assimilating foreign technology. Recognising China's limitations (and, to some extent, potential advantages) as a late developer, the new strategy stressed the twin goals of promoting 'indigenous innovation' (*zizhu chuangxin*) and 'leapfrogging development' (*kuayueshi fazhan*) in strategic industries (Cao, Suttmeier, and Simon 2006). What remained unchanged, but strengthened, was the capacity of the state

in orchestrating catch-up strategies. Development in China's case was to be achieved with more, rather than less, state presence. This was reflected in the CCP's much greater role in picking strategic industries and domestic enterprises to receive full state backing, enabling them to overcome technological inferiority and shielding them from market competition. The state appropriated financial resources to support domestic state-linked and non-state-linked capital in 27 frontier technologies in eight sectors and 16 megaprojects highlighted in the MLP. Key sectors included IT, agriculture, and health, while targeted frontier technologies among those sectors included advanced manufacturing, aerospace, and aeronautics (Cao, Suttmeier, and Simon 2006). Following the MLP, seven strategic emerging industries (SEIs) were named for prioritised development in 2010 (Table 3.2).

Framed as a state-directed S&T plan to promote growth and development, the MLP was a key initiative to advance selective domestic interests by empowering them through new institutional rules. It incorporated industrial policies that privileged existing and nascent domestic tech-linked actors by furnishing them with financial, regulatory, and human capital resources. Underlying these policies was a political narrative that was built around the central role of technological innovation in sustaining future growth of China. This message was made clear from the MLP and successive public announcements by Chinese leaders in the 2000s. What followed was

Table 3.2 Priority sectors and technologies: MLP, SEIs, and MIC2025

	Eight priority technologies, MLP (2006)	*Strategic Emerging Industries (SEIs) (2010)*	*Ten strategic sectors, MIC2025 (2015)*
1.	Biotechnology	Biotechnology	Biopharma and hi-tech medical devices
2.	Information technology	Next-generation information technology	Next-generation information technology
3.	New materials technology	New materials	New materials
4.	Advanced manufacturing technology	High-end equipment manufacturing	Maritime equipment and hi-tech ships
5.	Advanced energy technology	Clean energy vehicles	New energy and energy-saving vehicles
6.	Maritime technology	Alternative energy	Railway transport
7.	Laser technology	Clean energy technology	Energy equipment
8.	Aerospace technology	—	Agricultural equipment
9.	—	—	Aviation and aerospace equipment
10.	—	—	Robotics

Source: State Council of the PRC 2006 (MLP), 2010 (SEIs), 2015 (MIC2025)

major institutional restructuring to provide the conditions for continued development. Among the various interests shaping the MLP, the Party was a key interest which consistently provided justifications for its indigenous innovation policies. These included the appeal to national competitiveness, ranging from reducing reliance on foreign technology to surpassing foreign competitors, and the visionary claim that innovation would bring technological breakthroughs and therefore both economic and social benefits. To ensure that elite interests were safeguarded, SOEs and state-linked research institutions remained the major beneficiaries of various funding schemes. The technological upgrading plan, which was meant to support longer-term development, was viewed sceptically by foreign governments and multinational capital which saw the MLP's mercantilist approach to promoting indigenous innovation and leapfrogging development as a threat to their national and commercial interests. Indigenous innovation in the Chinese context, as defined in the MLP, is a type of innovation that is achieved through 'enhancing original innovation through co-innovation and re-innovation based on the assimilation of imported technologies' (State Council of the PRC 2006). Critics argue that this supports the exploitation of foreign technologies and the transformation of them into Chinese-owned technologies (McGregor 2010). At the inauguration of the MLP, then Chinese President Hu Jintao branded the initiative as 'innovation with Chinese characteristics' (Xinhua 2006), stressing the crucial role of the Chinese state in accelerating industrial upgrading; yet for Chen and Naughton (2016), the industrial plan merely signalled China's return to state-directed 'techno-industrial policy'.

Analysing the MLP through a dichotomous lens of the Chinese state versus foreign governments/capital gives at best a partial picture of forces influencing the institutional development of technological upgrading in China. Assuming the institutionalisation of S&T efforts in China to be a monolithic, unidirectional operation under the full control of CCP leaders inevitably overlooks the complicated and contentious nature of crafting S&T policies in China. In reality, the processes leading to the inauguration of the MLP entailed serious battles between several groups of organised interests, divided primarily between economists, who supported giving market mechanisms a greater role in nurturing innovation, and those who believed state intervention would be needed to achieve progress in technological upgrading, namely scientists and engineers in MOST, CAS, and other research institutes. In particular, scientists and subnational governments bid eagerly for the allocation of state resources to their specialised fields. The consultation process of the MLP involved over 1,000 experts, who gave initial ideas, drafted, and finalised the plan (Chen and Naughton 2016, 2145). According to a Beijing-based think tank member, a stronger state role in pushing innovation and commercialisation was eventually adopted as the guiding approach. One argument supporting this position was that in order to develop pioneering technologies and strengthen basic

research—for instance, in the biopharmaceutical sector—massive financial and human resource capital would be required to insulate innovators and researchers from upfront costs, potential failures, and losses during the course of research. Sufficient essential funding, especially for research and projects whose payoffs would only be realised years later, could only come from the Chinese state.

Even with regard to innovation promotion, domestic players are by no means the only agents influencing the national agenda, either in terms of providing the rationale or recommending the necessary steps and actions. As organised interests, multilateral organisations also exert considerable influences and pressures on China's institutional reform. For example, the World Intellectual Property Organization (WIPO) is a strong advocate for 'increasing awareness among policymakers that fostering innovation is crucial to a vibrant, competitive economy' (WIPO 2016), bolstering the CCP narrative regarding the link between innovation and sustainable development. Furthermore, the World Bank and its development specialists have been strong proponents of further liberalising the Chinese economy and promoting innovativeness in Chinese society. *China 2030: Building a Modern, Harmonious and Creative Society*, a joint report by the World Bank and the Development Research Centre of the State Council of the PRC, spelled out key developmental challenges confronting China and called for the implementation of six reform strategies that formed the core of 'a longer-term strategy' for China's sustainable growth 'that extends to 2030' (World Bank 2013, xxi). Among these strategies, restructuring the economy, especially in terms of redefining the role of the government, and boosting innovation across society were listed as the top two priorities.[5]

Meanwhile, international pressures and regulatory demands forced the reforming of Chinese institutions to comply with international standards. The promulgation of the Chinese Patent Law in 1984, together with its first two amendments, was largely a response to foreign capitalist interests demanding stronger protection of their brands, technology, and inventions in China. Indeed, in China's final bid for WTO membership, CCP reformers acquiesced to further institutional change by passing the second amendment to the Patent Law in 2000, a move primarily made to harmonise domestic legislation with the TRIPS agreement made by WTO members.[6] TRIPS (the Agreement on Trade-Related Aspects of Intellectual Property Rights) is an international agreement that protects the interest of owners of intangible assets and perpetuates 'intellectual monopoly capitalism' (Pagano 2014). Chiefly drafted by lawyers and economists hired by a group of US MNCs (May 2010), the agreement, which sets out the scope of IP protection and its standards, largely represents the interests of American and European multinational capital. According to Susan Sell, the agreement would have been inconceivable 'without the concerted efforts of US-based corporate executives' (Sell 1999, 170).

The development of IP rules in China is one area that shows the influence of rising interests in influencing institutional reform relating to innovation in China. In line with the CCP's aim to push indigenous innovation since the early 2000s, the efforts of institutionalising policies and practices intended to stimulate innovation are logically extended to cover IP, for only when new ideas are protected and valued enough to bring material wealth and competitiveness will innovators be incentivised to explore new ventures and undertake risk-taking projects. Patented technology in particular is seen as conducive to the successful upgrading of the economy. Consequently, various state initiatives to improve and strengthen the domestic IP regime (comprising laws, norms, and practices) are understood to be complementary to the national campaign for indigenous innovation. Examples of these broad state strategies in the case of China include the Outline of the National Intellectual Property Strategy of 2008 and the National Patent Development Strategy of 2010. The former was aimed at improving China's capacity to create, utilise, protect, and administer IP, thereby raising China's IP ranking among advanced economies (State Council of the PRC 2008), while the latter stressed the importance of patented technology as the 'strategic resource for raising core competitiveness in a knowledge-driven globalised economy' (State Intellectual Property Office 2010, 1). In line with the development objective of promoting indigenous innovation, indigenous IP (*zizhu zhishi chanquan*) was treated as an important vehicle for assisting China's economic transition. A key developmental goal was to strengthen the national utilisation and protection of IP, encouraging more enterprises to become innovators in the process.

In contrast to the 1980s and 1990s, when China was under heavy external pressures to reform its IP laws, changes to its IP system from 2000 onwards developed not only in reaction to foreign demands, but also increasingly as a response to domestic needs. Chinese policymakers, inventors, and entrepreneurs had developed an awareness that a modern IP regime would be an integral condition for indigenous innovation. At the same time, Chinese policymakers were also answering the demands of favoured players, in particular those who had strong stakes in a full-fledged IP system in China. By the mid-2000s, industries within China had diversified; those that owned and thrived on IP-related assets had also expanded. More engineers, scientists, entrepreneurs, and other personnel engaged in research-linked and creative industries desired a stronger national IP system to protect their intangible interests. Moreover, certain technology-intensive industries, including telecommunications, IT, automobiles, and biotechnology, had begun to gain prominence since the late 1990s. For enterprises in these technology-intensive sectors, the struggle for profit maximisation has since extended from the traditional realm of tangible assets to the new frontier of intangible capital (The Economist 2010). The Huawei–Cisco IP dispute of 2003–2004 further demonstrated that a robust national IP system would be needed to make Chinese enterprises more competitive in overseas markets.[7]

The CCP's political interest in pushing Chinese innovation, coupled with the economic interests of the more powerful domestic IP holders, has propelled much of the institutional change on the IP front. Taking the Chinese Patent Law reforms as an example, while the second amendment in 2000 was largely made to harmonise with the external demands articulated in TRIPS, the third amendment of 2008 responded directly to the imperative of spurring indigenous innovation. Certain revisions reduced the restrictions on foreign entities filing patents in China while encouraging local IP holders to file for overseas patents. The amendment tightened the novelty requirements for patent filing, aimed at reducing the number of applications and grants for 'junk' patents, i.e. those for products with low innovation levels and limited economic value (Yang and Yen 2009). By giving greater recognition and exclusiveness to the patents held by state-linked capital, the 2008 amendment was an important step in incentivising and empowering state-linked capital to accumulate and commercialise its intangible assets.

Race to the future: Competition over emerging technologies (2013–present)

The year 2013 marked yet another turning point in contemporary Chinese reform. Following Xi Jinping's assumption of office in late 2012, many painstaking decisions on structural adjustments to the economy were finally made in 2013 (Shambaugh 2016). With China's economy experiencing slowing growth, Premier Li Keqiang spoke about the inefficiency of the Chinese growth model, highlighting problems such as overcapacity and an over-reliance on fixed-asset investments. The erosion of demographic dividends also became more apparent. In 2012, China's working-age population declined for the first time in recent history, a trend that is likely to continue until 2030. New economic solutions, accompanied by a new political narrative, were needed; these have had a bearing on the formation and content of innovation and technology policies. Under Xi Jinping, national strategies targeted at accelerating S&T development and innovation promotion have assumed a more assertive form. Setting the direction of China's transformation into a 'strong power' was the 'three-step' goal incorporated in Xi Jinping's call for the 'great rejuvenation of the Chinese dream', a reference that the Chinese leader has made repeatedly since 2012, the first step being that by 2025, China would have significantly moved up GVCs and established internationally competitive enterprises. This would ostensibly be followed by China becoming a strong industrial country by 2035, and eventually establishing itself as a leading global industrial power by 2050. The year 2050 is significant for the CCP as it is the year following the centennial of the establishment of the PRC. Two important national development strategies unveiled during this period—the 13th FYP (2016–2020) and MIC2025—placed innovation at the heart of China's development strategy. 'Promoting innovation as the driver of economy' was the first of five

principles put forward in the 13th FYP to guide development in the next five years. Both development plans served as a blueprint for revamping Chinese manufacturing and rebalancing the Chinese economy, stressing the continued role of the CCP and associated state apparatuses in guiding China's institutional transformation.

The role of the Chinese state in pursuing technological competitiveness in frontier emerging technologies constitutes what Ibata-Arens (2019) describes as a new form of technonationalism. In this new phenomenon, the developmental state has been eclipsed by a networked technonational state, aiming to improve both innovation and entrepreneurial competitiveness in targeted, usually high-technology industries (Ibata-Arens 2019, 5). In many respects, MIC2025 echoes earlier policies (such as those identified in the MLP) in the mobilisation of resources to help move Chinese industries up value chains, while reducing the country's reliance on foreign technology in the long run. The ultimate goal is to transform China from a big industrial country (*gongye daguo*) to a strong industrial power (*gongye qiangguo*) (Government of the PRC 2017). As with all other national plans, MIC2025 includes a list of indicators and targets to use as benchmarks for China's S&T progress. For example, the plan sets the target of raising the domestic share of core component supplies to 40 percent by 2020 and 70 percent by 2025 (State Council of the PRC 2015), an ambitious goal given that China's tech-linked manufacturing still relies heavily on foreign imports of core technologies. By 2025, 40 manufacturing innovation centres dedicated to developing new manufacturing technologies and training expertise will also be created. To achieve these ambitious goals, state-driven mechanisms will be employed to spur technological innovation and strengthen the competitiveness of Chinese enterprises.

Key beneficiaries of MIC2025 are SOEs and state-favoured enterprises in emerging technologies and target industries. Large state-owned and state-linked enterprises have always been the targets of protection in China's industrial policies. Foreign and non-private sectors are only supported when they contribute to development through creating jobs and technology transfers. One important source of power of the CCP comes from its control over the country's domestic finance, which directly influences who has access to finance to support technological upgrading. To develop new products, upgrade production capacity, and support R&D, firms often need additional sources of capital. In allocating credit, the state-controlled banking system biases towards state-owned and state-favoured firms. The largest commercial state-owned banks—Industrial and Commercial Bank of China, China Construction Bank, Agricultural Bank of China, and Bank of China—often act as instruments of the Party to allocate credit to state-favoured enterprises. In 2018, assets owned by these large state banks amounted to RMB105 trillion (US$16 trillion), accounting for 37 percent of all banking assets in the country (Xinhua 2019). Under MIC2025, firms which are engaged in prioritised sectors and in the development of

emerging technologies have better access to finance such as low-interest loans and direct capital injection. They also benefit from tax holidays, free land, and procurement incentives. Subsidies are available for state-owned and state-favoured enterprises in targeted industries such as semiconductors, pharmaceuticals, solar panel manufacturing, steel-making, automotive, IT, and defence. For instance, the state-owned Zhejiang Huahai Pharmaceutical reported that it had received government subsidies totalling US$44.4 million; such funds are believed to have facilitated the firm's R&D and export of medicines (Palmer and Bermingham 2020). In 2014, the government set up a fund of RMB130 billion (US$20 billion) to nurture the domestic chip industry. Major beneficiaries include government-backed Tsinghua Unigroup and Wuhan Hongxin Semiconductor Manufacturing Co. According to the Semiconductor Industry Association, Chinese chip manufacturers received government subsidies amounting to US$50 billion between 2000 and 2020—that is 100 times the amount received by companies in Taiwan (Semiconductor Industry Association 2021). Likewise, in the automotive sector, state-favoured NEV maker BYD (an abbreviation for 'Build Your Dream') received government subsidies worth RMB3.6 billion (US$576 million) in 2017 alone (Shepherd 2019).

What sets MIC2025 apart from its predecessors is the context in which it was created and released, its overall scale and the strategic sectors it targets, and the extent of the attention and criticism it has generated. As a national strategic plan aimed at industrial upgrading, MIC2025 lays down the institutional conditions—for example, through the utilisation of state financial and fiscal resources—for China to dominate high-end technology sectors and eventually displace existing technology leaders. To leading foreign technology firms, the plan represents a massive state drive by China to ramp up support in helping domestic enterprises gain control of the priority sectors and technologies of the future. Throughout the course of China's market reform, market-distorting measures undertaken by the CCP, often in the form of generous subsidies to favoured domestic enterprises, have provoked dissatisfaction from MNCs over unfair competition. Resentment from multinational capital has heightened as more and more Chinese firms have grown and captured a significant share of the domestic market. Multinational capital has been highly critical of various rules adopted by the CCP to mandate technology transfers from foreign corporations to domestic SOEs, such as from those involved in JVs in the automotive sector. Such dissatisfaction over unfair market entry terms is also expressed by state actors who bring these issues to multinational organisations. The United States, EU, and Japan continue to put pressure on China, demanding that additional forms of state subsidies and forced technology transfers are made subject to WTO scrutiny (Wu 2020). In sum, China has been criticised for pursuing global technology supremacy through the exploitation of mercantilist and zero-sum policies, at the expense of the economic interests of other nations and the global international order (Atkinson, Cory, and

Ezell 2017). Such an approach to industrial catch-up was made clear, and justified, in MIC2025. Since the launch of the industrial plan, there has been an increase in acquisitions of US and EU hi-tech companies by CCP-backed Chinese enterprises.[8] There are also security concerns that China's bid for technological supremacy will strengthen its dual-use technology capabilities in strategic sectors (Glaser 2019). According to Orville Schell and Susan Shirk (Schell and Shirk 2019, 12) in their report on US–China Relations:

> This is not a standard industrial policy in which the government merely enables or channels spontaneous market activity. Instead, the policy aims to help Chinese firms control targeted sectors of technology markets both at home and abroad, dominate a wide range of cutting-edge industries deemed 'strategic', and put systemic limits on the operation of foreign competitors in its own domestic markets.

MIC2025 thus stands out as China's ambitious plan to become a global technology power. While the strong role of the state in orchestrating the plan receives a lot of attention (a typical new institutional economist approach), there are more complex forces at work surrounding the initiative, often involving purposive acts of dominant interests in a changing political-economic environment. If we adopt the Murdoch School approach to understand China's institutional development, we can see that MIC2025 emerges from conditions that depart from those underpinning previous initiatives. These circumstances include the newly defined political interest of the CCP (and of Xi Jinping in particular), intersecting with socio-economic pressures confronting China (directly related to the previous point), and the changing horizons of global competitiveness. Xi Jinping's role in China's institutional transformation since 2013 is instrumental. MIC2025 serves alongside the BRI as a signature strategy of Xi to establish China as a global economic and technological power. At a time when China is battling development constraints and the Party is suffering from legitimacy challenges on multiple fronts, Xi has developed a narrative on China's ambitions and greatness to rally the support of its 1.4 billion people, characterising China's ascendancy to a global technology power as part of 'realising the dream of national rejuvenation'. China's great historical inventions of the past—notably paper-making, printing, gunpowder, and the compass—are rightly prized for their contributions to human civilisation; riding on this, its elites create a narrative that achieving technological breakthroughs in the modern era is crucial to restoring China's greatness. Such a narrative also evokes a strong sentiment within China that the country has missed out on previous industrial revolutions and reforms, and consequently trails behind other countries in development. The current opportunities presented by the fourth industrial revolution—one that is anticipated to extend capabilities of humans and machines and further embed cyber technology into daily lives—are therefore too precious to be missed.

Furthermore, the strong state component emphasised in technological progress also serves crucial political purposes, most importantly reinforcing the centrality of the CCP in leading the country to overcome challenges. In this sense, technological upgrading is not only a means to sustain development, but an instrument exploited by elite interests to pursue a wider political project. This also applies to foreign elites who have branded China a technology rival pursuing techno-mercantilism. As could be expected, China's technology aspirations were exploited in the United States for political reasons; it suited the Trump administration well to identify a foreign enemy that they could blame for all the country's problems, including the outsourcing of manufacturing jobs and social inequality. These sentiments were crucial in leading the United States to impose tariffs on Chinese goods and prohibit the transfer of critical US technologies to Chinese tech companies.[9]

Importantly, the Party's political interest is also tied to whether the regime can successfully lead China in overcoming the middle-income trap. Pursuing technological upgrading is a rational response to overcoming the obstacles to China's sustainable development, one of which is demography. It is forecast that between 2016 and 2026, the population of young workers between the ages of 20 and 29 will drop by a quarter, with an even steeper decline of 50 percent predicted for those aged between 20 and 24 (Wang 2011). China's latest census, from 2020, showed that the share of the population soon to be, or already at, working age declined by 6.79 percent over the past decade, to 63 per cent in 2020 (National Bureau of Statistics of China 2021). A low fertility rate of 1.3 (National Bureau of Statistics of China 2021), and a rapidly ageing population with a sharp decline in young people entering the workforce, portend an erosion of China's manufacturing competitiveness, along with serious social consequences. This prompted the Chinese government to introduce a new three-child policy in May 2021. Breakthrough developments in smart manufacturing and robotics, as prioritised in MIC2025, are expected to compensate for China's anticipated loss in competitiveness as a result of demographic changes. Furthermore, developing clean energy technologies and applying them to support the agriculture and power industries has the potential to alleviate some of the pressure on Chinese and global resources, as well as environmental constraints. In short, innovation and technology capability are crucial to the successful revamping of a dwindling Chinese growth model.

Explaining variegated institutional outcomes

The previous sections examined major development strategies initiated by the CCP to accelerate industrial catch-up and technological innovation since reform and opening. At different junctures of China's development, various dominant interests, including those of ruling elites and of transnational capitalists, have shaped and contested institutional reforms, while

subsequent institutional changes have also affected the distribution of power among existing and new players. Proponents of the new institutional economics approach to understanding development will focus on the correlation between economic institutional arrangements and their outcomes. Such an analytical focus will point to a mixed scorecard of China's industrial upgrading efforts in the contemporary era. Massive investment and state support in strategic sectors over the years have undoubtedly brought some success. Scientific breakthroughs have included making the world's first quantum computing machine and China's first touchdown on Mars. In addition, made-in-China high-speed rail technology has been exported to countries in Eastern Europe. Pioneering projects have also been undertaken to apply cloud computing and big data in modern agriculture. Meanwhile, several Chinese tech companies, including wireless technology equipment makers Huawei and ZTE, have soared in global patent registration numbers, while other internet-based enterprises such as Alibaba, Tencent, and ride-hailing platform Didi, have seen their businesses expand to other countries. What lies behind the glamour and the numbers, however, is a more complex story. State-led campaigns to nurture creative minds have brought mixed results rather than consistent achievements.

As will be illustrated in the three sectoral case studies that follow in Chapters 4–6, although some fast-growing Chinese firms are considered highly innovative domestically, they have faced various hurdles in making significant innovative breakthroughs and venturing into most established overseas markets. Despite the aspiration of fostering technological innovation on a national scale, the progress of upgrading has not been uniform across state-linked firms, private entities, and their hybrid forms. Across the board, innovation within SOEs progresses slowly. Despite the high levels of credit and support they have received, one constraint faced by these state-backed monopolies is their large size and the lack of incentive structures to make innovative breakthroughs in S&T possible (Zhao and Yang 2012, 306). Even in the case of top Chinese smartphones and wireless communication equipment, despite a much-expanded business portfolio at home and abroad, there is still a heavy reliance on foreign supplies of core components and technologies such as semiconductors. Meanwhile, for the more dynamic Chinese internet technology companies including Alibaba and Tencent, they might have popularised online shopping, mobile games, and online payments in China, their success rests on innovations in business processes—a less sophisticated form of innovation than that warranting patents—as well as protection from foreign competition, thanks in no small part to the government's Great Firewall (see Chapter 4). Furthermore, in sectors dominated by TNCs such as the automotive and pharmaceutical industries, the majority of indigenous Chinese inventions remain 'me-too' products that serve the domestic market (see Chapters 5 and 6).

How to explain such a mixed picture and the relation between institutional rules and technological upgrading outcomes? Undeniably, state

intervention and investment, which distort market mechanisms, constitute part of the explanation. But rival interests between different social groups, as noted by the Murdoch School approach, help explain more completely the variegated patterns of development witnessed in China. One example of such rival interests is embedded within China's bureaucratic structure, frustrating certain upgrading efforts envisioned by central policymakers. In particular, the involvement of multiple ministries and agencies in large-scale national plans undermines administrative and operational efficiency, resulting in overlapping responsibilities and policy instruments. In the case of MIC2025, in addition to central party leadership, the National Development and Reform Commission (NDRC) also played a central role in formulating strategic principles and guidelines, as well as coordinating industrial development. Specific plans were then developed by the Ministry of Industry and Information Technology (MIIT), while funding of prioritised industries and R&D initiatives is managed by the Ministry of Finance. Furthermore, MOST coordinates with other agencies such as CAS to implement S&T policies. As a result, innovation policies are administered by multiple government agencies, instead of a single organ such as MOST, which used to take the sole lead in S&T development prior to 2000. Despite efforts to realign ministerial and bureaucratic responsibilities, it is common for policies to be managed by competing agencies, resulting in overlapping policy instruments and duplicated administrative procedures. As a manager of a domestic tech firm commented, companies in China are constantly subject to a changing mix of research funding, tax deductions, local content requirements, and differentiated tariffs, all of which significantly impact their business calculations.

Decentralised decision-making at the subnational governmental level also compromises centralised state-led development plans. Lardy (1988) observed this at the early phase of reform, when the CCP launched its Guide to China's Science and Technology Policy in 1986. China's fragmented bureaucratic structure, as well as the various bureaucratic interests within the policymaking system, remain important forces that mediate policy outcomes (Lieberthal 1992; Mertha 2009; Breznitz and Murphree 2011). This structural constraint in the system, already noted in the past, has become more salient in the present as China's marketisation has led to an expansion of interests within and beyond national borders. The decentralisation of decision-making is one of the mediating factors of central research fund allocation. While the central government allocates particular funds for basic research purposes, by the time the money reaches the provincial and local levels, it is very often used to finance the commercialisation of products, which tends to offer quicker returns compared to technological investment (Appelbaum, Parker, and Cao 2011). An IP expert based in Hong Kong noted that personal relationships between bureaucrats and Party members who make decisions on grants is a conspicuous feature of Chinese research culture. On many occasions, research funds

are allocated on the basis of connections rather than on the merits of the research itself (Shi and Rao 2010).

Reform outcomes are also further constrained by the interests of key political and economic actors, particularly those responsible for policy implementation, who are sometimes motivated by divergent interests that drive them away from original policy goals. This is evident in the various patent-promoting policies that have provided financial incentives for inventors as part of the national strategy to drive patent applications.[10] Though these policies have led to a surge in applications since 2010, averaging a yearly growth rate of 36 percent (State Intellectual Property Office 2017), this rapid increase in domestic filings is driven by less valuable patents.[11] For local officials, the objective is to encourage individuals and firms to file as many patents as possible, regardless of their quality or worth. As local government officials are desperate to meet or even exceed patent targets in order to gain higher positions in city rankings, substantial financial subsidies are offered at the local level to incentivise filing behaviour. Filing patents brings tax benefits for a company; individual academics may file a patent to gain tenure (The Economist 2010).[12] As a result, domestic individuals and firms race to file the easiest type of 'utility model' patents, which have low innovation content and do not require rigorous examinations of novelty. Sadly, these 'junk patents' have become the main driver of China's patent boom. Furthermore, Chinese firms also split each innovation product across multiple patent applications in order to benefit from financial incentives (Lei, Sun, and Wright 2011, 18). Political considerations of sub-national governmental actors have been an important factor that mediates policy goals handed down from the centre. Central leaders may indeed have achieved their stated patent goals quantitatively; it remains doubtful whether they have successfully boosted innovative capacity through their policy initiatives. In fact, more efforts should be focused on rewarding more valuable patents such as triadic patent families and strengthening the commercialisation rate of Chinese patents, both of which remain low compared with patents filed by the United States, Europe, and Japan.[13]

Conclusion

This chapter has discussed China's efforts in pursuing industrial and technological upgrading, from the beginning of reform and opening to the adoption of MIC2025. It examined major strategic plans aimed at accelerating economic modernisation, strengthening innovation capacity, and facilitating leapfrogging development. Under the broad objective of industrial catch-up, shifts in strategy occurred at different junctures of China's development; this chapter identified and explained these patterns.

China's technological upgrading experience has been and remains a contentious journey, where competing interests rationalise the construction of favourable rules and practices to achieve their desired outcomes.

While China's national S&T and innovation plans have been presented as coherent state-led strategies orchestrated from the top down, their emergence and implementation have in fact involved political tensions arising from different social forces, both internal and external. China's efforts at industrial upgrading since reform and opening have aimed at overcoming technological inferiority, pursuing economic modernisation, and, for the ruling elites in particular, sustaining political legitimacy. Yet tensions often arise as there are competing views about how these objectives can be best achieved institutionally. At various developmental junctures, different class interests fought for institutional arrangements that could best advance their own objectives. On the one hand, foreign capitalist interests, in the form of TNCs, governments of advanced economies, and multilateral organisations, have been important drivers behind China's institutional reforms related to market openness, technology transfer, and IP protection. On the other hand, domestic capitalist interests have also expanded as market liberalisation progresses in China. More recently, with the push to build an innovative and digitally driven China, tech-linked capital also joined the race to negotiate more favourable environments for capital accumulation and the exploitation of intangible assets for increased material return. While institutional change had taken place to nurture domestic R&D talent, it had simultaneously strengthened special interests encompassing local scientists and researchers, as well as Chinese experts returning from overseas. Meanwhile, bureaucratic interests involving ministries and think tanks charged with S&T policy planning and implementation also intensified, which paved the way for their increasing role in influencing policymaking in subsequent years.

What remains salient in China's trajectory of industrial catch-up is that innovation and technology policies are closely tied to economic modernisation objectives, while at the same time subject to the political interests of the ruling elites in maintaining party legitimacy in changing global political-economic situations. Objectives of strengthening S&T capabilities in the first two decades of reform initially centred on modernising Chinese industries, together with increasing industrial production and efficiency, at a time when Chinese manufacturing remained at the lower end of the GVC. Entering the new millennium, China's socio-economic problems, particularly those related to the middle-income trap—widening inequalities, environmental degradation, and the erosion of comparative advantages resulting from changes in demography and resource endowments—signalled that more drastic measures were needed to restructure China's growth model. These socio-economic pressures constitute sources of social instability that have already begun to constrain China's growth. Consequently, a new narrative that revolved around 'indigenous innovation' and 'leapfrogging development' under the leadership of the Party was promoted in response to the challenges ahead. Under Xi Jinping, the institutionalisation of innovation and technology policies has become increasingly

politically motivated. The fact that the CCP continues to preside over these developmental projects, privileging domestic capital and sectors that are deemed strategic to national development, reflects its continuing struggle to hold back decentralising forces of globalisation and liberalisation, as well as to retain control over the commanding heights of the economy in the context of hyperglobalisation.

By placing China's industrial upgrading trajectory in its historical, political and economic contexts, the Murdoch School framework of social conflict theory helps to explain the ways in which the construction and evolution of China's innovation and technology policies, past and present, have been susceptible to various social forces and competing interests. Technological advances resulting in changing horizons of global competitiveness have also shaped institutional change. In this respect, new institutional economists—who are obsessed with the positive correlation between market-friendly institutions and growth—and HI scholars—who, among other things, stress path-dependent tendencies of existent rules and norms—have offered only partial understandings of the evolution of institutions and their relationship to development. The variegated patterns of China's industrial upgrading, as well as the tensions entailed in evolving state–market relationships, indicate that development cannot be fully understood by the mere presence or absence of certain preferred forms of institutions without attending to the central role of social forces and their ongoing interactions with political and economic structures.

Notes

1. The 'Four Modernisations' was a national programme of industrial modernisation first outlined by moderate and reformer Zhou Enlai in 1975. Chinese reformists at that time aimed to reverse China's backwardness and remake the country into a strong economic and military power by 2000. The programme comprised policies to acquire foreign technology on a vast scale to strengthen domestic productivity and technological capacity. The reform was interrupted by the Cultural Revolution. See Baum (1980).
2. China's FDI liberalisation began with the promulgation of the first Sino–Foreign Joint Venture Law in 1979. This was followed by the establishment of Special Economic Zones (SEZs) in geographically propitious places as laboratories for greater openness and integration with the world market. The first four SEZs were set up in Shenzhen, Zhuhai, Shantou, and Xiamen in 1980. This was followed by the adoption of the Coastal Development Strategy in 1984 to further open coastal cities for export-led industrialisation. See Stoltenbery (1984).
3. SOEs are those wholly owned by the Chinese party-state. However, since the 1990s, as part of SOE reform, some SOEs have undergone equitisation and, as a result, have non-state shareholders. These enterprises, of which the state remains the dominant shareholder, are sometimes referred as 'state-owned and state-controlled enterprises'.
4. In 2020, China's R&D spending reached 2.4 percent of GDP (Shen 2021). Though total R&D spending represented a 10.2 percent growth from the previous year, the growth had slowed due to the COVID-19 pandemic. Unlike

R&D spending, the goal of reducing reliance on foreign technology to 30 percent is harder to achieve. For example, in the semiconductor industry, China only supplied 30 percent of its own chips in 2019 (Chen 2020).

5. The six priority reform areas were (1) implement structural reforms to strengthen the foundations for a market-based economy; (2) accelerate the pace of innovation and create an open innovation system; (3) seize the opportunity to 'go green'; (4) expand opportunities and promote social security for all; (5) strengthen the fiscal system; and (6) seek mutually beneficial relations with the world (see World Bank 2013, xxi–xxiii).
6. In addition to amending the Patent Law, China also passed amendments to the Copyright Law and Trademark Law in 2001. It was only after these attempts to align Chinese IP laws more closely with TRIPS that China 'qualified' to join the WTO (Stoianoff 2012).
7. In 2003, Cisco of the United States and Huawei of China were the world's two largest telecom equipment makers. Cisco accused Huawei of infringing upon its IP through incorporation of Cisco's proprietary software in the operating system of its routing devices (Bose and Lyons 2010, 197). The sensitivity of the industry and allegations that they might be 'spying' for their respective governments added a political dimension to the commercial contest between the two. Governments on both sides were involved in the negotiations and a settlement was reached in July 2004. Huawei agreed to change the specifications of its routers.
8. For example, Chinese companies have targeted the acquisition of leading Swedish companies in priority sectors identified in MIC2025 such as industrial products and machinery, health and biotech, information and communications technology, and vehicle manufacturing (see Braw 2019). Innovation capacity and strength in industrial machinery manufacturing has also made German companies attractive targets for Chinese M&A. In 2016, Midea, China's home appliance maker, bought Kuka, a pioneering German firm specialised in industrial robots and automation technology (Ren 2018). Though Midea's acquisition would help expand Kuka's presence in the Chinese market, the Chinese takeover of an iconic, innovative German company has caused concern at home and across Europe that vital cutting-edge technologies will fall into Chinese hands.
9. This is not the first time that the United States has confronted an Asian tech challenger. Back in the 1980s, Japan's economic rise, epitomised by competitive manufacturing products along with innovative product development and business practices, was regarded as a serious threat to US supremacy. Yet contemporary US–China trade disputes go beyond the bilateral economic frictions that defined US–Japan relations a few decades ago in several aspects. Despite being security allies, the United States and Japan clashed over an array of trade issues during the 1980s. Among a host of policies addressing bilateral trade imbalances and alleged industrial espionage by Japanese firms, the United States imposed barriers, such as tariffs on electronics and voluntary export restraints over automobiles, semiconductors, machine tools, and textiles, to constrain the influx of Japanese exports (Satake 2000). The present confrontation with China, however, is driven by greater political and economic interests, given that the conflict is related to China's ambitions of dominating futuristic technologies that underpin a wide range of industries.
10. A national target was set to quadruple the number of patents owned by Chinese entities between 2010 and 2020 (Suttmeier and Yao 2011). In an interview with the New York Times, David Kappos, former Director of the US Patent & Trademark Office, described the Chinese government's 2 million annual patent filing target as

'mind-blowing' (Lohr 2011). It should be noted that most patents are firm-based (including domestic, foreign, and different forms of partnerships); therefore, they may not adequately reflect how innovative a country or a population is.

11. There are different types of patents with different levels of novelty and economic value. For discussions on China's patent fever, see Hu and Jefferson (2009), Cookson (2017), and He (2021).
12. For China's patent-promoting policies and their impact on patenting behaviour, see Lei, Sun, and Wright (2013).
13. Triadic patent families are simultaneously filed in the largest technology markets: the US Patent and Trademark Office, the European Patent Office, and the Japanese Patent Office. In 2019, China filed 5,597 triadic patent families. In the same year, Japan and the United States filed 17,702 and 12,881 triadic patent families, respectively (OECD 2022).

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4 The Rise of Big Tech
China's Digital Dilemma

Introduction

> Alibaba is a beneficiary of the strong social and economic progress in China over the past 22 years. We are eager to do our part to support the realization of common prosperity through high-quality development.
>
> —*Daniel Zhang, Chairman and Chief Executive Officer of Alibaba Group*

On 3 November 2020, Chinese financial regulators suspended the initial public offering (IPO) of Alibaba-owned fintech company Ant Group (hereafter 'Ant'), two days before it was planned to go public in Shanghai and Hong Kong. The abrupt move rocked international capital markets and disappointed underwriters and investors who were anticipating what would have been the world's largest IPO to date. Ant's listings were expected to have raised US$37 billion. Some speculated that a speech made by CEO Jack Ma a few days before the planned IPO, criticising Chinese financial regulators and China's out-of-date banking regulations, had triggered the debacle; for others, the last-minute halt reflected nothing more than the tightening of political control over growing private capital at home under Xi Jinping. Ant, a home-grown fintech company emblematic of innovative and dynamic private capital in China, had become one of the latest casualties of a resurgent state capitalism. Other leading domestic tech companies, including Didi Chuxing and Meituan, also faced tightened regulatory actions imposed by the government, on the grounds of protecting national data security, safeguarding labour rights, and ensuring fair competition.

Undeniably, privately owned Chinese internet technology companies have grown significantly over recent years; several of them have become conglomerates in the domestic market, with some successfully venturing into neighbouring southeast Asian economies. Many analysts suggest that leading Chinese internet technology companies have close ties with the ruling elites: one of the distinctive features of Chinese state capitalism is that companies benefit from state favours on the one hand but are subject to the

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state's political control on the other. Because of their importance as economic and political vehicles for the regime, the prospects for these Chinese private tech companies are paradoxically hampered by the demand for them to navigate between capital accumulation in a competitive environment and political scrutiny from state actors. This scrutiny is demonstrated by anti-trust, data protection, overseas listing, and other regulatory policies targeted at private tech companies since late 2020, reflecting what is generally described as Xi Jinping's tightening grip on leading tech companies and the important assets they hold.

Following discussions in the previous chapter on the contentious nature of various state-led innovation and technology strategies, this chapter seeks to unpack the development paradox encountered by China in highly competitive late capitalism, focusing on the country's fast-growing yet controversial internet sector. As a competitive fraction of capital, Chinese internet companies have disrupted power relationships among key actors in the Chinese political economy. Until the introduction of new regulations in 2021, their development trajectory owed much to global neoliberal policies, domestic protectionism, and the CCP's shift to embrace internet technology in development within its national strategy. The relationship between China's tech giants and the ruling regime depends on economic expediency and political imperatives. Yet as the influence and power of tech capital grows, divergent goals and clashes of interests have problematised their relationship. The changing balance of power across different sets of relationships, driven by an evolving economic landscape, has consequently triggered various forms of state intervention. In an effort to reap 'digital dividends' for socio-economic development, Chinese state actors have to deal with the 'digital dilemma' involving competing interests and tensions on multiple fronts, as illustrated by pairs of dichotomous terms such as state/private, domestic/foreign, and internet freedom/control.

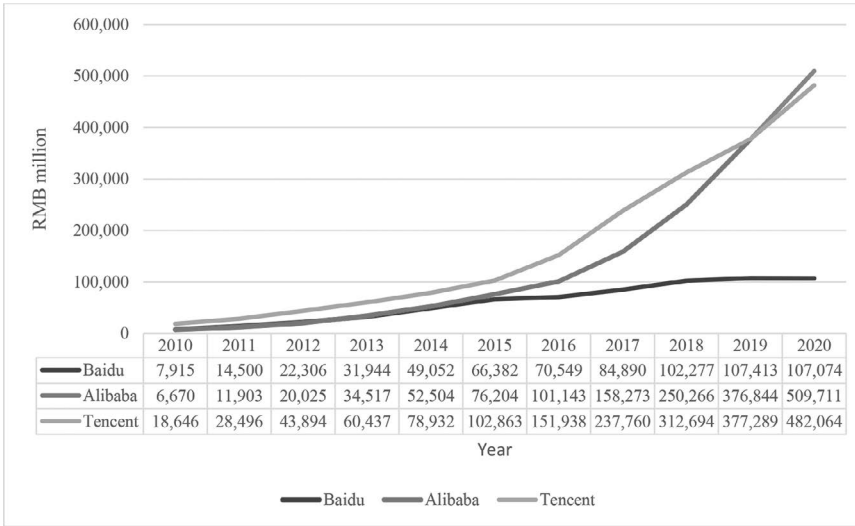
The chapter first introduces some of the leading internet firms in China and explains the political and economic climate into which the internet emerged in China in the 1990s. It then examines the rise of tech capital, both globally and in China, exploring various forces that have redefined the dimensions of global competitiveness and promoted new patterns of capital accumulation. Within China, the need to revitalise the economy and combat multiple developmental challenges is key to driving the government's turn in the early 2010s to embrace digital technology in its development strategy. Such a strategic shift was contentious as it contradicted some of the CCP's fundamental political objectives. This chapter will provide evidence to show that Chinese tech capital monopolies have to some extent shaped policymaking related to China's innovation and technology strategies. The alignment of interests between leading Chinese internet technology companies and the CCP is evident in policies around AI and the national cybersecurity law. Yet the expansion of these monopolies has also proved to be a disruptor. The stepping up of state regulations and interventions works to

close legislative loopholes but also reflects the Party's attempts to rebalance competing demands from key players in the political economy. The chapter concludes by discussing the ways in which institutions relating to upgrading in the internet sector in China are contested by evolving interests of political elites, foreign state actors, Chinese tech capital monopolies, and their competitors, featuring contingent confrontation and collaboration. The enlargement and tightening of market space for Chinese Big Tech are conditioned by changing domestic developmental challenges encountered by China and the demands of a digitally driven competitive global economy.

Understanding the rise of Chinese Big Tech

The initial emergence of Chinese tech companies in the private sector as opposed to the state sector was neither planned nor anticipated by the Chinese ruling elite; rather, it was the wave of technological breakthroughs, the political-economic climate of the 1990s and 2000s, and global developments that mainly contributed to the unexpected rise of private tech firms. Despite its relatively short history, the internet industry is one of the fastest-growing sectors in China. Today, the sector comprises firms of various sizes, which exploit digital technology and big data in both consumer markets and industrial manufacturing. This case study focuses on three internet companies—Baidu, Alibaba, and Tencent. They are collectively known as the BAT group; this acronym mirrors the FAANG group, which refers to the five prominent US technology companies including Facebook (now known as Meta), Amazon, Apple, Netflix, and Google (Alphabet). There are other fast-growing, second-generation Chinese internet technology companies such as Bytedance (online video), Meituan (food delivery), Didi Chuxing (ride-hailing), and Pinduoduo (agricultural food technology platform), which are gaining power and influence and, in some areas, challenging the market dominance of the BAT companies. In a number of ways, the BAT companies are representative of Chinese Big Tech; in addition to having an ecosystem of consumer businesses with a large customer base, they actively engage in developing emerging technologies, which differentiates them from the second-generation internet companies. Because of their capacity for developing vital technologies that are linked to national competitiveness, the BAT companies have intricate ties with the CCP in multiple areas; this makes them suitable candidates for a study of factors affecting technology-related institutional change.

In 2018, the BAT companies accounted for almost 74 percent of the total market capitalisation of all 102 listed Chinese internet firms (China Internet Network Information Centre 2018). In 2020, the Internet Society of China ranked the BAT companies and Meituan (partly owned by Tencent) as the leading internet enterprises in the country (China Banking News 2020a). The growth of Alibaba and Tencent since their inception is particularly striking, with annual revenues shooting up by factors of 74 and 26,



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Baidu	7,915	14,500	22,306	31,944	49,052	66,382	70,549	84,890	102,277	107,413	107,074
Alibaba	6,670	11,903	20,025	34,517	52,504	76,204	101,143	158,273	250,266	376,844	509,711
Tencent	18,646	28,496	43,894	60,437	78,932	102,863	151,938	237,760	312,694	377,289	482,064

Figure 4.1 Annual revenues of Baidu, Alibaba, and Tencent, 2010–2020

Source: Company reports 2010–2020; compiled by author

respectively, between 2010 and 2020 (Figure 4.1). By international measures, the two Chinese tech companies are still small when compared to Amazon, Alphabet/Google, and Meta/Facebook but, globally, Chinese internet companies (including second-generation ones) are among the few that can rival US internet firms (Table 4.1). For almost two decades, the BAT companies have operated in a unique context combining technological breakthroughs, financialised capitalism, and domestic protectionism, which has facilitated their expansion from core businesses to cutting-edge technologies such as AI, cloud computing, and autonomous driving. Compared to traditional industrial heavyweights such as the automotive and energy resource sectors, which are dominated by SOEs, the internet sector in China is more vibrant and innovation-driven.

The growth of Chinese tech companies follows a wave of technological breakthroughs, including advances in the internet, computer software, and digital and mobile communication technologies, primarily led by US tech firms based in Silicon Valley. In the 1990s, following the policies of Deng Xiaoping, Presidents Jiang Zemin and Hu Jintao continued market reforms and, in the process of negotiating China's accession to the WTO, acquiesced to US demands to further liberalise trade and foreign investment. These measures drew unprecedented levels of foreign capital inflows and human expertise; China became the world's second-largest recipient of FDI in 1999, just behind the United States. Moreover, greater openness allowed more foreign-invested enterprises (FIEs) and domestic

Table 4.1 Top internet companies by market capitalisation (as of February 2021)

Rank	*Company*	*Country of origin*	*Market capitalisation (US$ billion)*
1	Amazon	US	1,662
2	Alphabet/Google	US	1,392
3	Facebook	US	759
4	Alibaba	China	571
5	Tencent	China	461
6	PayPal	US	295
7	Netflix	US	239
8	Adobe	US	231
9	Salesforce.com	US	162
10	Booking Holdings	US	85
11	ByteDance	China	78
12	ServiceNow	US	53
13	JD.com	China	52
14	Uber	US	51
15	Meituan	China	51
16	Shopify	Canada	46
17	Pinduoduo	China	44
18	Baidu	China	44

Source: Statista (2021a)

private enterprises to flourish. They were supported by 'new' finance, such as private equity funds and venture capital, as new financial models were imported and localised in China from the 1980s onwards (Robertson 2010, 2015). Meanwhile, many managerial and technical personnel quit positions in faltering SOEs and other jobs in the state sector to start their own ventures. Crucially, inflows of new ideas helped nurture a Chinese population that had become increasingly receptive to new technology. Aided by the increased mobility of global labour, foreign-educated Chinese returnees have also become important sources of talent, institutional knowledge, and technical skills for jump-starting local entrepreneurship (Saxenian 2005), as well as providing access to finance (Robertson 2015). For example, Robin Li, the founder of Chinese search engine Baidu, returned to China after working as a software engineer in the United States. In the wake of the emergence of the internet, and within a relatively more liberalised economic environment in China, Chinese entrepreneurs took the opportunity to tap into the latest technology; Alibaba and Tencent were established in the late 1990s, followed by Baidu in 2000.

When the internet went public in China in 1996, the Chinese leadership was more concerned about the political repercussions of the new technology than its economic potential. The ruling elites at that time were ambivalent towards the small, private internet start-ups with respect to their business operations. Traditional industries such as energy and automotive

remained the commanding heights of the economy; no attempt was made by the Chinese leadership to establish SOEs to compete in the little-known, emerging internet industry. That being said, increased economic openness in China throughout the 1980s and 1990s did not result in parallel political relaxations. For the ruling elites, there was no question that the latest technological breakthroughs, which allowed broad access to and diffusion of information, should be put under state scrutiny. Under the leadership of Jiang Zemin, a political censorship system began to take shape. China obtained essential internet surveillance tools from leading US tech companies such as Cisco to develop its in-house censoring system (Griffiths 2019); such filtering technologies were initially developed to enable firms to monitor the browsing activities of their employees. Supplementing these technical tools were an array of laws to legitimise state censorship of information. For example, in 1997, the CCP passed a law to criminalise online postings that it considered as potentially undermining national interests (Economy 2018). Even before the incorporation of the BAT companies, China already had a political censorship system in place.

During the 2000s, with political censorship and some form of regulation on messaging and blogging, internet companies grew within the political parameters set by the CCP. Given that this was a new industry, there were no pre-existing state-favoured SOEs or prevailing state-controlled market rules. Nor did Chinese leaders see the nascent internet firms as potential challengers to the status quo. The BAT companies enjoyed first-mover advantage and developed their businesses with relatively little state intervention on the commercial side, though competition with foreign competitors still existed. In e-commerce, Alibaba established its online marketplace Taobao in 2003, competing head-to-head with eBay's Eachnet at the time. With more successful marketing strategies and more localised and tailored services, Taobao's business grew rapidly. It eventually kicked eBay out of the Chinese market in 2006.[1]

While Chinese tech entrepreneurs deserve much credit for their innovation and business acumen, these start-ups could hardly have grown to their present scale had there not been parallel global forces providing channels for them to overcome certain domestic constraints. To fully explain these changes, one needs to go beyond analysing path-dependent policymaking conditions to focus on various global forces that have impacted economic policies and social relations within China. Adopting the Murdoch School framework of social conflict theory allows us to recognise domestic events in China as being largely rooted in major global developments under late capitalism and in the diffusion of capitalist social relations in places where they were previously absent or constrained. As deepened processes of liberalisation in trade and capital have given precedence to markets over the state, a technological revolution facilitated by global financialisation has buttressed the growth of a new branch of tech capital. This category of capital takes advantage of ICT, digital technology, and big data to create new

avenues, devices, and platforms that perpetuate capital accumulation—a distinctive feature of hyperglobalisation.

Since the 1980s, important transformations within the global economy have precipitated the growth of tech capital. The global deregulation and liberalisation of investment have provided the institutional environment for extended capital accumulation activities. Cammack (2016, 2017) argues that there is an ongoing agenda and campaign by capitalists, capitalist states, and regional and multilateral organisations to liberalise trade and promote competitive pressures on a global scale, that is inspired by neoliberal doctrines. The effects of this agenda are the creation of a world market order that consolidates the hegemony of capital over labour (Cammack 2017, 139). In the case of emerging and frontier markets, the rationale of development is pursued by processes of 'deep marketisation', which involve campaigns by multilateral entities to construct new spheres of production and capital accumulation around the state, particularly in emerging and frontier markets, in order to create a friendly environment for capital through financialisation (Carroll 2012; Carroll and Jarvis 2017).

For new Chinese internet firms, global financialisation provides important funding sources in their early development phase. New finance, including private equity and venture capital funds, was a novel economic force supporting many Chinese tech firms in the 1990s. Foreign investment, such as SoftBank's US$20 million injection of funds into Alibaba in 2000, helped jump-start the company's e-commerce business. As Chinese internet firms developed, increased access to global capital, for instance through listing on foreign stock markets, allowed them to amass resources that they were deprived of at home. Domestic finance in China is controlled by large commercial state banks which serve the interests of the Party. These state-controlled banks implement a hierarchical structure of lending rates: SOEs enjoy the most favourable rates while private sector companies are subject to higher interest (Beardson 2013, 128). In addition, given that bank chiefs are Party members, whose career prospects depend on demonstrating absolute loyalty and obedience to the Party, lending decisions are often based less on commercial considerations than on alignment with Party objectives and industrial development goals. Protected by the state, SOEs produce around one-third of national output but account for around 70 percent of bank loans (Nolan 2014). The more competitive non-state sector needs to obtain funds from other sources. According to Fuller (2016), hybrid FIEs (such as the BAT companies) do not enjoy preferential access to state finance and procurement as established SOEs do, yet they have managed to gain access to foreign capital. They are the 'hidden dragons' behind China's technological aspirations, making the greatest contributions to indigenous technological developments in China. In the case of the BAT companies, their listing on the Hong Kong and New York stock exchanges enables them to obtain the external capital to fuel their commercial expansion.

Closely related to the developments associated with late capitalism outlined above, breakthroughs in ICT from the late 20th century onwards have transformed global production relations, redefined dimensions of global competitiveness, and supported new patterns of capital accumulation. What is distinctive in the 21st-century global economy is that the internet has become a new, intensive battlefield among firms and countries alike for capital accumulation and market dominance, in addition to being a crucial springboard for commercial success. The ability to combine big data with network connectivity empowers firms to harvest valuable customer data, which they can then exploit to their commercial advantage. In a digitally driven and competitive global economy, the internet and the availability of data have empowered tech firms to extend and accelerate capital accumulation, often at the expense of other industries. Owning prodigious, up-to-date personal data on customers (and the greater global population) has become an unrivalled advantage that tech firms use to customise their products and service offerings for profit-making. In this sense, Rushkoff (2016) argues that Silicon Valley-based tech giants engage in a form of extractive capitalism, in which, through the technology platforms they offer, they monetise users' preferences and behaviour to extract profits from other industries to sustain their business. Tech firms have become some of the largest companies in the world (Table 4.2); in March 2021, the world's largest firm Apple Inc. had a market capitalisation (US$2,051 billion) almost five times larger than that of the previous number 1, Exxon Mobil, in 2011 (US$417 billion) (PricewaterhouseCoopers 2021), suggesting that tech firms nowadays do not just lead, but are also significantly bigger overall.

By combining digital technology and innovation, internet firms are able to draw in customers quickly and leverage viral adoption cycles, thereby rapidly accumulating market share and revenues (Donegan 2017). Tencent's Weixin and Alibaba's Alipay, the two dominant super apps in China, which each boasts over one billion active users, are exemplars of such business models. Based on user profile and preferences, and applying big data and algorithms, these digital platforms provide a one-stop shop to users, promote tailored products and services, and encourage more and more consumption. For these platform providers, the objective is to lock users into the respective ecosystem of the technology companies. Furthermore, global competitiveness in the 21st century is increasingly predicated on the ability of a nation or a firm to develop and exploit intangible assets, including data, financial assets, and various forms of IP, in addition to tangible ones. Technology-rich companies can extract additional value from their patent portfolios through licensing out their technologies. The rise of intangible assets has also prompted more extensive IP protections that further safeguard the interests of IP owners. All these changes have buttressed the dominance of tech capital in the modern economy.

Table 4.2 Top 20 global companies by market capitalisation (as of 31 March 2021)

Rank	*Company*	*Country of origin*	*Sector*	*Market capitalisation US$ billion*
1	Apple	US	Technology	2,051
2	Saudi Aramco	Saudi Arabia	Energy	1,920
3	Microsoft	US	Technology	1,778
4	Amazon	US	Technology	1,558
5	Alphabet	US	Technology	1,393
6	Facebook	US	Technology	939
7	Tencent	China	Technology	753
8	Tesla	US	Consumer discretionary	641
9	Alibaba	China	Consumer discretionary	615
10	Berkshire Hathaway	US	Financial	588
11	TSMC	Taiwan	Technology	534
12	Visa	US	Industrial	468
13	JPMorgan Chase	US	Financial	465
14	Johnson & Johnson	US	Healthcare	433
15	Samsung Electronics	South Korea	Technology	431
16	Kweichow Moutai	China	Consumer staples	385
17	Walmart	US	Consumer discretionary	383
18	Mastercard	US	Industrial	354
19	UnitedHealth Group	US	Healthcare	352
20	LVMH Moet Hennessy	France	Consumer discretionary	337

Source: PricewaterhouseCoopers (2021)

Shift of national strategy to empower internet technology

As the previous section explained, the CCP's policy towards private, home-grown internet firms in the 2000s was a combination of political censorship and economic relaxation. Domestic internet firms such as the BAT companies took advantage of the lack of domestic market regulation and a global liberalised environment to expand their businesses. As China entered the 2010s, changing domestic and international environments prompted a major shift both of state narrative and policies to tackle developmental challenges in China. The CCP's relationship with the BAT companies thus changed from ambivalence to active engagement. The CCP's turn to embracing internet technology as a growth strategy came at a time when China's post-high growth development was at a crossroads. In 2014, Xi Jinping announced

that China had entered a 'new normal condition' of moderate growth and thus called for a new strategy that focused more on quality and sustainability, rather than the sheer pace of growth (Ministry of Foreign Affairs of the PRC 2014). Rising wages, an ageing population, overcapacity, and falls in exports and inward investment all contributed to the gradual decline in national growth rates after 2010. In addition, China had to deal with rising corporate debt, sporadic social protests, and environmental degradation. At this developmental juncture, China needed new engines of growth; the internet and digital technologies offered a prospect to reinvigorate the economy. Confronting contingent global forces (the new dimensions of global competitiveness in a digitally driven economy) and development-related challenges on the domestic front (the middle-income trap and regime legitimacy), Chinese political elites had to find new ways to 'work' with the internet industry and the growing private capital within it. It was against this backdrop that discussions on rebalancing the economy through digitalisation came to dominate political discourse by the mid-2010s. What followed was a new CCP narrative that made internet development central to China's economic reform, accompanied by successive national strategies to spearhead internet development.

In 2015, Premier Li Keqiang announced the flagship 'Internet Plus' strategy, committing state resources to upgrade Chinese manufacturing with mobile internet, cloud computing, big data, and the 'internet of things' (IoT) (Xinhua 2015). For Li, 'Internet Plus' and the 'Mass Innovation, Mass Entrepreneurship' initiatives, combined with the industrial upgrading efforts set out in MIC2025 (see Chapter 3), would unleash a 'new Industrial Revolution' in China (Government of the PRC 2015) that could help revitalise the slowing economy. Several targets set out in the 'Internet Plus' plan point to this goal, with investments to be channelled towards raising both the broadband household penetration ratio (from 40 percent in 2015 to 70 percent in 2020) and mobile broadband subscriber penetration ratio (from 57 percent in 2015 to 85 percent in 2020) (State Council of the PRC 2015). Additionally, state commitments to financial resources would be made to meet the investment needs of both tech start-ups and other more established firms in internet-related fields. An example of these commitments was the new Internet Investment Fund launched in January 2017, which featured a portfolio of US$14.55 billion that would provide equity investment in the IoT sector. Finally, several state-owned banks would also provide credit lines for companies that the Internet Investment Fund had subsidised (Patton 2017).

Given China's developmental challenges in the mid-2010s, the CCP's turn to internet technology and the BAT companies appears not so much an option as a necessity. Undoubtedly, accelerating digital development would bring certain social and economic benefits, with multilateral development organisations such as the World Bank stressing the 'digital dividends' that emerging and developing countries could reap from a wider adoption of digital technology (World Bank 2016, 2018). In short, digital technology

helps create new services and industries. Web-based solutions, including online shopping, mobile payments, and the broadening of online social communication, help boost domestic consumption and enable suppliers to reach underserved markets. All these benefits are relevant to China's transition from export- and investment-led development to consumption-driven growth under the 'new normal' condition. Furthermore, the integration of digital technology into manufacturing is expected to lower costs while enhancing productivity and efficiency—particularly appealing at a time when the competitiveness of Chinese manufacturing is being undermined by rising production costs and a declining workforce. At the same time, the applications of digital technology are expected to help alleviate social problems and improve living conditions, which are another priority for the CCP; for example, urban congestion could be tackled by the creation of smart cities powered by digital technology.

In spite of these potential economic and social benefits, one should not overlook the strong political imperatives that are associated with the development pattern of internet-linked capital in China. Having home-grown tech leaders meets the CCP's political objective of counteracting US dominance in global cyberspace, allowing the Party to maintain its control over the dissemination and exchange of online information. Internet censorship in China is also an instrument of economic protectionism. Since foreign websites and social media including Google, Facebook, Twitter, YouTube, and Instagram, which allow access to uncensored material, are all blocked in China, Chinese internet firms essentially operate in a 'walled garden'—a state-protected environment which shields them from external competition.[2] Furthermore, unlike traditional industries such as the automotive and energy resource sectors, within the emerging internet industry, newcomers do not need to compete against established state-owned incumbents. In such a favourable environment, marked by the absence of domestic forerunners and foreign competitors, several Chinese internet firms were able to establish their monopolistic positions quickly.

Yet the decision to place internet technology and its associated private capital at the heart of national economic development was contentious. It sparked clashes of views and interests among policymakers. Essentially, the new narrative involved managing relationships with the new sector and the dominant, non-state-owned players within it, as well as reconciling the interests of the new sector with the Party's key objectives of maintaining political control and sheltering the state sector. As described by a member of CAS, within the CCP policymaking circle, serious divisions emerged over whether the internet would be a desirable tool for serving national economic goals—a possible explanation for the delayed rollout of the 'Internet Plus' strategy. In addition, there was scepticism about how much control the state could exercise over private tech firms. For central state leaders, the internet is a double-edged sword, bringing economic benefits along with political risks. And therein lies the dilemma. Politically, it concerns the regime that

as more people obtain internet access, the platform could be used for political and social mobilisations, potentially undermining national stability and regime legitimacy. Studies have shown that internet freedom can threaten the stability of authoritarian regimes by providing an expanded social space to facilitate discussions and the exchange of views among people across the socio-economic spectrum. These interactions may then mobilise civil actions that can potentially change the political landscape of a regime (Tkacheva et al. 2013). Fielder (2013) further suggests that as a mobilising vehicle, the internet increases the opportunities for dissent in authoritarian regimes by reducing distance and costs, as well as facilitating broad social exchanges in a decentralised and interactive manner.[3] As a result, the Party's new internet-favouring narrative only stressed the role of internet development in promoting socio-economic progress (Ministry of Foreign Affairs of the PRC 2015), while on the political front, Xi Jinping repeatedly justified political censorship over the internet on national security grounds. For the Party, cyberspace should be carefully managed so that it does not become a platform for subversive activities. Crucially, maintaining control over internet firms empowers the Party to monitor and control online communications, thereby preventing collective social movements or 'mass incidents' from materialising.[4] Since Xi Jinping came to power in 2012, central control of the internet has intensified. Under his leadership, the CCP engages in more subtle and organised ways to mobilise support for the regime through guiding netizens' online political participation (Repnikova and Fang 2018). Several repressive laws have been passed to silence dissenting voices, while blogs with large followings that were considered by authorities to be potential threats to social stability have been shut down. In the words of Griffiths (2019), Xi has created an 'alternative version' of the internet in China.

Market power, political ties, and contestation

The global technological revolution, deepened processes of liberalisation and financialisation, and favourable domestic conditions have enabled the BAT companies to quickly become leading economic actors with significant market power and influence. They benefit from first-mover advantage, as well as state support, enabling them to become a form of monopoly capital covering a range of sectors spanning internet searches, e-commerce, social media, entertainment, data storage, AI, and many others. For example, Baidu dominates internet searches in China after Google China's withdrawal. It is also venturing into developing autonomous driving technologies, an area in which its monopolistic mapping services will give it a defining edge. Alibaba, which initially only provided online trading platforms, now also competes in data storage, online payments, retail marketing, and logistical infrastructure. It is China's biggest cloud computing provider and the third-largest in the world (just behind Amazon and Microsoft) in terms of public cloud service market share (Gartner 2017), thanks to favourable

regulations which mandate the storage of Chinese data on servers of local suppliers. Lastly, Tencent's social media platform dominates the domestic market, where access to foreign social media sites is blocked. Such a lead gives it the leverage to venture into other sectors including entertainment, healthcare, food and beverages, and online payments. Tencent became the world's largest online game provider (by revenue) after it acquired a majority stake in Finland's Supercell in 2016 (Osawa and Needleman 2016). And, extending its interests to self-driving technologies, it bought a 5 percent share in Tesla in 2017 and has since become the fifth largest shareholder of the leading US electric car manufacturer (Reuters 2017). Table 4.3 gives an overview of the diverse interests of the BAT companies and their monopolistic positions across various sectors.

In addition to operating in a walled-garden, CCP policies to exploit digitalisation and emerging technologies to spur growth, driven by developmental needs, have inevitably empowered the BAT companies, resulting in a deepening relationship between the CCP and Chinese Big Tech. Given that national competitiveness and economic progress are contingent upon the acceleration of digital technology, state actors have little choice but to construct new policy space to 'collaborate' with private tech capital. In this context, the state–capital relationship (involving private tech capital) is characterised by the struggle of the ruling elites to overcome developmental challenges, and to manage non-state economic actors who have become crucial drivers of the economy and China's hope in the global technology race. Indeed, the CCP's protection of domestic internet companies has produced the only technological ecosystem that can rival Silicon Valley.

Accompanying the increased market power of the BAT companies are stronger political ties between Chinese tech entrepreneurs and the CCP. The founders of leading technology firms in China have formed a monopolistic class of wealthy business elites whose influence has extended to policymaking. For example, Huateng Ma of Tencent, Jack Ma of Alibaba, Robin Li of Baidu, Jun Lei of Xiaomi, and Wei Cheng of Didi Chuxing were among the key architects of the 'Internet Plus' strategy. As I was informed by a Beijing-based technology consultant, the tech entrepreneurs pushed hard on policies that accelerate the construction and improvement of ICT infrastructure and technology, which would bring direct commercial benefits to the BAT companies and other platform providers. This suggests that although it was unveiled as a national strategy, 'Internet Plus' was in part driven by bottom-up pressures from private tech capital. As rising economic elites, these tech entrepreneurs also reap commercial benefits through the political connections they secure. The co-founder of Alibaba, Jack Ma, is public about his CCP membership. Jun Lei, the co-founder and CEO of smartphone manufacturer Xiaomi, has been a delegate to the National People's Congress (NPC) since 2013. Tech entrepreneurs serving as delegates to the Chinese People's Political Consultative Conference (CPPCC) include Huateng Ma, CEO of Tencent; Richard Liu Qiangdong, the founder and owner of

Table 4.3 Key interests and selected investments of the BAT companies

		Baidu	*Alibaba*	*Tencent*
Internet search engine		Baidu Search	–	Sogou*
Online messaging and forums		Baidu Tieba	Dingtalk (for enterprises)	WeChat
E-commerce		–	Online marketplaces (Taobao, Tmall AliExpress)	Largest shareholder of JD.com (China's second-largest e-commerce retailer)
Digital media and entertainment (videos, music, games)		iQiyi (video streaming)	Youku (China's Youtube) Alibaba Pictures, South China Morning Post (Hong Kong-based English newspaper)	Tencent Video, Tencent Music Mobile games: Honour of Kings, Clash of Clans, Clash Royale
Logistics		–	Cainiao	JD Logistics
Food delivery		–	Ele.me*	Meituan (20% stake)
Financial services		Du Xiaoman Pay	Alipay Ant Group: wealth management, microfinance and insurance services	WeChat Pay WeBank (China's first online bank)
Cloud computing and big data management		Baidu Cloud	Alibaba Cloud	Tencent Cloud
Autonomous driving		Leads the world's largest autonomous driving platform 'Apollo', with participation of companies including Volkswagen, Toyota, Ford, and Intel.	Invests in autonomous driving start-up AutoX and Momenta	Invests in autonomous driving start-up Momenta
Healthcare		Melody (AI-powered conversational bot for healthcare) Develops AI technology in medical diagnosis and treatment	Alibaba Health (online consultations and prescription drugs) Develops AI technology in medical diagnosis and treatment	Tencent Medipedia (medical information platform) Medical AI Lab researches imaging, diagnosis and treatment
Selected major investments	Domestic	Chuanke.com* (online education platform)	Didi Chuxing (ride-hailing service) Sun Art Retail Group (consumer retail) InTime* (consumer retail)	Didi Chuxing (ride-hailing service)
	Overseas	xPerception (US computer technology firm)	Lazada (e-commerce group)	Supercell (mobile games) Snap (online messaging) Tesla (5% stake)

*Company buy-out

Source: Compiled by author from company reports and websites, various media including *Financial Times, South China Morning Post, Bloomberg, China Daily*, and *China Internet Watch*

Alibaba's rival e-commerce operator JD.com; and Ding Lei, the founder and chairman of China's second-largest mobile game publisher NetEase. Given that it is the NPC that generally approves plans handed down from top leaders, whereas the CPPCC assumes an advisory role with no real legislative power, it can be argued that these political appointments only serve symbolic meaning. However, the NPC and CPPCC do offer channels for tech capitalists to advance their interests through other informal means.

Contemporary China has a political economy that is significantly larger and more sophisticated than it used to be. The increasingly pluralised policymaking and policy implementation environment has opened up room for different actors to advance individual or organisational goals (Mertha 2009) in what Lieberthal (1992) describes as a 'fragmented authoritarian governance structure'. In particular, dominant interests have better access to resources for employing subtle and indirect forms of power to increase their influence. These mechanisms include *guanxi* (personal relationships) forged indirectly via other intermediaries, as well as directly through lobbying regulators and policymakers (Kennedy 2005). As Kennedy (2005, 3) remarks, 'China's national economic policies can no longer be viewed as the clear intentions of a strong state or as only the product of bargaining between government agencies'. It is difficult to gauge the extent to which these tech interests influence the actual formulation of policies; however, their privileged positions and political ties, particularly through *guanxi*, have at least allowed them to protect some of their commercial interests. In the words of Breslin (2012, 32):

> the result is a symbiotic relationship (at the very least) between state elites and many of the new economic elites; they have effectively co-opted each other into an alliance that, for the time being, mutually reinforces each other's power and influence (not to mention personal fortunes).

Artificial intelligence and cybersecurity

The complex, intertwining relationships between the CCP and private tech capital are reflected in institutional changes associated with artificial intelligence (AI) and cybersecurity—contentious new areas in the global race for emerging technologies. There are strong reasons for CCP leaders to help domestic tech companies to develop AI capabilities. The transformative potential of AI in the economic, social, security, and even moral aspects of life has been widely documented (Rao and Verweij 2017; Loucks et al. 2019). From a development perspective, with adequate resources, late developers like China have a greater likelihood of breaking institutional constraints and leapfrogging development in emerging technology sectors like AI. This is because in traditional and developed industries and markets, late developers have to compete with more established players and chase moving

targets while being disadvantaged by the institutional rules set up to favour incumbents. Late developers are therefore less likely to become lead players in industries and markets where incumbents have already established a strong presence. By contrast, the development of AI-powered technologies and their adoption in advanced manufacturing, transportation and logistics, urban planning, and medical treatments, is still in its infancy. As a result, with adequate and appropriate resources, late developers can exploit these opportunities and potentially become early movers in this emerging industry. Global internet and software companies currently dominate the AI industry, because recent, accelerated AI research has evolved from the existing online platforms of global tech firms. These companies initially researched and adopted AI-powered technology to better manage their customer data. China boasts a number of conditions that are favourable for AI research. A massive population of 1.4 billion, of which 989 million are internet users (Statista 2021b), provides a large pool of data for deep-learning experiments, an important aspect of AI research. China's netizens are also more willing than others to share personal data in exchange for freebies and other benefits. Furthermore, the use of personal data by third parties faces fewer restrictions due to the lack of privacy protection laws. Given the intensive use of mobile phones in China for everyday economic and social activities, both the quantity and quality of data at their disposal are likely to give Chinese tech companies a competitive advantage in future AI breakthroughs.

In order to exploit the leapfrogging opportunities offered by AI technologies, Chinese state actors have intentionally created a congenial environment for the BAT companies to make significant gains at the expense of local and foreign competitors. While this implies further strengthening of private tech capital, the CCP hopes that achieving AI technological breakthroughs would break the US monopoly in the field and make China a front-runner in the global technology race. Again, leading tech entrepreneurs in China have become the prime beneficiaries under the state's new technological catch-up initiative. Aside from 'Internet Plus', already mentioned, the chiefs of the BAT companies, along with Chinese scientists and economists, CAS, and MOST, were the key architects behind China's 'Next Generation Artificial Intelligence Development Plan' (State Council of the PRC 2017).[5] This strategy promotes state–tech capital collaborations in AI development in the interest of national economic development and global competitiveness. Outcompeting other domestic rivals, the BAT companies and iFlyTek, a Chinese company specialising in voice recognition, were hand-picked by the CCP to lead a national AI research team (Ministry of Science and Technology of the PRC 2017). Each of the four firms will conduct research on a specific area within AI, thereby reinforcing both their monopolistic positions in the field and their ties with the state. Baidu was assigned to autonomous driving, Tencent to AI-enabled medical diagnosis, iFlyTek to voice intelligence, and Alibaba to the development of a 'city

brain' for improving urban living conditions, especially traffic issues. In 2017, Alibaba also announced a further investment commitment totalling US$15 billion into R&D on AI (Lucas 2017).

Ultimately, China's AI strategy has developed in response to the country's economic challenges and global technological aspirations. It also serves the political interests of the CCP to extend social surveillance and political control under Xi Jinping's leadership. While addressing the CCP's 19th National Congress in October 2017, Xi Jinping vowed to build a domestic AI industry worth US$150 billion in the coming years and to transform China into a world leader in AI technology by 2030 (State Council of the PRC 2017). The CCP anticipates that the embedding of AI technology into the real economy could create a new growth engine. This is supported by a recent report suggesting that AI-related industries are expected to boost China's GDP by up to 26 percent by 2030 (Rao and Verweij 2017). This GDP growth is expected to be driven by the integration of AI-enhanced technologies into smart manufacturing to enhance efficiency, as well as AI-stimulated customer consumption. Embedding AI technologies in digitalisation and big data analytics is expected to bring social benefits, as in the cases of smart transport (e.g., digital control of traffic lights to help ease congestion) and enhanced medical diagnoses.

The CCP is not alone in using industrial policy to bolster national competitiveness. For emerging technologies such as nanotechnology, the US federal government has also provided extensive funding to support in-country research as it aims to secure leadership for the United States in these new fields. The National Nanotechnology Initiative (NNI), which began during the Clinton administration in 2000, has so far committed US$29 billion to nanoscience research (Nano.gov. 2019), with government and commercial investments into nanotechnology rising each year. High-risk investments in US tech sectors are often made by the state before private business steps in (Mazzucato 2015); for example, the smart technologies supported by the iPhone, including the internet, the touchscreen display, and the voice-activated Siri, are products of earlier state-funded projects. In this respect, the state serves the important role of creating and shaping new markets (Mazzucato 2015). The state funds radical early-stage research and core technologies, which are then further developed by private enterprises. A similar view is shared by Geoffrey Owen (2017), who argues that the role of the US government in funding core technologies has contributed to US supremacy in information technology and biotechnology. The postwar US federal government offered extensive funding to scientists at research-based universities to support them in their discovery of new technologies. Though some of these technologies were developed for military purposes, the federal government also successfully encouraged new entrants who focused on non-military tasks (such as Intel, Microsoft, and Apple) to provide rival technologies (Owen 2017, 4–6), paving the way

for the commercialisation of new civilian technologies. It has also been argued that the United States pursues a 'stealth' industrial policy which is highly decentralised (Block 2017). Despite the dominant free-market narrative in the country, US policymakers have created agencies and programmes to strengthen the country's lead in science and technology. The Advanced Research Projects Agency in the Department of Defense, which has played a crucial role in supporting US innovation through funding research and commercialisation efforts in the computer and microelectronics industry, is a prime example (Block 2017).

Nevertheless, state–capital collaborations in the Chinese context are founded on a controversial relationship which blends technological advancement, national economic benefits, and private commercial gains with the regime's political interests in censorship and control. The CCP and the BAT companies each have their own interests in developing AI capabilities. For their part, the BAT companies rapidly reap commercial gains as pioneers of cutting-edge technology. China's investments and research capabilities in AI are highly concentrated among these three players, who receive 53 percent of all state investments across 190 AI companies in China (Hao 2019). On the one hand, the BAT companies benefit from a state-regulated marketplace that helps ensure their domestic dominance; on the other, they are inevitably tied to the CCP's political objectives through providing the necessary data and AI-powered technologies to modernise and strengthen the government's citizen surveillance system. In short, the economic advantages they enjoy from protectionism have made them susceptible to accommodating the regime's demands.

For the state, private tech capital possesses important resources that are valuable for political reasons. Enormous quantities of data are available through Alibaba's e-commerce platform (with more than 846 million monthly active users), Tencent's WeChat (with more than 1.2 billion monthly active users), and Baidu's web search engine. Jack Ma of Alibaba once advised Chinese police units on preventing crime through utilising big data to track citizens' behaviour (Bloomberg 2016). In addition, Alibaba has invested in SenseTime, one of the key local suppliers of facial and image recognition software, as well as surveillance cameras, for national and local authorities. Similarly, Tencent provides the much-desired data and technology to support the new social credit system; based on information collected from mobile device users, its system tracks and rates citizens' social behaviour. The political fusion of data and advanced technology has further empowered law enforcement units in China; in certain Chinese provinces and cities, the power of police officers has even grown to the extent of having access to the utility records and other private data of individual households in given patrolling areas.

Another area reflecting contestation of interests over the control of valuable data is cybersecurity. As discussed earlier, the increased value and relevance of data as a tool of capital accumulation, combined with digital

technology, provide strong motivations for protecting these valuable assets from external interference and ownership. New institutions that are put in place by the CCP in the interest of controlling local data for political and commercial reasons have the effect of altering the playing field in favour of a particular fraction of capital. This is the case with China's new cybersecurity law. The law, which came into effect on 1 June 2017, follows Xi Jinping's campaign for 'cyberspace governance' and his advocacy of 'the right of individual countries to independently choose their own path of cyber development, model of cyber regulation and internet public policies' (Ministry of Foreign Affairs of the PRC 2015).[6] With strict provisions on the management of data, the law mandates both the localising and centralising of data storage in China by imposing greater restrictions on information outflow. For example, the new law empowers regulators to review any transfer abroad of large amounts of data by businesses. Moreover, for companies operating in 'critical' industries—also known as the critical information infrastructure (CII) operators—it becomes mandatory under the new law to store data collected in China within the country.[7] Finally, the law specifically targets multinational companies in stipulating that, in the interest of national security, regulators may request such companies to hand over data source codes and decrypt data for further examination (Financial Times 2017; Yang 2017).

The adoption of state regulation of local data storage and information outflow has important implications. The law changes the playing field in favour of domestic tech players. The requirement that companies keep all data collected in China within the country means that the demand for domestic servers will increase. It also means that foreign cloud service providers have to collaborate more closely with their local partners. Currently, the two largest domestic cloud storage providers are Alibaba and Tencent, which have become the biggest beneficiaries of the legal requirement for companies to store certain data locally. In 2019, Alibaba Cloud and Tencent Cloud represented 46.4 percent and 18 percent of the country's cloud computing market, respectively, followed by Baidu Cloud (8.8 percent) (Fan 2020). It will also be more difficult for foreign e-commerce companies to compete in the Chinese market, given the need to comply with stringent data storage and cross-border data transfer requirements. Key foreign tech players have already made moves in response to tightened state restrictions. Since new Chinese regulations forbid foreign companies from owning certain technology and infrastructure in relation to cloud services, Amazon Web Services, which operates cloud services in China, has sold some of its cloud equipment to its local partner, Beijing Sinnet Technology (Yang and Lin 2017). To meet data localisation requirements, Apple has opened a new data centre in China, where personal data of its Chinese customers will be stored on computer servers operated by a state-owned company, Guizhou-Cloud Big Data Industry (Nicas, Zhong, and Wakabayaski 2021). Lastly, tightened regulations on data storage and transfer will further increase the

administrative and operating costs of multinational companies investing in China; foreign companies may even need to completely overhaul their data storage systems to comply with new regulations.

New contenders

Competition for access to markets in China is not restricted to rivalries between domestic and foreign capital. The vast but closed domestic market offers opportunities not only for the BAT companies but also for second-generation internet start-ups to fill any gaps left by their forerunners. Having emerged in the 2010s, several new entrants have grown to become challengers to the BAT companies, creating new markets in on-demand food delivery (Meituan), ride-hailing (Didi Chuxing), consumer group buying (Pinduoduo), news and information (Toutiao), video-sharing (Douyin, Kuaishou), and many others. Like their predecessors, these companies base their growth on leveraging customer data (in the relatively relaxed data-protection regulatory environment, at least before 2021), advances in wireless technology, the prevalence of mobile usage in China, and a domestic market that is closed to foreign competitors. Furthermore, their development is shaped by rivalry (and sometimes collaboration) among the established BAT players.

Take Meituan and Didi as examples. Both are dominant players in their respective market segments, yet their developments are subject to the market power—exercised through different means of financialisation—of the more established players in the sector. Meituan is the country's largest food delivery service provider. It operates an online platform that offers group-buying discounts, and connects merchants and restaurants with their customers. Started in 2010, the company had an annual revenue of RMB115 billion (US$18.4 billion) (Meituan 2021, 6) with 510 million active users in 2020 (Meituan 2021, 8). In its early years of development, Meituan benefited from investment from Alibaba. Later, two major M&A deals further cemented the company's market position. In 2015, the merger with Dianping—China's popular restaurant review app—strengthened Meituan's capacity to provide complementary services in addition to food delivery. This was followed by Tencent's purchase of a 17 percent stake in the company in 2016 which in effect incorporated the delivery service provider into the tech giant's business ecosystem. In many ways, Meituan has been caught in the ongoing rivalry between Alibaba and Tencent as the two tech giants battle for position in the food delivery market, valued at US$50.5 billion in 2020 (Liu 2019). Tencent's major investment provides strong backing for Meituan to expand beyond its core business of food delivery to encompass wide-ranging lifestyle offerings such as cinema, holiday, and hotel bookings. The Meituan super app also offers its own online payment platform, in addition to Tencent's WeChat Pay and Alibaba's Alipay. In this sense, Meituan has created an ecosystem that rivals Alibaba's businesses in e-commerce, food delivery, on-demand lifestyle services, and online payments. Similarly, competition

between Tencent and Alibaba in the ride-hailing market is evident in the development of Didi. Established in 2012, Didi received significant funding from Tencent in the early years of its establishment. Between 2013 and 2015, the battle between Tencent and Alibaba to acquire market share in the online payment market led to a price war between the two main ride-hailing platforms, Didi (backed by Tencent) and Kuaidi (backed by Alibaba). Eventually, Tencent and Alibaba agreed to merge Didi and Kuaidi in 2015, thus putting an end to the price war which had undermined the revenues of the two tech giants. Both Tencent and Alibaba maintain their interest in the new Didi. Senior executives of Tencent and Alibaba now sit on the board of the company. At the time of the company's IPO in the United States in 2021, Tencent owned 6.8 percent of Didi.

Recent steps by Chinese regulators to penalise anti-competitive practices of Chinese Big Tech have roots in the broader structural conditions in the internet sector in China—conditions that have thrived and evolved with the aid of foreign and domestic finance capital, and are shaped by contestation over market power and capital accumulation among the entrenched players, as well as between dominant players and new contenders. The expansion of tech-linked capital, and the methods used to reap profits in an area of intense competition, have provoked state actors to tighten regulatory measures in the industry. One way for the Big Tech companies to gain market share is to target potential rivals and incorporate them into their respective super app ecosystems. This is achieved by buy-outs and business practices which Chinese regulators have criticised as anti-competitive. For example, in the Meituan super app, Meituan's own payment channel and Tencent's WeChat Pay are featured more prominently than Alibaba's Alipay. This has led to Meituan joining Alibaba and Tencent as the subject of investigation by Chinese regulators looking into monopolistic business behaviour, particularly the use of exclusivity agreements which prohibit a company's clients from marketing their products and services with rival providers.

Restraining Big Tech

In spite of shared interests, state–capital relationships in China are contingent on changes in the balance of power between key players. As the Murdoch School framework points out, policy changes and outcomes are driven by battles over resources, power, and influence between social groups. This is also true of the relationship between the CCP and Chinese Big Tech, which is characterised by collaboration (as discussed in the case of AI and cybersecurity) and contention at different developmental junctures. One of the arguments articulated in this book is that the role and power of tech capital in the modern economy are expanding. Technological breakthroughs and hyperglobalisation have produced super tech capital that has disrupted the political-economic system in China. The growing influence of the BAT conglomerates has changed power relations and upset the status

quo, whereby SOEs and state-linked interests traditionally dominated the commanding heights of the economy.

In state-capitalist China, the rise of private tech capital vis-à-vis other important interests creates particularly strong tensions. In terms of performance and contributions to the economy, the contrast is stark: many SOEs are weighed down by overproduction, debts, and low productivity—hence earning the nickname of 'zombie SOEs'—while the BAT companies are associated with innovation, growth, and successful entrepreneurialism. With large private tech capital increasingly undermining the interests of large SOEs, pressures to defend important state interests also flare up. A new rule by the CCP in 2017 to make private tech firms invest in state enterprises demonstrates the pressures encountered by private tech capital to comply with the regime's demands. Ten private and state investors, including the BAT companies, invested US$11.7 billion into state-owned telecoms service provider China Unicom (Weinland 2017). This interventionist measure was part of the CCP's mixed-ownership reforms aimed at rescuing SOEs and ensuring their share in the gains of private capital. Another tool that the CCP uses to try to impose some degree of control on growing private tech interests is the exercising of management oversight. In 2017, the CCP took steps to acquire a 1 percent stake in leading tech firms and to appoint a government official to their boards of directors (Yuan 2017). Due to their ambiguous management structure, some of these tech companies have been described as 'private obscurely-owned enterprises' (POOEs) (Stine 2017). Their independent decision-making processes could be compromised by the presence of CCP committees that oversee firm operations from within. Furthermore, to curb the increasing market power and influence of Tencent and Alibaba's online payment platforms, the People's Bank of China (China's central bank) has mandated that online payments be operated and managed through a centralised clearing house, thus obliging Alibaba and Tencent's payments businesses to share valuable transaction data with competitors. Tencent's ambitions of extending its social credit scoring system to generate greater commercial benefits for its internet finance arm also encountered regulatory pressures from the CCP, resulting in the tech firm rolling back some of its new lending programmes aimed at drawing in new customers. This intervention stemmed from the CCP's concern that private credit rating businesses would dominate the centralised national credit scoring system, leading the People's Bank of China to reiterate that the effort to build a national credit scoring system would be led by the central government and only 'supplemented' by private businesses (Shi 2018).

Tensions build between Chinese state actors and Chinese Big Tech when the CCP's interest in political legitimacy and stability clashes with the self-interested commercial motives of the tech giants. The suspension of the IPO of Ant in November 2020 was in part driven by the conflicts between diverse state interests and those of Alibaba. When Chinese financial regulators called off Ant's debut in Hong Kong and Shanghai just two days

before the listings, there was much speculation about what had prompted the CCP's decision. Jack Ma's speech which blatantly criticised Chinese financial regulators could have been a trigger (China Banking News 2020b), while the intention of the regime to rein in political control of powerful private capital could also have been the motivation. Whatever the real reasons, the confrontation can be understood as an outcome of state actors prioritising one developmental need over others. The exponential growth of Ant's credit business not only encroaches on the business of established financial institutions but also poses systemic risk to the national financial system.

Controlling financial risks was stressed by Xi Jinping as one of the three critical battles that China needs to fight fiercely (Liu 2018; Xinhua 2018). For the ruling elites, it is imperative that China does not repeat the mistakes of the United States in the global financial crisis of 2008–2009. Maintaining financial stability is a key priority of China's developmental agenda, even when this means compromising other goals. Ant is the largest online credit provider in China and an icon of China's financial technological innovation. Its rapidly growing financial services arm—including wealth management, microfinancing, and insurance—contributes more than 50 percent of the company's total revenues (Alibaba Group 2021, 59). On the positive side, Ant's operating model of providing short-term credit to online shoppers addresses certain market needs. Its peer-to-peer microlending function connects borrowers and lenders through the digital platform. Algorithms and big data analytics help manage credit risks and tailor specific loans and wealth management products. This feature of embedded finance helps streamline credit services and provides alternative access to finance to customers who are excluded from more stringent traditional banking services. However, for Chinese regulators, unregulated microfinance could create a financial bubble with serious repercussions. Ant's credit for consumers and small businesses is offered without any security pledges from borrowers. The debts are then bundled as securities and bonds for refinancing so that more loans can be issued. In addition, Ant partners with financial institutions to offer joint loans but its contribution to these joint loans remains minimal. Of the US$263 billion outstanding loans made via Ant's platform at the end of June 2020, only 2 percent was funded by Ant, and the rest by Chinese banks and trust companies (Yang and Yu 2020). Defaults will expose these financial institutions to much higher risks than Ant. Moreover, Ant is not subject to any leverage ratio, therefore no checks are placed on the size of its loan portfolios. State-run banks have been complaining about Ant's fast-growing digital lending and wealth management services, which are not bound by the regulations applied to traditional banks. The fact that Ant offers financial services without being subject to the same regulations that its industry peers face is a regulatory loophole. In response, Chinese financial regulators issued a set of new draft rules which govern online microlending activities. One of the rules is that financial technology platforms will be required to contribute at least 30 percent in joint loans issued with banks. Ant needs to restructure

its business to comply with the new regulatory requirements before it can relaunch its listing. From a governance point of view, regulatory measures imposed by the CCP are necessary given that proper rules on online borrowing are lacking in the industry. Yet behind such regulatory efforts also lies the intention of the political elites to curb the influence of Chinese Big Tech and redistribute gains from these economic actors to SOEs. The Ant case also illustrates that while encouraging domestic consumption and technological innovation are part of Xi Jinping's 'dual circulation' strategy, managing financial risks takes precedence over other considerations.

Tensions between Chinese Big Tech and the CCP stem in part from the evolution of the home-grown internet conglomerates themselves which result in more diversified interests. As the companies grow and become ambitious international players, their interests are no longer confined to the domestic market, in which they are protected; instead, they now respond to global competitive pressures and the demands of the various markets in which they operate, including interests of institutional investors in overseas markets. Many Chinese tech companies have sought listings in the United States in recent years. As of 25 February 2019, 156 Chinese companies were listed on the three largest US exchanges—NASDAQ, the New York Stock Exchange (NYSE), and NYSE American (US-China Economic and Security Review Commission 2019). Many of these are internet and technology firms, including the BAT companies, Weibo Corporation, and JD.com. Having access to overseas capital strengthens the independence of the BAT companies by reducing their reliance on domestic finance, which is largely in the hands of state banks.[8]

Chinese firms also seek overseas listings to overcome the constraints of raising new capital at home, given that the Chinese equity markets primarily serve state-linked interests. Stringent rules governing IPO applications in China have forced young companies with potential to look for funds elsewhere, despite their rapid growth in the home market. In China, a company seeking an IPO needs to show profit earnings for three consecutive years leading up to the application year. This requirement in effect makes a number of Chinese tech companies—unprofitable at the time of application but with growth potential—ineligible for domestic listing. Similar rules are not applicable to US exchanges (Li 2017). A number of Chinese tech companies were reporting losses when they went public in the United States. Approval of an IPO is also quicker in the United States than in Hong Kong and China. For the BAT companies, there are also other benefits to listing in the United States: offshore listings allow them to gain access to a larger investor base while at the same time raising the company's profile in overseas markets. Having US dollar shares would also help simplify procedures when engaging in future M&A deals with a US company.

Meanwhile, maintaining a certain degree of independence from the CCP is necessary for the BAT companies to compete internationally. Their strong political attachments to the CCP, which have proven to be an advantage at home, have become a hindrance to further capital accumulation

elsewhere, as evidenced by Alibaba's setbacks in introducing its online payment platform and Tencent's frustrations in extending WeChat usage in the United States. The banning of TikTok in the United States indicates the political hurdles Chinese tech companies encounter when expanding overseas. Increased scrutiny from the US government over the acquisition of US assets by the BAT companies also suggests that it is important for Chinese Big Tech companies to demonstrate their independence from the CCP if they want to succeed in the United States and other foreign markets (Jing 2017). Given that the growth of the BAT companies has a lot to do with domestic protectionism, their moves to tap into overseas markets and accrue foreign capital will likely be met with escalating demands from foreign capital and governments for greater market access and reciprocal treatment in China.

Conclusion

This chapter has analysed state–capital relationships in China in a sectoral context, focusing on the political and economic collaboration and contention between the Chinese state and leading Chinese internet companies, against the background of the country's developmental imperative to move up global value chains. The relationship between the CCP and dominant private tech capital, involving the implementation of new policies and rules, reflects the struggle of state actors to manage certain powerful economic players which the regime relies upon to achieve important development goals. Increased power and influence of technology capital (both domestic and global) in the age of global capitalism have produced both synergies and conflicts that shape CCP policies. This category of capital exploits digital technology and big data to create new avenues that perpetuate capital accumulation—a distinctive feature of hyperglobalisation.

Applying the social conflict theoretical framework, this chapter has shown that interactions between state actors and dominant tech capital are characterised by periods of collaboration followed by political pushbacks as power dynamics change. Contestation over markets, power, and influence between different social groups—in this case between Chinese Big Tech and SOEs, and between domestic and foreign tech capital—drives the making of policies. Importantly, these tensions stem not only from the domestic operationalisation of growth strategies steered by the Chinese government, but also from a global capitalist order in which capitalist social relations are diffused in various places. While rapid digitalisation has brought economic and social transformations, Chinese ruling elites remain caught in a digital dilemma, which involves balancing socio-economic gains with political control, as well as reconciling interests of large technology firms with other competing goals. The elites' capacity to deliver positive development outcomes is increasingly challenged by competing objectives, for example, between promoting an innovative digital economy and maintaining financial stability. Chinese tech capital monopolies face a parallel dilemma: these

competitive fractions benefit from state favours on the one hand but are subject to the state's political control on the other. For them, overcoming institutional barriers to expanding capital accumulation overseas might involve moving beyond their comfort zone and partially disassociating their interests from those of the political regime.

Notes

1. On the competition between Alibaba and eBay in China, see Wang (2010).
2. Google operated in China briefly. The company withdrew from the market in 2011 after deciding not to comply with the CCP's rules on internet censorship. Even before its withdrawal, Google only occupied a tiny share of the Chinese internet market. The company was reported to have difficulty in developing software that suited the local context.
3. Internet censorship is not restricted to authoritarian regimes. Democratic governments also rely on private actors to censor online content for a number of reasons (see Meserve and Pemstein 2018).
4. King, Pan, and Roberts (2013) conducted extensive research on China's censorship apparatus, and concluded that the purpose of the Chinese censorship campaign was to forestall any collective action campaigns that were deemed destabilising to the regime.
5. Other governments also have AI-focused development plans, for example Germany's 'AI Made in Germany', the US executive order on AI leadership, and the 'Pan-Canadian Artificial Intelligence Strategy'.
6. For key provisions of the law, see Fu (2017).
7. Article 31 of the law says CII includes traditionally sensitive sectors such as 'public telecommunications and information services, energy, transportation, irrigation, finance, public services, e-government', but also includes 'other areas that may harm national security, the economy, and the public interest'. Subsequent draft regulations associated with the law list additional industries and sectors (including healthcare, big data, news services, and others) whose network facilities and information systems should be considered as CII (see Fu 2017; Yue et al. 2017).
8. The Hong Kong Stock Exchange (HKSE) was Alibaba's first choice for listing back in 2014. However, HKSE listing rules at that time forbade any company with 'dual-class' shares to go public, prompting Alibaba to list on the NYSE. Those rules were changed in 2018. After its US IPO in 2014, Alibaba completed its secondary listing in Hong Kong in 2019.

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5 Institutional Reform and Contestation in China's New-energy Vehicle Market

Introduction

> The Chinese can go to Europe and it's like a buffet, they have everything to pick from. Here we are constrained to four dishes and a fruit: cars, chemicals, and a few other areas.
>
> *–Joerg Wuttke, President of the European Chamber of Commerce in China, interview with* Financial Times*, 5 April 2017.*

On 7 January 2020, Tesla delivered the first 15 made-in-China Model 3 sedans from its Shanghai Gigafactory plant. The global leader in electric vehicles has made history by becoming the first wholly foreign-owned carmaker in China, following a relaxation of foreign investment restrictions in the automotive sector by the CCP. In a strategic sector in which state-owned interests are fiercely protected, Tesla is part of a broader contest between new, innovative capital and established state-linked interests. Its value to Chinese ruling elites lies in its innovation capacity, gradual localisation of supply chains, and potential contributions to meeting the regime's NEV objectives. How do we understand China's institutional reforms relating to the promotion of NEVs? What kinds of interests drive policy change, as in the case of Tesla overcoming institutional hurdles and establishing a foothold in the highly protected automotive market in China?

Like the internet sector discussed in Chapter 4, the automotive industry has been designated a priority development sector that is to receive government support under China's latest industrial policy, MIC2025. Yet in contrast to the internet sector, China's automotive industry has historical roots dating back to the 1950s, when the CCP began to construct a truck-building industry. Moreover, during the reform and opening period, the automotive industry was the only sector in China where investment rules, in the form of JVs, were purposely put in place to foster the growth of state-owned automakers in a state-protected environment. The case study presented in this chapter examines major NEV policies between 2008 and 2019 which aim at expediting the transition from conventional vehicles

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to NEVs. These reforms are largely responses to challenges that China faces regarding energy security and environmental issues. Both domestic state initiatives and global technological advances have played key roles in facilitating the emergence of large (by volume) domestic NEV automakers. Policies aimed at strengthening the production and innovation capacities of domestic automakers have traditionally favoured domestic state-owned capital over foreign capital by erecting market entry barriers. As the CCP strives to construct a NEV market, however, the support traditionally given to state-owned domestic automakers has been extended to non-state-owned domestic automakers and, more recently, to selective multinational automakers. In the highly contested NEV market, Chinese state actors face increasing pressures to shift strategies, both in terms of policy reversals and the lifting of market restrictions, to balance the interests of different state and non-state players who exercise a varying degree of influence within and outside China.

This chapter first establishes the background context for further discussions, stressing the strategic importance and economic value of the automotive industry. It goes on to highlight major transformations in both the global automotive industry and the Chinese automotive sector under hyperglobalisation, as well as the new dimensions of competitiveness emerging in the industry as technology advances. Several national policies aimed at upgrading the automotive industry by means of a full transition from internal combustion-engine (ICE) vehicles to NEVs will be examined. These policies centre on the provision of subsidies to NEV makers and buyers, and the adoption of zero-emission standards. More recently, the CCP has also abandoned foreign investment restrictions in the industry; Tesla's successful entry into the Chinese market amid changing global pressures and domestic demands, as well as its implications for institutional change, are explained in this section. The chapter concludes that policy shifts related to NEV market rules are products of competition over market dominance between major players both within and outside China, as these actors leverage opportunities and overcome regulatory constraints in the evolving global automotive industry.

A crucial driver of development

The automotive industry has long been regarded as an important sector helping to stimulate growth in an economy. Car manufacturing and sales generate investment and employment opportunities, along with improving mobility to support daily social and commercial activities. The industry's long and sophisticated supply chain, which includes R&D, the production of auto parts, and after-sales maintenance services, creates positive effects for the economy by supporting upstream and downstream industries including electronics, steel, chemicals, and many others. It is a sector that, through fostering entrepreneurial activities, generates a

'multi-dimensional conspiracy' favouring development, thereby creating positive spillovers that support the overall economy (Hirshman 1977 cited in Evans 1995, 7).

The automotive industry is important to both developed and emerging economies. In the United States, it is the country's largest exporter (followed by aerospace), and contributes 3 percent to GDP (American Automotive Policy Council 2020, 7). In Germany, over 77 percent of cars produced are for export (Chazan 2019), generating substantial export earnings that totalled US$254 billion (EUR 234.2 billion) in 2017 (Verband der Automobilindustrie 2018). In Japan, employment in auto manufacturing and related industries accounted for 8.3 percent of total employment in 2017 (Japan Automobile Manufacturers Association 2017). For emerging economies, a modern automotive industry promises a major development impetus. Crucially, in addition to the benefits of job provision, a strong domestic automotive industry helps to reduce reliance on expensive imports. The industry is also an established source of innovation and technological progress. In an intensely competitive market, those who succeed build their success on continuous innovation and product improvement. For example, technological advances made Fordist mass production possible in the past, with many flow-on effects for the way in which production was organised across many industries. Likewise, capital investment in R&D has become a prerequisite for automakers looking to succeed in today's competitive global economy. In 2014, automakers and their suppliers were the second largest R&D investors by industry, with a portfolio of US$115 billion, second only to the pharmaceutical and biotechnology sector (American Automotive Policy Council 2020, 4). Finally, having a strong automotive industry and the capacity to produce successful indigenous auto brands are often considered symbols of national pride.

Given the importance of the automotive industry to domestic economies, it is often a target of protectionism. As cross-border trade and investment accelerates, governments are keen to maintain the competitiveness of their industry, adopting (at different times) protectionist measures against imports, the outsourcing of automotive manufacturing, and other activities in the industry that are seen as constituting unfair competition. In the 1980s, citing negative impacts on economic growth, the United States imposed tariffs and quotas on Japanese car imports when they challenged established US brands with cheaper and higher-quality passenger and commercial vehicles. Today, governments continue to adopt measures such as tightening domestic content and emission control requirements in an attempt to safeguard domestic jobs and address trade imbalances (see Whelan 2017). Over time, regulatory requirements have greatly impacted the types of cars that are manufactured.

Historically, the automotive industry featured intense competition among a handful of automakers. After World War II, US car manufacturers (led primarily by Ford) dominated international production until

they were challenged by European (in particular, German) and Japanese rivals. Over the past few decades, the global geography of the industry has experienced major transformations. Leveraging relatively low production costs in terms of labour, land, and regulatory pressures, emerging economies such as China, Mexico, Thailand, and India have gained prominence as important assemblers and sources of parts for global automakers. Since the turn of the century, Chinese automakers have also become serious contenders in the industry, aiming to move higher along GVCs to capitalise on technological transfer via JVs, a rapidly growing domestic market, and a more liberalised international economic environment. As a result of globalisation, technological advances, and changes in the domestic terrain, players in the industry now face different opportunities and challenges. Today, international competition in auto manufacturing lies not only in costs, but also innovation in design, fuel-saving and battery technologies, connectivity, and automation. Advances in these areas have 'stimulated the technological renaissance' of the industry worldwide (Nieuwenhuis and Wells 2015, 2), revitalising it after periods of sluggish growth during the first decade of the 21st century.

Two important trends define the global automotive industry in the 21st century. First, it has become a transnational enterprise with increasingly fragmented production. Automotive GVCs are producer-driven and highly integrated, and lead firms source parts from a diverse pool of suppliers worldwide. While these global leaders retain key proprietary knowledge and core production functions in-house, they leave the supply of parts and assembly processes to different suppliers across various territories. When one considers the importance of *national* car industries for development agendas in the past—in many ways, they were crucial industrial cornerstones of developmental states and Keynesian/social democratic countries—the shift to *transnational* production and consumption marks a major change for both the industry itself and the countries intent on leveraging off it. Second, technological innovations in the industry have allowed new players such as EV makers and battery suppliers to enter the industry. Meanwhile, traditional automakers are also researching and developing electric and hybrid cars, forming new alliances to maintain competitiveness in the process. Other new industry players include software and digital technology companies; benefiting from the race towards smart driving, these companies have become tier-one suppliers for major global auto brands. More third-party app developers have also joined the industry to provide vehicle content (Burkacky et al. 2018). The overall landscape of the industry today is therefore comprised of long-established players facing shifting markets and regulatory requirements, along with entirely new market entrants such as Tesla that provide ongoing competitive pressures. These newer brands have skipped over the need to cultivate certain forms of knowledge, such as those related to the ICE. Instead, they position themselves around other forms of knowledge such as those

associated with electric power and automation. For states still interested in trying to leverage off the automotive industry, its current form poses an incredibly challenging environment.

Market access for technology

Given the strategic value of the automotive industry, the revamping of the sector was prioritised at the onset of China's market reform. When Deng Xiaoping inaugurated his economic reforms, China's automotive industry was backward and unproductive, and its technological levels were decades behind global standards. Deng handpicked the automotive industry as a 'pillar' industry, whose development the state was determined to steer (Thun 2006). At the time, CCP reformers were confronted by several forces: the domestic need to modernise state-owned carmakers and protect them from foreign competition, as well as external pressure from multinational automakers and their governments demanding access to the vast Chinese market. To reconcile these demands, a new strategic framework promoting 'Market Access for Technology' was implemented (see Chapter 3), allowing foreign auto investment into China through partnerships with domestic SOEs. For the CCP, the primary objective of its industrial policy was to transform large SOEs into globally competitive firms (Nolan 2014, 120). To achieve this, the ruling elites pursued a strategy that relied heavily on foreign capital partnering with inferior SOEs, in the hope that the transfer of capital, technology, and management know-how would help to upgrade China's automotive industry (Chang 2011).

That being said, given the development priority of facilitating these transfers to the benefit of SOEs, foreign automotive investments were subject to a number of entry barriers. First, foreign ownership in an automotive JV was restricted to less than 50 percent. Second, production needed to meet a certain level of domestic content, otherwise JVs would face severe penalties (Thun 2006, 22). Third, in return for market access, foreign companies were required to contribute modern product and process technologies to the JV, as well as help develop indigenous R&D capabilities together with domestic SOEs in their local operations. Finally, strict requirements were stipulated for foreign investors funding auto component manufacturing and R&D centres.[1] Consequently, as recipients of FDI, SOEs benefited from the transfers of technological and management know-how from their foreign partners, while the injection of foreign capital also created spillover effects that impacted other indigenous firms.

China's admission to the WTO in 2001 marked another important milestone for the automotive industry. China's WTO membership—itself emblematic of the juggling act that state elites have had to play with liberalisation and protection—led to a gradual reduction of tariffs on imported automobiles and increased relaxations on FDI inflows.[2] The years following 2001 witnessed the rise of independent indigenous automakers, who had

taken advantage of broader economic liberalisation policies to become competitive forces offering lower-cost products (Chang 2011, 61–7). By 2003, all of the world's leading auto manufacturers had established production facilities in China in various forms (Liu and Dicken 2006). As a result, China's annual vehicle output surged from more than 2 million vehicles in 2000 to 9.5 million in 2008 (Tang 2012, 3). Whereas a disproportionate share of China's automobile output in the 1990s was heavy goods vehicles, industry growth has been led by an increase in passenger cars since 2000. In 2009, China surpassed the United States and Japan to become the world's largest automotive producer for the first time, even though the Chinese automotive industry continues to primarily serve the domestic market, with exports remaining limited. The beginning of the 2010s also saw a critical shift from traditional vehicles to electric car production in China, examined in detail in the next section. Through decades of economic reform, including that associated with meeting the liberalisation conditions imposed by WTO membership, China's automotive industry has become increasingly integrated into global production networks. Today, Chinese firms produce parts and components for both indigenous and foreign automakers, while Chinese production facilities have become important sites for producing and assembling vehicles. Notably, all major global automakers now have at least two JVs in China (Table 5.1).

Despite this impressive expansion overall, reforms in the Chinese automotive sector have delivered mixed results. While the size of the sector has grown significantly to become an important market for leading global automakers, indigenous automakers are still trailing in many aspects such as design and technological levels, not to mention the accumulation of export earnings. Moreover, FDI inflows into the automotive industry have not delivered the expected outcomes of enabling foreign–domestic technology transfer and making Chinese state-owned automotive enterprises competitive (Wang et al. 2013). The best-selling cars, all produced by JVs, are often old models, and manufacturers remain slow or reluctant to upgrade existing products. Thun (2006, 23) notes that one of the most popular models in China during the 1990s, the Volkswagen Santana, was based on 1970s technology, and there was still no upgrade to the vehicle a decade after it was first launched in China. One of the key contributing factors is that the JV arrangement discouraged the transfer of core technologies from foreign technology owners to their Chinese domestic partners. While the JV ownership model was designed to tap into supplier innovation, as well as facilitate co-designing and product innovation between foreign automakers and their Chinese counterparts, the context of lax regulatory and enforcement standards poses high risks and costs for foreign auto firms, such as the leakage of IP (Jean, Sinkovics, and Hiebaum 2014). A good example is Volkswagen; its Chinese JV partner FAW reportedly copied designs of the German maker's transmissions and engines (Schmitt 2012). In addition, with SOEs having privileged access to government subsidies, JVs lack the incentives to

Table 5.1 Major manufacturers of passenger cars in China

SOEs	*SAIC Group (Shanghai)*	*BAIC Group (Beijing)*	*FAW Group (Changchun)*	*Dongfeng Motor (Wuhan)*	*GAC Group (Guangzhou)*	*Chang'an (Chongqing)*	*Chery (Wuhu)*
Major foreign JV partners	Volkswagen General Motors —	Hyundai Daimler —	Volkswagen General Motors Toyota	Honda PSA Nissan	Fiat Chrysler Honda Toyota Mitsubishi	Ford Mazda	Jaguar Land Rover — —
Non-state-owned enterprises	**Geely** (Hangzhou)	**BYD** (Shenzhen)	**Great Wall Motors** (Baoding)	**NEV Start-ups**	**NIO** (Shanghai)	**Xpeng Motors** (Guangzhou)	**Li Auto** (Beijing)
Major foreign JV partners	Daimler Renault	Toyota Daimler	BMW —	Major strategic technology investors	Tencent	Alibaba	Meituan
Wholly foreign-owned enterprise	**Tesla** (Shanghai)						

Source: Company and media reports; compiled by author

improve industrial productivity despite the introduction of foreign players to the industry, which theoretically should have boosted competition. To the disappointment of Chinese reformers, the 'Market Access for Technology' plan failed to create a national champion in the automotive sector, leaving the original goal of exporting Chinese branded cars yet to be realised.

The shift to new-energy vehicles

Over the years, China's modernisation has relied on a high-consumption and high-investment growth stimulation strategy. Resource depletion, environmental damage, rising wages, and social inequality are among the myriad of development constraints that began to emerge in the late 2000s. By the early 2010s, China's economic growth was beginning to slow, revealing within its automotive industry three aspects that posed threats to the country's sustainable development. First, as China's population and economic growth expanded, the country had to increase fuel imports from oil-producing countries including Russia, Canada, the United States, and Middle Eastern nations to support local production and consumption. China imports 70 percent of its oil to satisfy local demands (Innovation Centre of Energy and Transportation 2019). This increased reliance on energy imports to support both industrial and household needs marks a strategic weakness, leaving China susceptible to fluctuating oil prices, as well as changes in global political and economic situations, not to mention being held hostage by the demands of oil-exporting countries. The widespread adoption of NEVs would therefore significantly reduce China's dependence on foreign energy.

Second, severe air pollution and the health issues it causes also threaten economic growth and social stability. ICE vehicles remain the biggest source of air pollution in China today (Innovation Centre of Energy and Transportation 2019). Worsening health concerns have made the CCP determined to cap carbon emissions by 2030. Successive national development plans have prioritised the adoption of environmentally friendly, clean-energy vehicles since 2010, when they were designated one of the seven national SEIs in a strategic development plan. The 13th FYP (2016–2020) identified 'green development'—the pursuit of environmentally friendly growth—as one of its five core development principles. Furthermore, the CCP named combating pollution as one of the three critical battles to be fought by the country, the other two being controlling financial risks and reducing poverty. As envisioned by Xi Jinping, successfully combating these problems has become crucial for China to develop into an overall moderately prosperous society (*quanmian xiaokang shehui*) (Liu 2018; Xinhua 2018).

Third, despite 40 years of tapping into foreign technological know-how and expertise through JVs, Chinese automakers still lack the capacity to build cars that can compete with major international automakers. China's entry into the WTO in 2001 was a boost to the industry, but the increase in

production capabilities also led to problems such as overcapacity. Moreover, given the lack of indigenous product development initiative, most Chinese branded cars bear physical similarities with foreign designs, often turning out to be subjects of IP infringement litigation. So far, no Chinese branded cars have made it into the United States, the world's second largest automotive market. Chery Automobile, considered to be China's most successful automotive exporter, sells cars in countries including Australia, New Zealand, Russia, Turkey, Mexico, Venezuela, Singapore, and Ghana, but not the United States and Europe. Indeed, the more stringent safety and environmental regulations of the US and European markets pose additional barriers for Chinese automakers. Even in the components subsector, the persistence of local protectionism also means that local suppliers are often favoured even when their products are less competitive in terms of quality and price (Harwit 2001). Overall, the Chinese automotive industry contributes only 1.53 percent to the national GDP (Ministry of Industry and Information Technology of the PRC 2016), comparing unfavourably to higher percentages in other countries with strong auto manufacturing bases—3 percent in the United States (American Automotive Policy Council 2020) and 5 percent in Germany (Chazan 2019). The fact that China's automotive industry primarily serves the domestic market and generates limited export earnings suggests that although the sector has been gathering strength and resources in making cars, the lack of new designs and production innovation has deprived automakers of higher profit margins. In other words, by producing for the domestic market, Chinese automakers largely remain at the lower end of global production chains—a fact acknowledged within China itself (see Economics Daily 2015).

Amid worsening air pollution, a heavy reliance on oil imports, and setbacks in catching up with global makers of conventional internal combustion-based cars, a wholesale shift to electrification, sooner rather than later, has become a strategic necessity for the Chinese automotive industry. Nevertheless, several issues remain. To make new car models that run on a different type of energy source requires a certain technological know-how and a ready supply of essential parts such as batteries. A successful transition to clean energy also hinges on an adequate supply of and demand for NEVs, in addition to essential infrastructure such as charging stations. The good news for China as a late developer is that an electric car involves far fewer parts than an ICE car, and is therefore less complicated to build; this effectively lowers the EV market entry barrier for new players. Furthermore, multilateral governmental organisations and non-governmental organisations are also pressing for stronger emission regulations, which would encourage the adoption of more fuel-efficient and environmentally friendly vehicles. On a global scale, national governments have, to various degrees, embraced electrification to meet international commitments and address environmental challenges. In particular, a number of countries, states, and cities have set timelines for banning the sale of ICE vehicles (Table 5.2). In

Table 5.2 Proposed timeline of sales bans on ICE vehicles, selected polities

Sales ban to begin	*Country/state/city*
2025	Norway
2030	Germany, Denmark, The Netherlands
2035	China, United Kingdom, California (US)
2040	France

Source: Media reports; compiled by author.

China and other emerging and developing economies, their low levels of car ownership compared with advanced economies also implies existing space in the automotive industry for new automakers to join.

Subsidies and licence arrangements

As is characteristic of CCP state-led development, national plans were ushered in to spearhead the transition from ICE vehicles to NEVs. The Automotive Industry Medium- and Long-Term Development Plan, issued in April 2017, made the development of NEVs and intelligent connected cars a top priority for technological advancement and cross-sector cooperation. The urgency of addressing air pollution, along with the CCP's conviction in its ability to mobilise the necessary resources for delivering outcomes, resulted in very ambitious NEV targets being set from the start. The NEV development plan issued by the State Council in 2012 called for 5 million NEVs to be on the road by 2020 (National Energy Administration 2012). This goal created the challenging task of increasing NEV sales by 40 percent each year from 2016, which translates to cumulative NEV sales of 4 million between 2016 and 2020 (Table 5.3). Given that NEVs are still more expensive to make than conventional vehicles, and that customers remain concerned

Table 5.3 Annual NEV sales in China, 2014–2020

Year	*Number of NEVs sold*
2014	74,763
2015	379,000
2016	507,000
2017	777,000
2018	1,256,000
2019	1,206,000
2020	1,300,000

Source: China Association of Automobile Manufacturers (various years), Automotive Industry Medium- and Long-Term Development Plan; compiled by author.

Table 5.4 Chinese central government subsidies for buyers of fully electric cars (in RMB), 2017–2020

Driving range (km)	*2017*	*2018*	*2019*	*2020*[4]	*Percentage change, 2017–2020*
100 ≤ 150	20,000	0	0	0	−100
150 ≤ 200	36,000	15,000	0	0	−100
200 ≤ 250	36,000	24,000	0	0	−100
250 ≤ 300	44,000	34,000	18,000	16,200	−63
300 ≤ 400	44,000	45,000	18,000	16,200	−63
≥ 400	44,000	50,000	25,000	22,500	−49

Source: Various notices from the Ministry of Finance of the PRC; compiled by author.

about driving ranges and charging facilities, new incentives are needed to change customer preferences while simultaneously encouraging the mass production of NEVs. For the ruling elites, the intent was to favour domestic NEV and battery makers, especially in terms of providing a congenial environment for them to enjoy first-mover advantage and capture the domestic market share ahead of foreign competitors.

Among the suite of government incentives, generous state subsidies on NEVs have been a major trigger for burgeoning NEV sales in China. One study estimates that to create a large domestic NEV market, the Chinese government has spent over RMB390 billion (US$62.4 billion) on subsidies, incentives, and infrastructure, equivalent to over 42 percent of the sector's entire commercial activity (Kennedy 2018). To stimulate demand, the central government offers subsidies to EV buyers (Table 5.4). Domestic automakers also receive financial support in the form of manufacturer subsidies. Local state actors, many being under pressure to meet NEV targets, also raced to provide local subsidies on top of state incentives until these local incentives were finally abolished in July 2019. Aside from consumer-side measures such as subsidies, in cities where traffic control has been imposed to alleviate gridlock and pollution, more aggressive measures have been taken to tip the balance against conventional vehicles. In these locations, provincial and local governments now issue more licence plates for NEVs than for ICE vehicles. This is certainly the case for Beijing, where citizens seeking to obtain a licence plate for a conventional vehicle need to enter a lottery system, with the chances of being successful decreasing each year. As the lottery does not apply to NEV licence plates, first-time car buyers that choose to purchase NEVs are guaranteed a licence plate.[3] More recently, to revive demand for NEVs following the COVID-19 pandemic, the Beijing municipal government announced that an additional 200,000 NEV licence plates would be issued in 2020 for carless families. Similarly, other cities have de-incentivised obtaining a licence plate for ICE vehicles by making them very costly; for instance, such a plate can now cost up to US$12,000 in Shanghai.

In some ways, state action has succeeded in achieving the CCP goals of boosting NEV adoption and production capacity. Indigenous NEV makers, including SOEs and non-state-owned firms, have become the biggest

beneficiaries of the NEV strategy as they capture significant market shares, with some stronger domestic players even shifting to full NEV production. While this may be prompted by state pressure, it may also indicate that such players have developed the necessary capacity to make the switch ahead of their foreign competitors. Chang'an Automobile and BAIC Motor, both SOEs, have announced plans to completely halt sales of self-branded ICE vehicles by 2025 and focus instead on building NEVs (Li 2017a, 2017b). Local start-ups, including NIO, Li Auto, and Xpeng Motors, have also emerged to challenge more established players in the NEV business. These local NEV makers in particular benefit from state incentives offered at a certain developmental juncture, when technological innovations and a lack of foreign competition permit new, small manufacturers to enter the competition. The present enthusiasm for NEV production displayed by local Chinese carmakers contrasts with the scepticism that foreign auto manufacturers already operating in China had shown about the commercial viability of NEVs at the time when the Chinese government made NEV adoption a national development priority. Without the manufacturer subsidies that are offered to their local counterparts, foreign-branded NEVs would have been much more expensive to produce compared to those powered by ICEs. There were also serious doubts about the quality and availability of NEV parts, especially their batteries, in addition to the availability of charging grids and stations to support NEVs.

Zero-emission vehicle mandate

The central government's NEV policies did not just stop at subsidies. On the supply side, the Chinese party-state is determined to shift manufacturers towards NEV production. The new zero-emission vehicle (ZEV) mandate, modelled after the carbon trading scheme in California and took effect in 2019, applies to any automaker in China—indigenous, foreign, or JV—selling over 30,000 units a year. To accelerate the widespread adoption of NEVs, the new mandate obliges eligible automakers to meet government-set quotas for NEV production, even though such obligations mean ignoring market signals. Under the new scheme, automakers earn credits for every NEV they produce and are charged credits for every ICE vehicle they produce. These new rules also impose two sets of targets on manufacturers: one set of quotas for NEV sales volumes, and another for fuel economy compliance. Overall, the mandate requires that NEVs make up 10 percent of new sales from each automaker by 2019 and 12 percent by 2020; those who fail to comply with the new regulations will have to purchase credits from other manufacturers, or else be penalised (Bloomberg 2017).

The new ZEV mandate has several important implications. By imposing regulatory pressures on automakers, the CCP plays an instrumental role in pushing for the electrification of the automotive industry. On the other hand, the impact of this decision varies among different automakers. For

domestic NEV leaders such as BYD, Chery, and Chang'an Automobile, which already have a sizeable NEV business, there is no major pressure to meet government quotas; instead, they can benefit from selling credits to other medium-sized indigenous makers who need to meet such quotas. Meanwhile, the mandate has shifted the preferences of multinational automakers, who were previously reluctant to scale up their NEV production given their disadvantaged position in terms of eligibility for NEV subsidies. Indeed, the mandate pushes multinational carmakers to expand their NEV investments in China, resulting in the formation of new JVs. These enterprises include a partnership between BAIC and Daimler that is set to expand the local production of Mercedes EQ all-electric vehicles, along with building a new battery factory to support its electric car portfolio (Reuters 2017), in addition to new NEV projects between Volkswagen and Anhui Jianghuai Automobile Co., GM and SAIC Motor, and Renault-Nissan with its local partner Dongfeng Motor Corporation. In this sense, the ZEV mandate acts as an instrument pushing foreign automakers to compete in the NEV market 'with Chinese characteristics'. Nevertheless, in order to protect the domestic interests of indigenous NEV makers, penetration of foreign capital into the NEV market was encouraged (but also regulated) only after Chinese NEV brands had developed high production capacities and established dominance in the local market (see Table 5.5). Perhaps

Table 5.5 Top NEV automakers in China by sales volume of passenger cars*, January–March 2021

Company	*Type of ownership*	*Year of incorporation*	*Number of units sold*	*Market segment*
Tesla	Foreign, private	2003	69,195	Premium
SAIC-General Motors-Wuling	Joint venture	2002	64,236	Low to medium
BYD	Domestic, private	1995	47,049	Low to medium
Great Wall	Domestic, private	1984	27,289	Low to medium
SAIC	SOE	2011	23,644	Low to medium
NIO	Domestic, private	2014	19,844	Premium
GAC	SOE	1955	13,460	Low to medium
Chery	SOE	1997	13,180	Low to medium
Xpeng Motors	Domestic, private	2015	12,662	Premium
Li Auto	Domestic, private	2015	12,321	Premium
Chang'an Automobile	SOE	1862	12,118	Low to medium

*Include full electric cars and plug-in hybrids

Source: National Passenger Cars Association (China); compiled by author.

tellingly, one industry expert estimated that Chinese brands accounted for 96 percent of the domestic NEV market in 2017 (Dunne 2018).

Limits of state activism

The CCP's approach to creating a large market or industry through market-intervening measures is by no means unprecedented. The Chinese government had previously heavily subsidised the steel industry and solar panel production, resulting in overcapacity in the former and proliferation of domestic manufacturers in the latter. State-led policies surrounding the creation of a NEV market have also spawned new problems. In particular, changes in the distribution of gains among industry players, on account of Chinese state actors revamping institutional rules, have produced new pressures that have forced policymakers to consider other alternatives.

Scaling back NEV subsidies

Despite having some success in meeting numerical targets, subsidy-based incentives have compromised the other important objective of building a strong and competitive industry capable of both meeting domestic needs and generating export earnings. Since their introduction in 2009, NEV subsidies have been driving domestic demand for NEVs produced by indigenous manufacturers. Yet they have also become the subjects of fraud; certain indigenous bus and car manufacturers were found to have submitted falsified sales records in order to benefit from government subsidies (Yu 2016). The innovativeness and competitiveness of Chinese NEV makers, in general, is also subject to debate. The strong push from the central government to electrify the automotive sector, coupled with the relatively low entry barrier into the NEV industry, has created an extremely crowded NEV market, comprising a handful of big players plus many small automakers. According to data from the Beijing University-based NEV State Monitoring Platform, there were 486 registered NEV makers in China as of 2018 (EV Partners 2019).

Adding to the problem, the availability of subsidies for NEV sales sustains, rather than eliminates, loss-making domestic auto enterprises. As small indigenous start-ups rush to manufacture NEVs, they tend to produce simple, basic NEV models that only meet the lowest driving range threshold qualifiable for NEV subsidies. In this way, smaller NEV manufacturers can profit from government incentives without making massive investments in more sophisticated models of higher capacity. This temptation to produce very basic NEVs with just 'good-enough' innovation has created a race-to-the-bottom phenomenon. While this competition contributes to meeting national targets in overall production and sales, as well as those regarding the state's overarching objective of alleviating air pollution, it has also

somewhat compromised the other national goal of enhancing the innovative capacity of Chinese automakers and their ability to compete internationally for export dollars. For example, despite being the world's largest EV manufacturer, Chinese brand BYD has repeatedly delayed its plans to export its passenger cars to the United States and Europe, even though its electric buses are now available in almost 50 countries, including the United States, the United Kingdom, Spain, and Italy (Moss 2018). Moreover, although BYD has produced several more sophisticated models at home, such as the Yuan and Tang series, the majority of Chinese NEV automakers continue to engage in low-cost mass production.

By 2016, policymakers were compelled to deal with various contradictions and political tensions that emerged in the NEV industry. In a move that will shake up the industry, a timeline was announced for gradually scaling down national and sub-national financial stimuli towards NEV sales (see Table 5.4). The original plan was to phase out all government subsidies for NEVs by 2017, although the deadline was later extended to the end of 2020, and then further delayed until 2022 to revive NEV sales hit by COVID-19 during the early months of 2020. While the COVID-19 pandemic is the most recent trigger prompting the CCP to maintain NEV subsidies to spur sales, there were other forces driving the previous decision regarding NEV subsidies. First, years of providing subsidies to create and support the NEV market have burdened both the central and local governments with excessive outgoings. These financial incentives have also contributed to overcapacity; for instance, certain provincial governments have overbuilt production facilities to generate desirable numbers. Consequently, to safeguard its financial interest, the CCP decided to reduce subsidies, shifting costs and responsibilities back to NEV producers. Second, Chinese policymakers hoped that the rollback of subsidies would help consolidate the fragmented NEV market. The rationale was to effectively leave resources and competition to SOEs and their JVs, as well as more productive private indigenous automakers, while squeezing out smaller companies with low technological intensity; certain small automakers producing only a few hundred cars a year could hardly survive without government incentives. However, countervailing pressures from key industry players have complicated the suspension of subsides. There was strong resistance from vested interests, as SOEs such as SAIC and BAIC competing in lower market segments anticipated huge impacts on annual sales once subsidies were cut back. BYD also expressed concerns over a sharp drop in domestic demand which would have negative impacts on supply chains, jobs, and the ability to compete with foreign brands. Hence, domestic auto manufacturers including large SOEs and state-backed, private indigenous firms collectively lobbied for the continuation of special privileges accorded to them. Eventually, the withdrawal of state subsidies to manufacturers was extended from 2017 to 2022.

Resistance to ZEVs

The political conflict between indigenous automakers and multinational capital explains the contested nature of government-designated ZEV quotas. As discussed above, the ZEV mandate obliges both indigenous and foreign automakers to produce a certain percentage of clean-energy vehicles in accordance with a given timeline. The process of implementing these new rules demonstrates how growing resistance from market players has impacted policy deliberations and outcomes, despite the authoritarian nature of the CCP. The original ZEV mandate, announced in 2017, set a target for NEVs to reach 8 percent of new auto sales as early as 2018. Foreign automakers lobbied against this proposed plan, claiming that there was very little time to prepare during the lead-up to the actual enforcement of these goals. In addition, the ZEV targets set uniform emission quotas for foreign and indigenous automakers alike; however, as domestic NEV makers benefit from additional state subsidies, it is difficult for foreign automakers to successfully meet the Chinese regulatory targets on emission levels.

In June 2017, the American Automotive Policy Council (AAPC), the European Automobile Manufacturers Association (ACEA), the Japan Automobile Manufacturers Association (JAMA), and the Korea Automobile Manufacturers Association (KAMA) wrote a joint letter to MIIT that proposed six recommendations for Chinese authorities, which included delaying the implementation of the ZEV mandate by one to three years, increasing flexibility in the credit system, and reconsidering the proposed penalties for when quotas are not met (Taylor and Schwartz 2017). This international coalition of foreign automakers in the China market also demanded more consultation with industry stakeholders and additional time to adjust to new rules and regulatory policies (EU Chamber of Commerce in China 2017, 191). In the end, Chinese regulators made some concessions. While the NEV quotas remained unchanged, enforcement was postponed for a year, to 2019, thereby satisfying one of the demands articulated by the coalition of foreign automakers. MIIT also provided details about further scaling down NEV subsidies for indigenous producers. These changes support the suggestion that considerable pressure from foreign automakers via their representative trade associations and governments played a part in shaping final decisions on NEV policies. Chinese ruling elites have learned to adapt to dealing with countervailing voices, and an evolving pattern of introducing, negotiating, and finalising policies has emerged—no small adjustment for a state often described as monolithic and all-powerful. At present, when the Chinese government first publicly announces a new policy, it typically involves harsh targets and more stringent rules while featuring areas of ambiguity in relation to enforcement. The underlying intention of this arrangement is to leave room for adjustments at a later stage, especially after considering demands from important players.

Tesla in China

Globalised economic relations, competitive pressures, and the profit motive driving multinational capital to seek new sites for capital accumulation have made Chinese state policies regarding the maintenance of a protected market for domestic automakers increasingly difficult to sustain, especially given multilateral commitments and the threat of trade sanctions from other countries. Over the years, multinational automakers, joined by their respective governments, have put significant pressure on Chinese political elites to further liberalise the automotive market. The grievances of this sector of multinational capital are multifaceted. First, regarding the simple but key issue of market access, China still imposes a tariff of 25 percent on imported vehicles. This pushes foreign automakers to set up production facilities in China to circumvent such tariffs; however, making cars in China obliges them to form JVs with Chinese SOEs. Such partnerships benefit foreign automakers in terms of granting access to relatively cheaper production inputs, and the wider distribution networks of their Chinese partners; yet such collaborations also raise issues regarding technological transfer and IP infringement. US, European, and Japanese automakers have repeatedly criticised Chinese automakers regarding forced technology transfers in the automotive industry. In addition to these long-term grievances, China's more recent industrial policy favouring domestic firms at the expense of multinational capital in the NEV market has provoked greater resentment from foreign automakers and their governments.

While Japan and South Korea succeeded in building their nascent automotive industries within the economic conditions of the 1970s and 1980s, the adoption of a similar strategy now by China under hyperglobalisation has provoked greater confrontation. As the late developer rises to become a global technology contender, and its achievements are largely viewed as capitalising on the openness of the world economy with its relatively easy access to others' knowledge, capital (including IP), and markets; foreign competitors are desperate to negotiate reciprocal treatment from China in order to protect their own economic interests. These pressures from foreign governments and multinational capital became one of the driving forces behind the landmark decision of the CCP to lift foreign equity investment restrictions in the automotive sector.

Discussions about relaxing the equity restrictions for FIEs in the automotive sector in China date back to 2008–2009, when multinational auto capital suffered from a global sales slump largely induced by the global financial crisis, weakening the industry worldwide. Yet during this period, resistance from domestic automakers represented by the China Automobile Manufacturer Association, as well as dominant state-owned auto groups including SAIC, BAIC, Dongfeng, and FAW, blocked any intentions to change related policies. Nevertheless, CCP leaders now face new challenges of retaining foreign investment and stimulating domestic consumption to

maintain growth—challenges that have prompted a revision of policies to accommodate the demand for market access from foreign interests. In 2017, the NDRC announced that the equity ownership restrictions governing foreign-invested automotive makers producing NEVs and combustion engine-driven passenger cars would be eliminated in July 2018 and 2022, respectively; meanwhile, no restrictions would be imposed on the number of JVs that a foreign company could form in China (National Development and Reform Commission 2018). This easing of multiple restrictions represents a major step by the CCP to open up its pillar industry further towards foreign interests, 34 years after the first Sino-foreign automotive JV was formed in China. Not surprisingly, foreign automakers, who had been lobbying for unrestricted market access and who would be major beneficiaries of the abolition of such market entry and investment restrictions, welcomed these institutional changes (EU Chamber of Commerce in China 2019).

The elimination of entry barriers to China's NEV market paved the way for the leading US electric car manufacturer Tesla to strike a deal with Chinese authorities in registering as a wholly foreign-owned automaker in China in July 2018. Discussions over Tesla setting up a production facility in the country had emerged as early as 2014. Under the agreement signed in 2017 between Tesla and Chinese authorities, the company would build a production plant in a free-trade zone, in this case Shanghai, and produce made-in-China Tesla models for the Chinese market. This agreement indicates that Chinese policymakers were very partial to Tesla as they sought to attract the global EV leader to expand its business into China. Favours given by the state to the company to accomplish this goal included a range of financial incentives, as well as the regulatory green light to help the global giant quickly establish its presence in the Chinese market. In terms of finance, a five-year loan totalling RMB11.25 billion (US$1.8 billion) was also granted to Tesla at attractive rates by four major Chinese state-owned banks to fund its Chinese business (Ren 2019).[5] Like some preferential corporate entities, Tesla is entitled to a beneficial corporate income tax rate of 15 percent (which is lower than the 25 percent statutory corporate income tax rate in China) granted by the Shanghai government until 2023. Tesla was able to pass the necessary regulatory requirements and build its Shanghai Gigafactory plant within a very short span of time. Less than a year out from construction, the plant began production in December 2019, and delivered its first 15 Model 3 sedans in early January 2020 (Kharpal 2020), a timeframe that none of the major domestic automakers could have matched.

Furthermore, Chinese policymakers have eliminated other regulatory hurdles for Tesla to compete in the Chinese market. Previously, foreign-branded EVs were not eligible for state NEV subsidies unless they were powered by state-approved domestic batteries. Revised rules in June 2019 abandoned such a requirement (Ministry of Industry and Information Technology of the PRC 2019b), allowing Tesla to become the first foreign EV maker entitled to state NEV subsidies while continuing to source essential

batteries from foreign suppliers such as Panasonic and LG Chem. In addition, China-made Tesla Model 3 vehicles are also eligible for a central government NEV subsidy of RMB 24,750 (US$3,960) each (Ministry of Industry and Information Technology of the PRC 2019a), making the Model 3 the first foreign-branded EV benefiting from state subsidies. This figure does not include the additional subsidy offered by Shanghai municipal government, which can be up to 50 percent of the central government subsidy. Finally, making cars in China enables Tesla to avoid the 25 percent import tariff and enjoy reductions in purchase taxes, given that the 13 percent value-added tax normally imposed on passenger vehicles is also waived. The Chinese-made Tesla Model 3 could therefore be sold with a much-reduced price tag of RMB355,800 (US$57,000) at its debut.[6] All these concessions to Tesla have led to one Chinese commentator describing the central government as betraying indigenous automakers to permit the 'invasion' of Tesla into China (NEV Industry Net 2019).

In a sense, the CCP's shift of its market access policy in favour of certain fractions of multinational capital is a strong bet on further stimulating the NEV market and competition between producers in China. It is anticipated that Tesla will bring spillover effects, including the recruitment and training of technical staff, in addition to the upgrading of auto parts and components, thereby inducing innovation among Chinese automakers more generally. At present, domestic components account for 30 percent of a China-made Model 3, but Tesla plans to reduce costly imports of parts and components and fully localise production (Yijun, Huang, and Kubota 2019). In July 2020, Tesla started using batteries supplied by local Chinese company CATL in its Model 3. Moreover, the 'Tesla effect' could arouse consumer interest in EVs more generally, helping to drive EV sales towards national strategic targets while also counteracting the withdrawal of state subsidies. Indeed, since its debut in January 2020, Tesla's China-made Model 3 has been leading NEV sales in China. Inevitably, Tesla's entry into the domestic market poses a significant challenge to Chinese auto start-ups that target the premium NEV market. Even so, the interests of other state-linked key players such as BAIC and SAIC who mainly compete in the medium- and low-end market—a primary concern for CCP ruling elites—are expected to be impacted less for the time being.

The Tesla case has several important implications. Under hyperglobalisation, the increased (though not entirely transaction cost-free) mobility of cross-border flows of capital and goods provides the conditions for multinational capital to choose cost-friendly and regulation-friendly sites for production. Technological advances enable firms to overcome logistical hurdles such that essential parts and components can be assembled quickly and seamlessly in an alternative site outside of the host country. The speed with which Tesla has been able to complete the construction of its production facility, begin manufacturing, and then deliver its first batch of Model 3 sedans to the Chinese market manifests the effect that technology can have

on modern industrial production. Of course, from a political standpoint, unprecedented favouritism from Chinese authorities towards the global tech player is an important factor in explaining Tesla's hassle-free inauguration in China. On the part of the Chinese, various interests remain involved. First, political elites are concerned with achieving established NEV adoption goals. This obsession with national targets has already resulted in the further postponement of the NEV subsidies rollback to 2022. Tesla's sales in China could add good numbers to the MIC2025 targets, stimulating customer interest in NEVs more generally. This is possibly one of the reasons why Chinese policymakers were willing to eliminate regulatory hurdles, allowing the foreign automaker to enjoy national subsidies and tax cuts. Policymakers are also aware that since the launch of its first national policy in 2012 aimed at accelerating the shift towards energy-saving vehicles and ZEVs across the country, NEV development has reached a different stage. More substantial upgrading in quality and innovation, rather than quantity and scale, is needed to drive the industry forward. China's auto supply chain seeks to benefit from upgrading if it is to supply local parts and components to Tesla. Ultimately, China's large market remains an important advantage for drawing in global competitive capital, despite lingering concerns about IP infringement and forced technology transfers. More importantly, persistent demands from multinational capital and governments for the further liberalisation of China's strategic sectors have influenced Chinese policymakers to revise regulations and accommodate certain demands, as failure to address them could potentially damage relations with trading partners and put further strains on China's struggling economy.

On the part of Tesla, its interest is obviously closely tied to market potential and profitability. In 2020, the company's sales revenues in China amounted to US$6.6 billion, representing one-fifth of the company's total revenues of the year (Tesla 2020). China has become the company's second-largest market, behind the United States, which accounted for 48 percent of the company's revenues in 2020. The company has no strong rivals in China, the world's largest automotive and EV market. It has strong brand power and high-quality products with cutting-edge technology; it thus only needs to negotiate favourable terms regarding arrangements of equity ownership, component sourcing, and access to subsidies and finance. Tesla's search for new markets is also driven by a changing political and economic situation in the United States that is unfavourable for leading EV makers. In December 2019, the Trump administration refused an extension of a federal tax credit to EV makers. As Tesla has exceeded the cumulative sales threshold of 200,000 vehicles, its customers will no longer be entitled to US$7,500 in federal tax credit beginning in 2020, while other EV makers with smaller cumulative sales figures will continue receiving such credit (Gardner 2019). Notably, during the Trump administration, the company was locked in a wider political battle involving the White House, Congress, state governments, other

US automakers, and climate change lobbyists over policy commitments to emission reduction. Given the political uncertainties in its host country, Tesla has chosen to boost its sales in overseas markets. Interestingly, perhaps, we see here how regulatory inertia relating to vested interests in the United States is driving regulatory change and production patterns in authoritarian China.

Tesla's stylist entry into China, in addition to various rules imposed by Chinese state actors to promote NEVs, has disrupted the balance of power among established and new automakers in the Chinese automotive industry. The penetration of a competitive fraction of capital into the market has brought about another bigger struggle—that policymakers have to confront the changes and pressures unleashed from heightened competition in the market, which may or may not satisfy intended policy objectives. For one thing, the Tesla effect has aroused interest among Chinese car buyers in NEVs; Tesla's Model 3 was the best-selling NEV brand in China in 2020. Meanwhile, other local NEV producers have also benefited from the increased interest in NEVs overall. However, in terms of technological innovation, the outcomes vary. There is still a huge demand for rather basic, small-size, and affordable NEVs, and some automakers continue to provide these functional NEVs. One example is the SAIC-General Motors-Wuling NEV JV, which manufactures Wuling Hong Guang MINI EV, a very popular and affordable EV for city dwellers in China. It is a three-door mini car with a top speed of 62 miles per hour and is sold for just under US$5,000. Despite its relatively low level of technological inputs and the lack of high-tech features compared to Tesla's vehicles, the Wuling Hong Guang MINI EV was the highest-selling EV in China in the latter half of 2020.

While there will be continuous demand for low-cost, basic NEVs in China, intensifying competition is occurring in the premium market segment. There is heightened demand in premium cars from wealthy and middle-class consumers as more Chinese customers are looking for NEVs with more built-in technological and entertainment features. Even the more established domestic automakers are pushed to diversify and join the race in the premium market by setting up independent high-end brands. For example, Geely, a private automaker offering low-cost to medium-range vehicles, is investing in developing high-end passenger cars under the new Zeekr brand, aiming at competing with Tesla and in the premium market. While Tesla is a dominant player in the premium market segment, it encounters competition from domestic start-ups including NIO, Xpeng Motors, and Li Auto. The production of more sophisticated, higher-end EVs demands more intensive R&D and greater capital investment but in return, also gives higher margins if the products are successful. To address the increasing demand for capital, domestic premium EV startups have sought backing from a combination of domestic and finance capital. In a hyperglobalised global economy where capital flows are facilitated by the availability of various channels such as venture capital and stock markets,

potential EV startups have at least managed to raise some capital to support their development, though such competition for capital could be intense. NIO, Xpeng Motors, and Li Auto are all listed on US stock markets. They also have interests that are tied to private equity funds and Chinese internet behemoths. Tencent is a major investor in NIO; Xpeng Motors is backed by Alibaba, while Meituan and ByteDance (parent company of TikTok) have invested in Li Auto. As key players in China's premium NEV market, these domestic automakers represent a new fraction of capital which state actors have sought to defend from time to time. For example, NIO went through a number of crises in 2019. Hit by the scaling back of subsidies in China, falling share prices as a result of product recall, and new competition from Tesla, the company had to slash jobs and postpone the delivery of new vehicles. In April 2020, it received an investment of up to RMB10 billion (US$1.6 billion) from state-owned fund, Beijing E-Town Capital, mainly to support its R&D (Fang 2019). For Chinese policymakers, it is important that state policies help to nurture domestic challengers to Tesla. This explains why on one hand it slashes domestic NEV subsidies partly to eliminate less competitive automakers, while on the other hand supporting domestic capital that struggles as a result of changes in policies. Importantly, CCP policymakers have to attend to not only traditional state-owned capital but new forms of capital that is not state-owned yet is in some ways tied to important interests of the state. Competitive global capitalism, the race to develop emerging technologies, and the ongoing pressure of capital accumulation, have shaped state–capital relations in China, shifting power relationships among existing and new players in the automotive market.

Finally, the CCP's move to introduce more foreign competition into the NEV market is bound to create new pressures on ruling elites to protect less competitive yet still important interests in the industry, namely the state-owned automakers.[7] In a slowing economy with NEV sales responding negatively to rollbacks of state subsidies, most domestic NEV makers will struggle to maintain growth, and less competitive firms will be forced out of the market. Hit by the COVID-19 pandemic, NEV sales in China recorded a 32.8 percent year-on-year decline between January and August 2020 (China Association of Automobile Manufacturers 2020). However, for the ruling elites, state-owned automakers, which have been driven by state policies to mass-produce NEVs over the past decade, are too big to fail. There is evidence that the CCP will support important interests amidst changing market conditions at potentially great costs; for instance, cheap credit totalling US$145 billion was offered to the long-standing SOE FAW in October 2018 (Ren 2018). Ultimately, support for SOEs remains politically significant, as the interests of important Party members and their affiliates are strongly tied to them, not to mention the huge workforce that they employ (Thun 2006). The CCP simply cannot afford to have a traditional, long-standing state-owned automaker collapse.

Conclusion

China's efforts to create a competitive automotive industry at a time when the global industry is undergoing important transformations are driven by technological advances and environmental concerns. Institutional changes in the Chinese automotive industry—those associated with upgrading—are outcomes not simply of state activism, but of competition among existing and new players over access to the market and technology, as well as the resulting economic gains. The NEV market is a new battleground in which state-owned automakers, private domestic manufacturers, multinational automakers, and JVs compete over resources, market space, and commercial gains. Moreover, CCP state actors remain a key interest group who continue to muster efforts to upgrade the industry and accelerate the nationwide transition from ICE vehicles to electric ones. A successful transition is believed to be critical for alleviating environmental problems at home and getting a foothold in the global NEV market. Perhaps the more important takeaway from this tale of development is that those in charge of managing upgrading are susceptible to demands from multiple fronts. State actors face increasing pressure from dominant industry players over the design of market rules and regulatory measures. The CCP's decisions to delay the implementation of the ZEV mandate and eventually abandon foreign investment restrictions in the industry showed that in the age of globalised, interdependent economic relations, even the authoritarian CCP is compelled to perform juggling acts.

Importantly, institutional changes relating to constructing a NEV market are fundamentally aimed at protecting specific interests, in addition to the complex relationships between these interests and institutions, including beyond national borders. As far as the NEV market is concerned, privileges are accorded to domestic players, who are recipients of NEV subsidies, at the expense of foreign automakers, who remain subject to various import barriers and domestic content regulations, such as the required use of EV batteries produced by domestic manufacturers. However, the Tesla case shows that as both China's domestic developmental needs and the global political climate change, competitive fractions of capital are able to overcome regulatory hurdles and enter into new markets to sustain growth. Meanwhile, there is evidence that state activism in producing anticipated development outcomes is challenged. Measures that favour domestic automakers have heightened resentment from multilateral capital and foreign governments, which persistently pressure the regime to create a level playing field for all industry players. Issues around NEV subsidies, along with resistance from foreign automakers regarding ZEV targets, explain why Chinese policymakers have had to step back and address some of the demands made by multinational automakers. Tesla's entry into the China market reflects a new reality for the regime, which is responding to global pressures, as well as acknowledging that luring

innovative, multilateral capital into the Chinese market can contribute to certain development outcomes in terms of industrial upgrading, job creation, and meeting national targets.

Notes

1. Investment restrictions on the auto components sector were gradually lifted in 1993 as the Chinese government wanted to attract more foreign investment and technology to the industry by allowing foreign companies to set up majority-owned enterprises in China.
2. Under the WTO agreement, Chinese tariffs on imported vehicles were to be lowered from 100 percent to 25 percent by 2006, and tariffs on auto components from an average of 24 percent to 10 percent by 2006.
3. Due to the rapid increase in demand, there is now a long waiting time to obtain a NEV plate in tier-one Chinese cities. In the case of Beijing, there is an average wait of three to five years.
4. A new requirement was added to NEV subsidies effective from July 2020. To be eligible for NEV subsidies, vehicles have to be priced below RMB300,000 (US$48,000).
5. The four banks are China Construction Bank, Industrial and Commercial Bank of China, Agricultural Bank of China, and Shanghai Pudong Development Bank.
6. In May 2020, Tesla announced reducing the price of its China-made Model 3 to RMB291,800 (US$46,688). This is to make the Model 3 eligible for the central government's NEV subsidies. With a subsidy, the Model 3 is competitively priced at RMB271,550 (US$43,448).
7. Chang (2011) and Fuller (2016) explain why SOEs or state-favoured domestic companies in the automotive and IT sectors, respectively, lack innovation capacity and are less successful in achieving technological upgrading.

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6 Interests, Social Needs, and Competition

China's Struggle to Pursue Drug Innovation

Introduction

In July 2018, the screening of the Chinese film *Dying to Survive* provoked a huge public outcry. The film depicts how cancer patients in China, deprived of affordable life-saving drugs, resort to smuggling cheaper alternatives to survive. On various social media platforms, Chinese citizens expressed their resentment over the high cost of drugs for the treatment of chronic diseases and the inability of the government to offer adequate, affordable healthcare services. In an attempt to appease the public, Premier Li Keqiang committed to undertaking measures that would shorten the drug circulation process, from production to consumption, in addition to speeding up the reduction of drug prices. Around the same time that *Dying to Survive* was released, the country's second-largest vaccine manufacturer was found to have falsified data and distributed substandard vaccines for children. As a result, hundreds of angry protesters gathered outside a government building in Beijing, demanding justice and decisive government action against corporate wrongdoing and the lack of industry oversight (Meixler 2018). These two incidents relating to pharmaceuticals reflect critical development challenges that have accompanied China's overall economic transformation. Rapid urbanisation has also created an overstretched healthcare system, in which rising medical needs have yet to be met with adequate, good-quality, and affordable provision. Widespread chronic illnesses are not just burdensome for individuals and families, often entailing significant out-of-pocket expenses, but also represent a financial strain for the Chinese state, further aggravating the effects of China's declining labour force and undermining economic sustainability.

This chapter examines important changes shaping developments related to industrial upgrading in China's pharmaceutical industry.[1] Conditioned by the developmental challenge of meeting the increasing medical needs of the population, recent reforms in the sector have centred around remapping market entry rules for specific advanced medicines, increasing state resources in promoting indigenous drug development, and tightening oversight and regulation of the industry to improve overall quality. Central to

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the industry's evolution is the employment of top-down, state-led industrial policies and regulatory tools to create new market rules, pick winners, and address social needs in order to meet developmental objectives. Driving these interventionist measures are bottom-up pressures stemming from mounting demands for the provision of medical services within society, as well as external contingent forces resulting from advances in medical research and therapies. Meanwhile, the formulation of new policies continues to be contested by important fractions of capital under hyperglobalisation, particularly leading global pharmaceutical companies and, to some extent, rising industry contenders within China.

The chapter first examines new developments in the global pharmaceutical sector which is seeing an intense race for new, improved biologics to treat more complex diseases, implying that the growth of health-related biotechnology has become a vital area for late-developing countries to pursue. However, the higher and more profitable end of the global pharmaceutical market involves higher entry barriers which late-developing countries and firms have to overcome, as illustrated by two Chinese-made biologics. The discussion then turns to a number of government-led initiatives since 2013 aimed at constructing a modern pharmaceutical industry through industrial policies and regulatory intervention, and the external and internal forces behind these policies. It describes efforts by Chinese pharmaceutical companies to compete in the more advanced biological drug market, in addition to the opportunities and structural constraints faced by late-developing countries and their firms as they attempt to move up GVCs. The chapter concludes that state actors have worked with specific capitalist interests in an attempt to deliver development outcomes, through processes which involve both conflict and collaboration among different interests. In addition, structural constraints specific to the pharmaceutical industry have impaired the upgrading efforts of certain domestic Chinese firms, resulting in uneven innovation outcomes.

New battlefield for capital accumulation

China's emergence as a manufacturing powerhouse has altered global supply chains for medicines. Traditionally, global pharmaceutical companies maintained their own supply chains, from R&D and manufacturing to the marketing of drugs, within their host countries. Over the past few decades, as global drug manufacturers strive to maintain cost competitiveness, there has been a shift: instead of producing active pharmaceutical ingredients (APIs)[2] themselves, these are increasingly sourced from large API manufacturers, most of which are located in Asia. In China, state financial incentives, relatively low production costs, and less stringent regulatory standards make the bulk production of APIs and less sophisticated medicines cost-competitive. Today, China is the world's largest supplier of APIs, with the manufacturing and processing of these ingredients becoming

a fast-growing subsector of the Chinese pharmaceutical industry. In 2019, the subsector generated around US$61 billion in total revenue (including domestic and export sales), a 19 percent jump from 2013 (Statista 2022). Many life-saving drugs include Chinese-made APIs, although the final pharmaceutical products are manufactured by non-Chinese companies. In addition to APIs, China is also the world's largest producer of common medicines, including antibiotics, antidepressants, and birth control pills, serving growing domestic and overseas markets.[3]

As mass producers of APIs and common medicines, most Chinese pharmaceutical companies remain at the lower end of global pharmaceutical value chains. Like their automobile equivalents, global pharmaceutical value chains are producer-driven. They are led by innovative transnational pharmaceutical companies concentrated in the United States, France, Germany, Switzerland, and Japan. These lead firms control the research into and development of new drugs (including the different phases of clinical trials) and own valuable patents, allowing them to license technologies to others, and earn profits from their patented products throughout an exclusivity period. In this hierarchical GVC (Gereffi, Humphrey, and Sturgeon 2005), production is vertically integrated; suppliers to lead firms are excluded from sharing vital technology and knowledge. Nowadays, leading and innovative drug manufacturers compete in developing and manufacturing advanced medicines, particularly those made from living cells. Although biologics are not new to humans,[4] the recent discovery and application of more sophisticated biologics, in the form of monoclonal antibodies, to treat a broadening spectrum of chronic and complex diseases (including autoimmune illnesses and cancer) has been revolutionary for medical history. It has also sparked off a global race for new and improved biologics with higher therapeutic effectiveness and fewer undesirable side effects.

Currently, the top biological drugs are used to treat oncological complications, while others are being increasingly applied to treat medical conditions that until now have largely been treated by chemical drugs. Due to their more benign and less toxic nature, biologics are also being considered as supplements, or even replacements, for other existing therapies such as chemotherapy. New biological drugs are used on patients who react poorly to first-line conventional drugs treatment, or are applied as biological therapies alongside chemotherapy and other treatments to produce more effective results. Driven by rising demand and the high commercial value of biologics, many global biopharmaceutical firms are now diverting resources away from conventional drugs to new biologics. Similarly, the global market has seen a shift in pharmaceutical sales from conventional chemical drugs to biologics. Global sales of biologics amounted to US$253 billion in 2020 (The Business Research Company 2021a), representing 21 percent of the global pharmaceutical market (The Business Research Company 2021b). In 2019, seven out of the ten best-selling blockbuster drugs in the world were biologics produced by a few leading global companies

from the United States, Switzerland, and Japan (Table 6.1).[5] Leveraging global financialisation, some global pharmaceutical companies raise capital through stock markets to fund their R&D projects on biologics. Others pursue M&As to broaden their product portfolios and consolidate their monopoly in particular medical treatment areas. For example, the acquisition of Celgene by Bristol-Myers Squibb, which became the industry's largest M&A deal of 2019, is expected to strengthen and consolidate the latter's competitive edge in developing biologics for oncology, immunology, and cardiovascular diseases (Rees 2020).

Table 6.1 Top blockbuster drugs by sales volume, 2019

Ranking	*Drug name*	*Sales (US$ billion)*	*Manufacturer (country of origin)*	*Treatment*
1	Humira (biologic)	19.6	AbbVie (US)	Immune disorders such as psoriasis and rheumatoid arthritis
2	Keytruda (biologic)	11.1	Merck & Co. (US)	Lung cancer
3	Revlimid	9.4	Bristol-Myers Squibb (US) Celgene (US)	Multiple myeloma
4	Imbruvica	8.1	AbbVie (US)	Cancers such as mantle cell lymphoma, chronic lymphocytic leukaemia
5	Opdivo (biologic)	8.0	Bristol Myers Squibb (US) Ono Pharmaceutical (Japan)	Various cancers
6	Eliquis	7.9	Bristol-Myers Squibb (US) Pfizer (US)	Prevention of blood clots and stroke
7	Eylea (biologic)	7.5	Regeneron (US)	Vision impairments such as wet macular degeneration
8	Enbrel (biologic)	7.2	Amgen (US) Pfizer (US) Takeda (Japan)	Immune disorders such as rheumatoid arthritis
9	Avastin (biologic)	7.1	Roche (Switzerland)	Various cancers
10	Rituxan (biologic)	6.5	Roche (Switzerland)	Autoimmune diseases

Source: Yip (2020)

However, not every drug manufacturer has the capacity to make novel biological drugs, given that their production requires well-established core technologies and high-end know-how in both basic and clinical research. Due to the high entry barriers, the making of novel biological drugs has, so far, been the exclusive domain of large global biopharmaceutical companies, which partner with or acquire smaller and innovative biotech firms with valuable novel products. Scientific and technological know-how, IP protection, and high levels of capital investment are key requirements for successful biomedicines. They are also the major barriers that discriminate against less innovative and less resourceful players in the industry. Moreover, the production of approved novel biological drugs involves complex procedures that must be carried out under the laboratory conditions found in specially constructed and approved facilities accredited with Good Manufacturing Practices (GMP). As any slight change in the manufacturing process will alter the nature of the biologic, it is critical to keep laboratory conditions and manufacturing procedures highly consistent throughout to ensure the consistency, quality, and purity of the product (Biotechnology Innovation Organisation 2018). In sum, biological drugs involve a long development cycle, massive investment, and high failure rates. Yet, once approved and successfully commercialised, biological drugs attract high returns from being sold at premium prices, in part to compensate for the onerous costs and huge investments committed throughout lengthy research and clinical trial phases. Novel biological drugs also enjoy lengthy patent protections, ranging from 10 to 20 years depending on the jurisdiction; this helps biopharmaceutical companies maximise revenue from their drugs while rival products are blocked from entering the market.

To reap significant gains from the global pharmaceutical sector, China needs to overcome the high entry barriers and develop the capability to make indigenous drugs that can compete in the high-value segment of the global market. Without this, the country will remain dependent on importing high-value medicines, and will miss out on a potentially important export market. This is one of the drivers behind successive CCP strategies to strengthen China's biotechnology sector, in particular its capacity in biomedicine. Stimulating innovation in biomedicine has become one of the government's key development strategies since the release of the 11th FYP (2006–2010). The biotechnology industry was also named as one of the seven national SEIs to benefit from the state's fiscal and financial support in the 12th FYP (2011–2015). Given China's relatively low capacities in basic research, key policy foci for the sector, as spelled out in both the 12th FYP (2011–2015) and 13th FYP (2016–2020), include nurturing domestic scientific talent and attracting international experts, promoting R&D collaboration between local and international firms, and supporting foreign investments in high-end pharmaceutical products.

Preferential treatment given to both domestic and foreign innovation-linked capital is featured in a more specific industrial blueprint known

as the Bio-industry Development Plan, which was issued in 2013. In this plan, the State Council emphasised the need to strengthen technical cooperation on key R&D projects, inward and outward FDI, and R&D outsourcing in biotechnology. Institutional reforms were anticipated to shake up the industry such that smaller drug makers who had so far survived on producing off-patent and copied drugs would give way to more innovative, larger-scale domestic manufacturers. The new regulatory policies would also focus on boosting upstream drug exploration and tightening downstream drug distribution. Ultimately, the overall objectives of the Bio-industry Development Plan were to enhance innovative capacity within the industry, advance the commercialisation of pharmaceuticals, and upgrade the manufacturing of medical devices.[6] Table 6.2 gives an overview of key government policies since 2005. More recently, biotechnology and medical equipment were identified in MIC2025 as one of the 10 priority sectors to benefit from additional state support and policy incentives (see Chapter 3). The policies resulting from these objectives grant state-favoured biotech and pharmaceutical enterprises special access to funding, along with privileged access to global pharmaceutical players to facilitate the forging of international partnerships in the form

Table 6.2 Key government policies to strengthen the Chinese pharmaceutical industry, 2005–2016

Year	*Policy content*
2005	**11th FYP (2006–2010)**
	- Biotechnology identified as one of the SEIs
	- Promote the development of biotechnology with an emphasis on drug innovation
	- Promote domestic pharmaceutical firms as internationally competitive enterprises
2007	- Tighten the drug registration review process to focus on upgrading drug appraisal and approval standards
2009	**Guidelines on Deepening the Reform of the Healthcare System**
	- Expand Basic Medical Insurance to cover 90 percent of the population by 2011
	- Revise the list of essential drugs under the Basic Medical Insurance scheme
2009	- State Council announces the introduction of universal and comprehensive healthcare by 2020
2010	**12th FYP (2011–2015)**
	- Build an innovative healthcare sector, encourage partnerships between local and international firms, and promote traditional Chinese medicine
	- New initiatives to support foreign investments in high-end pharmaceutical products
	- Establish globally competitive Chinese pharmaceutical companies
	- Identify R&D of therapeutic monoclonal antibodies as a key technology programme
	- Cut drug prices, reduce hospital reliance on drug revenues, and support the growth of local pharmaceutical companies

(Continued)

Table 6.2 Key government policies to strengthen the Chinese pharmaceutical industry, 2005–2016 *(Continued)*

Year	*Policy content*
2012	**Pharmaceutical Industry Development Plan** - Enhance international competitiveness through export and international ventures - New initiative inviting private investors to own up to 20 percent of China's hospitals
2013	**Bio-industry Development Plan** - Fund and facilitate biotech R&D - Establish biotech R&D centres and laboratories - Foster international collaborations between domestic biotech companies and leading biopharmaceutical firms
2015	**Technical Guideline for Development and Evaluation of Biosimilars (Interim)** - Set out criteria for the definition of a biosimilar in China, its approval process, and clinical data requirements
2015	**13th FYP (2016–2020)** - Encourage more private participation in the healthcare industry - Prioritise the development of indigenous medicines, in particular those for unmet medical needs
2016	**Guiding Opinions for Promoting Healthy Development of the Pharmaceutical Industry** - Improve drug innovation capability - Improve supply of drug products which are in shortage - Produce generics for at least 90 percent of drugs whose patents have expired - Optimise industry scale through M&As, coordinate regional development, and consolidate pharmaceutical companies at specialised industry parks

Source: State Council of the PRC; World Health Organization (2017); compiled by author

of R&D collaborations and joint investments. It is anticipated that these exchanges, largely facilitated by state-led mechanisms, will enhance the indigenous innovation capacity of Chinese biotech enterprises.

Domestic needs as source of institutional change

While the global pharmaceutical market is shifting towards the provision of more sophisticated biological drugs, China's institutional reforms to strengthen health-related biotechnology and improve its pharmaceutical sector are also compelled by socio-economic transformations that have generated diverse and rising medical needs within the country itself. Since China's reform and opening in the late 1970s, the increase of China's overall national wealth has been accompanied by more forceful demands from its population for better, more comprehensive medical and healthcare provisions. The legacy of the decades-long one-child policy, coupled

with improvements in living conditions and increases in life expectancy, has resulted in an ageing population. The urban lifestyles of residents in Chinese cities, as well as persistent pollution problems, have also contributed to a rapid increase in chronic diseases, including cancer, diabetes, respiratory diseases, and cardiovascular diseases. Nearly 300 million in China suffer from chronic diseases today, with half of them being under the age of 65 (People's Daily 2016). The number of cancer patients has also skyrocketed; in 2015, 4.3 million cancer cases were diagnosed, doubling the figure recorded in 2000, with more than 10,000 new cases being registered every day (Xinhua 2018). Moreover, these figures are conservative estimates, given that many people in remote rural areas have limited access to medical services and are thus less likely to be diagnosed. Among the various types of cancers, lung, gastric, liver, and breast cancers are the leading causes of death in China. In industrialised economies with greater access to the latest drugs and treatment options, more advanced therapies are often applied as first-line treatments for cancer; however, due to a shortage in the domestic supply of effective cancer therapies, China has to rely on costly imports as the main source for life-saving drugs.

Inadequate access to affordable medicines, especially those related to cancer treatment, has resulted in heightened public anger against authorities that threatens to undermine social cohesion and the CCP's legitimacy. In addition, although the domestic pharmaceutical industry is growing at a rapid pace, it is fraught with corruption and substandard products. As noted by managers of local pharmaceutical firms in China, at the local level, many drug manufacturers are under the protection of their local governments. These state-linked capitalist interests are important to local bureaucrats as they help create jobs, and contribute to local tax revenues and GDP growth figures. Despite receiving massive subsidies and financial incentives from the central and local governments in the form of tax reductions, reduced land costs, and cheap credit, certain state-owned pharmaceutical companies continue to violate industry standards by making low-cost—sometimes even substandard and counterfeit—medicines for short-term profits. Under the protection of local governments, Chinese pharmaceutical companies embroiled in scandals have, on a number of occasions, been able to avoid any consequences after inspections by local regulators. One example is Chongqing Pharmaceutical Research Institute, a major API manufacturer. During two inspections made by the Chongqing Food and Drug Administration in 2016 and 2017, the company was found to have violated drug-making standards. In 2018, anonymous employees claimed that the company fabricated production records and bribed local regulators. The Chongqing Food and Drug Administration subsequently inspected the company's facility, yet no report has been released and no further action has been taken. Although the company in question employs only around 300 staff (compared with thousands in large state-owned pharmaceutical firms), it is a subsidiary of the Shanghai

Fosun Pharmaceutical Group. Such a connection makes it an important interest for protection by state actors in both Chongqing and Shanghai (Pharmaceutical Technology 2018).

Contestation over market entry

Recent institutional reforms in the Chinese pharmaceutical industry have resulted in market rules being amended to allow for greater penetration of selected foreign medical products. Two major changes to market entry rules for foreign patented drugs are the expedition of their registration and the reduction of their sales price. The process of crafting such new regulations entails intense competition and bargaining between political elites and global capital, with the latter amassing competitive resources that give it significant leverage in certain aspects. These institutional changes also demonstrate that the meeting of China's changing domestic needs is dependent on more market openness and successful negotiation with foreign interests.

Constrained by the absence of high-end domestic drugs to treat a range of chronic diseases, the Chinese government had limited options aside from further liberalising the domestic market for targeted foreign drugs. Since 2016, in line with the 12th FYP (2011–2015), the National Medical Products Association (NMPA) (formerly known as China Food and Drug Administration, CFDA) has undertaken measures to expedite the registration and approval of new drugs from abroad. For decades, regulatory restrictions deliberately delayed the introduction of foreign drugs into China. For new drugs developed by foreign pharmaceutical companies, new trials in China could only start after trials in the originating market had reached an advanced stage with the result that, compared to the approval processes governing foreign drugs in the United States and the European Union, China's process could take up to seven years longer (Hancock and Xueqiao 2017). While these regulatory hurdles served to ensure that new foreign drugs were properly tested on Chinese patients before their Chinese approval, they were erected by ruling elites for the purpose of shielding domestic pharmaceutical companies from foreign competition, given that domestic manufacturers still trail their foreign counterparts in making certain advanced medicines.

However, the old strategy of delaying entry of foreign patented drugs is no longer tenable. The emergence of more complex new diseases, as well as rising demands for the treatment of chronic conditions, has put immense pressure on China's healthcare system. While domestic pharmaceutical companies have expanded as producers of generic drugs,[7] they lag behind significantly in their capacities to develop innovative drugs and more advanced therapies, not to mention their ability to address quality and safety concerns over their products. These limitations left policymakers with few alternatives but to revise market entry rules concerning imported drugs. New policies beginning in 2017 established the priority

review pathway, allowing foreign drugs that had been approved in home markets to be exempted from clinical trial re-runs with Chinese patients in Chinese state-run laboratories (The Economist 2018). Innovative biological drugs, which have become first-line therapies for certain diseases, as discussed above, immediately benefited from this relaxation of registration rules. Accelerated approvals apply to innovative drugs with a high demand in China. For instance, Bristol-Myers Squibb's Opdivo, which treats non-small-cell lung cancer, was the first immuno-oncology biological drug that received expedited approval in China in June 2018 (China Daily 2018). This was followed just a month later by the approval of Merck's Keytruda, which treats skin cancer (Merck 2018). Not only were the approvals of these two drugs unprecedented, but the duration of their review processes—226 days for Opdivo and 164 days for Keytruda—was extremely short compared to those for other imported medicines.

Relaxing registration restrictions applying to foreign drugs only solves part of the healthcare problem that China faces. Even with access to premium imported drugs manufactured by multinational biopharmaceutical companies, most Chinese patients are not able to afford them as they are often sold at exorbitant prices. This high price tag is usually justified by the fact that developing a new drug is costly: since a lot of drugs fail clinical tests, they have to be abandoned before they reach the market. In China, expensive drugs have been criticised for aggravating social inequalities, by limiting disadvantaged people's access to available medicines. On many occasions, these grievances have precipitated social discontent and instability, presenting legitimacy challenges to the ruling elites (Yu et al. 2010). Hence, facilitating the market entry of foreign patented drugs needs to be accompanied by a price reduction for these expensive medicines. In addition to scrapping all tariffs for imported drugs, Chinese authorities have, since 2016, been negotiating with multinational pharmaceutical companies, as well as a few domestic suppliers, to cut prices of patented drugs. The negotiation process itself underscores the need to reconcile competing political objectives and commercial interests among different parties. Global pharmaceutical companies have long eyed the huge and expanding Chinese market (as in the automotive sector discussed in the previous chapter), and have been lobbying through their governments and trade associations to demand greater market access (EU Chamber of Commerce in China 2019, 252–60). Yet, the potential of the Chinese market is compromised by weak IP protection domestically, which has allowed copycats to produce cheap generics that seriously undercut the commercial gains of global pharmaceutical companies; paradoxically, introducing their branded drugs to the Chinese market would also make them susceptible to copycats rushing in to produce generic versions. Furthermore, multinational pharmaceutical companies resist making substantial price cuts on valuable drugs as this may make exporting these drugs to China commercially unviable. On the part of the Chinese authorities, their prime objective is to introduce effective drugs

to satisfy unmet medical needs and, in so doing, to alleviate social discontent over access to medicines and healthcare in general. At the same time, ruling elites face pressures from domestic manufacturers who resist further opening of the market, and demand the continuation of existing protectionist measures to safeguard their commercial interests. As noted by a brand manager of a multinational pharmaceutical company operating in China, if the prices of imported foreign patented drugs were substantially lowered, many domestic producers would be easily outcompeted.

In the end, multinational pharmaceutical companies acquiesced to price cuts for designated patented drugs, in return for these innovative drugs being added to the National Reimbursement Drug List (NRDL). On average, the price cut amounted to over 60 percent of the original price, with cancer drugs seeing the deepest price cuts (Table 6.3). Patients prescribed with these listed drugs would be entitled to partial reimbursement through the national insurance scheme. As these approved drugs are made available to more patients, they will generate more sales volumes for drug manufacturers. These policy changes regarding imported drugs appeared to be influenced by bottom-up pressures. In October 2018, several months after *Dying to Survive* drew public attention to the plight of cancer patients, another 17 life-saving patented cancer drugs treating lung, kidney, and rectal cancers were made available at discounted prices and added to the NRDL (Zhuang 2018). Since then, further negotiations have expanded the NRDL yet again, with 70 new drugs being added to the list of drugs subject to pricing negotiations in 2019.

Global pharmaceutical companies selling their biological drugs in China, including AstraZeneca, Pfizer, and Merck, generally welcome the change in market rules that has provided the opportunity for their valuable patented drugs to reach a larger pool of Chinese patients, as noted by healthcare consultants in the industry. They also benefit from the broader healthcare reforms of the CCP, which have expanded the country's two healthcare systems to cover more citizens; almost half of the population is now covered

Table 6.3 Foreign patented drugs on national reimbursement list in China, selective

Drug name	*Manufacturer*	*Treatment*	*New retail price (US$) per unit*	*Percentage of price cut*
Tagrisso	AstraZeneca	Lung cancer	75 per tablet (80 mg)	71
Herceptin	Roche	Breast cancer	1,186 per injection	70
Farxiga	AstraZeneca	Diabetes	0.7 per tablet (10 mg)	69
Erbitux	Merck	Rectal cancer	187 per unit (100 mg/20 ml)	68
Humira	AbbVie	Immune disorders	184 per unit (40 mg/0.4 ml)	61

Source: Company press releases and media reports; compiled by author

by the more generous of the two schemes. Despite the price cuts, foreign drug makers have reported increases in revenue after their drugs were made eligible for state reimbursements (Hancock and Xueqiao 2018a). For example, although Tagrisso, a lung cancer drug made by AstraZeneca, is now offered at a discount of 71 percent, the reduction in price has been offset by high sales volumes (Roland and Rana 2018). During the patent period of a new drug (usually 10–20 years), the manufacturer's strategy is to reap as much profit as possible through high prices, high sales volumes, or both. Multinational pharmaceutical companies seeking capital accumulation in new markets regard China as a market with high potential, given the rise in patient numbers and the increased complexity of their medical needs. In addition, an expanding wealthy urban class, which can afford private insurance and is more willing to pay out-of-pocket medical expenses, provides a strong customer base for foreign patented drugs.

Nevertheless, while market entry terms have been made more favourable to selected innovative drugs of high demand in China, global pharmaceutical companies have to maintain pressure on other regulatory areas to secure their commercial interests. Given that China's IP rules and enforcement remain lax, one of the ongoing battles fought by foreign companies is the protection of their branded products against counterfeit and substandard drugs. In the pharmaceutical sector, counterfeit and substandard products can have particularly serious implications: not only do they damage the brand reputations of the original manufacturers and impede their commercial interests, but they can also impair medical treatment and pose actual risk to patients' lives. Less stringent patenting requirements in China also make it easier for domestic generic-drug producers to make less sophisticated, copied versions of the more expensive branded drugs. One interviewee, who serves as a senior executive at the Shanghai office of a global pharmaceutical company, commented that combating counterfeit cancer drugs has become increasingly challenging. With access to information available on the internet, as well as better equipment to produce packaging and labels, counterfeiters have become more skilful in making products which bear a convincing resemblance to the authentic drugs. While cheaper generic versions may benefit a certain segment of the population who cannot afford patented drugs, their market penetration inevitably undercuts the revenues of foreign drug manufacturers. For example, since the introduction of Humira to the Chinese market in 2012, the world's top-selling biological drug (by revenue) for treating immune disorders (see Table 6.1), the blockbuster drug has registered lower than expected sales, mainly attributed to its high price tag and competition from Chinese copycat drugs.

Global pharmaceutical companies work collectively to exercise pressure on Chinese policymakers to strengthen IP protections against counterfeit drugs through legislation and decisive enforcement action, particularly as more patented drugs are introduced to the market following the revisions in the terms of market entry. Some of these demands are channelled

through cross-sector industry lobby groups such as the Quality Brands Protection Committee of China Association of Enterprises with Foreign Investment (QBPC); global pharmaceutical companies make up one of the key units within the organisation, which has a membership of 187 FIEs. According to industry representatives, a number of multinational pharmaceutical companies, particularly those badly affected by domestically produced counterfeit drugs, have either employed external investigators or set up internal investigation teams to detect and report the suspected production and sale of counterfeit drugs. These global drug makers, alongside foreign companies in other sectors such as the automotive industry, have been lobbying Chinese policymakers to strengthen legislation governing IP-intensive products and their violations. Some of these efforts have resulted in incremental institutional change reflected in improvements to legislation, for example, penalties and enforcement actions that include large-scale crackdowns on counterfeit drugs.[8] Across sectors and regions, there are variations in terms of enforcement action. One explanation is that local enforcement units tend to protect important interests which have ties to local elites. However, food and drugs scandals that involve counterfeit and substandard products tend to prompt more decisive actions from relevant authorities who are concerned about social instability and political consequences. This contrasts sharply with the more lenient attitudes that enforcement agencies demonstrate towards non-life-threatening IP infringements, for instance, those involving apparel and household goods. One interviewee, who is a private investigator employed by several MNCs in China, commented: 'Enforcement units will conduct large-scale crackdowns on counterfeit consumer goods such as electronics and apparel. However, in most cases, after a couple of months in jail, these counterfeiters will be released; and the same thing will happen again'.

The battle to improve drug innovation

Given the high costs of importing foreign patented drugs, the long-term strategy of the Chinese state to fill the gaps in supplying much-needed medicines for its own people is to strengthen the innovation capacity of domestic pharmaceutical companies. Efforts by Chinese policymakers to change the regulatory environment to promote more innovation in the sector manifest yet another contested area in which competing interests strive to make the best gains for themselves. One of the challenges for Chinese policymakers is to discourage domestic enterprises from spending resources on making inferior or copycat biological drugs, even though these could bring short-term profits. By way of illustration, this section examines two Chinese biological drugs and shows how they fare with their competitors. In so doing, it demonstrates the multiple conditions, in addition to state-led regulatory measures, that are required to spur innovation and scientific breakthroughs in the sector.

The nascent biologics market in China is relatively small compared to those of the United States and Europe; however, it is growing rapidly due to rising demand. When patented biological drugs were first introduced to the international market, regulatory controls over drug quality and approval processes in China were relatively lax. This gave Chinese manufacturers the opportunity to make substandard copies of some of the world's leading, highly profitable biological drugs, broadly termed bio-generics. In fact, regulations governing the definition and approval pathways of these new drugs in China have only begun to take shape in recent years; before they came into force, domestic manufacturers had already produced copied versions of popular biologics that sell well in the domestic market and in some developing countries. An example of these successful bio-generics is Yisaipu, the Chinese copycat version of the global blockbuster drug Enbrel. After the branded biologic was first introduced in the United States in 1998, the Chinese bio-generic version hit the Chinese market in 2005, five years before Enbrel itself entered the Chinese market. Because the maker of Enbrel did not file for patents in China when the drug was first launched in the United States, copycat rivals were effectively granted a head-start in the loosely regulated Chinese market. For five years, Yisaipu ruled the domestic market without competition until Enbrel finally became available for Chinese patients as an imported drug in 2010.

The popularity of Yisaipu has been driven by strong domestic demand in an environment where foreign branded drugs are either not available or prohibitively expensive. Like Humira, Enbrel has indications for rheumatoid arthritis and psoriasis. A chronic inflammatory autoimmune disease, rheumatoid arthritis is common in China. A recent estimate suggests that there could be 200 million people in China suffering from different kinds of rheumatic diseases (Zeng and Yao 2018). As China's population grows old, the prevalence of rheumatic diseases is likely to increase. Traditionally, such diseases are treated by anti-rheumatic chemical drugs, owing to their affordable price and reasonable levels of efficacy (Wang, Mu, and Xu 2015); the introduction of new biological drugs such as Enbrel has offered an alternative therapeutic option for patients. Yisaipu, which is 40 percent cheaper than the branded Enbrel, continues to enjoy a much larger market share in China, benefiting both from having been available in the market for years prior to the entry of Enbrel, and from being included on the essential drugs list under the national insurance scheme. That being said, the Chinese-made Yisaipu remains inferior to its branded counterpart (Table 6.4), for neither its manufacturing processes nor its levels of efficacy and safety have been subject to rigorous examination.

Due to their sophistication, it is almost impossible to make exact replicas of biological drugs as they are produced under very specific laboratory conditions; at most, competitors can only produce similar products broadly known as biosimilars, given that the original manufacturer retains proprietary information on how particular living cells are produced. Yisaipu

Table 6.4 Comparisons between US-made Enbrel and Chinese-made Yisaipu

	Original branded biologic	*Chinese copycat version*
Brand name	Enbrel	Yisaipu
Marketed by	Amgen and Pfizer	Sunshine Guojian Pharma (previously Shanghai CP Guojian Pharmaceutical Co. Ltd.)
Active biologic agent	Etanercept	Etanercept
Indication	Rheumatoid arthritis, psoriasis, and ankylosing spondylitis	Rheumatoid arthritis, polyarticular juvenile idiopathic arthritis, and ankylosing spondylitis
Regulation	Approved by US FDA and EMA according to pathways governing biologics	Approval granted prior to China's new guidelines on biosimilars
Clinical trials	Phase III clinical trial to test efficacy and safety	No phase III clinical trial to test efficacy and safety
Available in US	Since 1998	Not available
Available in China	Since 2010	Since 2005

Source: Company reports, interviews; compiled by author

resembles Enbrel in that it contains the active biologic agent etanercept; however, it is not even classed as an Enbrel biosimilar by international standards, where a biosimilar is defined as a product similar to the original or reference biological drug. According to rules established by the US Food and Drug Administration (FDA) and the European Medicines Agency (EMA), a biosimilar must possess the same amino acid sequence as its reference product (Kay 2016, 1049); its quality, efficacy, and safety levels also need to be close to those of the approved reference product (US Food and Drug Administration 2018).[9] The Chinese-made Yisaipu is a bio-mimic or bio-generic at best, as it does not possess the amino acid sequence of the originator pharmaceutical company. It also varies in terms of formulation, efficacy, and safety. Lastly, even though Yisaipu copies a patented biological drug, it has not been developed, assessed, or approved according to the more stringent regulations that govern biosimilars (Kay 2016, 1049).

Characteristic of Chinese-made drugs, Yisaipu's success is restricted to the domestic and a few overseas markets including Mexico, India, and Colombia, but it faces huge obstacles to entering other major pharmaceutical markets such as the United States and Europe. Fundamentally, it encounters more stringent regulatory hurdles since it does not fulfil the requirements of a biosimilar set out by the US FDA and EMA; the drug was not subject to Phase III clinical trials to test its efficacy and safety before it was approved in China. Nor did it undergo head-to-head clinical tests with its reference product Enbrel. Finally, whether the drug is produced in GMP-certified facilities is

also in doubt. Consequently, unless Yisaipu goes through clinical retrials—which would amount to a significant commitment in resources and time—it is unlikely that the Chinese drug can extend its reach to more developed markets where drug regulation and IP enforcement are a lot more rigorous (Gray 2014).

The limits of Chinese-made biologics are also reflected in the case of Oncorine, the world's first approved oncolytic virus drug, which was developed by Chinese scientists. Oncolytic virus therapy is considered a promising potential treatment for cancer patients.[10] The development of the new drug was supported by state funding totalling US$30 million (Jia 2007). When the drug was approved in China in 2005 to treat head, neck, and oesophageal cancer (Garber 2006), it made headlines as the world's first oncolytic virus drug, hailing China's success in overtaking international efforts to develop similar medicines. Paradoxically, the hasty Chinese approval of Oncorine has hindered its success. A relatively small sample of patients was used during its clinical trials. Ultimately, international recognition and acceptance went to its US rival, T-Vec, another oncolytic virus drug with indications for treating melanoma. Although T-Vec only arrived on the international market in 2015, 10 years after Oncorine, it was approved by regulators in Europe and Australia in 2016; by contrast, Oncorine remains restricted to China only (Fukuhara, Ino, and Todo 2016).

The cases of Oncorine (an original drug) and Yisaipu (a bio-generic copy) both demonstrate the challenges that Chinese pharmaceutical firms face in improving their competitiveness and gaining international recognition for domestically developed drugs. Drug regulations concerning registration, approval, data collection, and manufacturing practices related to both patented biologics and their generic forms, all need to be tightened and brought in line with international standards. Chinese bio-generics are only good for the domestic market and other developing territories where there is a rising demand for cheap medicines; they cannot go global due to their inferior quality. Although the race to develop and sell bio-generics may help address domestic shortages of new drugs in the short run, it seriously hampers the country's prospects for moving up GVCs in the long run.

The limitations of the domestic pharmaceutical industry, coupled with pressures from the global race for advanced biological drugs, are important driving forces behind various institutional attempts by the Chinese ruling elites to create conditions that would facilitate the making of innovative and high-quality medicines. Since the 12th FYP (2011–2015), more rigorous assessment and approval procedures have been introduced to raise standards of drug safety and efficacy. In particular, the introduction of new guidelines governing biosimilars in China represents a significant step in tightening regulations and improving quality in the biological drugs market. Prior to 2015, China lacked a formalised pathway and a set of formal regulatory guidelines for biological drugs. As demonstrated in the case of Yisaipu, Chinese drug manufacturers could get around regulatory controls to come up with products that mimic branded originals. According to a healthcare expert based

in Shanghai, these copied drugs followed a less stringent registration and approval pathway that did not mandate detailed Phase III clinical trials to test their efficacy and safety. In the global pharmaceutical industry, only the original, effective, and safe drugs can draw high revenues.

One way of understanding institutional change is to analyse who gets what as a result of new policies. Take the Technical Guideline for Development and Evaluation of Biosimilars (Interim) (hereafter the Technical Guideline) as an example. Released in February 2015, the Technical Guideline was a step towards upgrading the standards of biological drugs in China. At the heart of it was the imposition of strict criteria for the definition of a biosimilar in China, its approval process, and its clinical data requirements (Wang 2015). It defined biosimilars as those drugs that are similar to reference products approved either in China or overseas, a move aimed at phasing out low-quality bio-generics that are often branded as biosimilars. While domestic biosimilar makers would benefit from such a classification, the new rules use foreign novel biologics as reference products, thus making multinational pharmaceutical companies another major group of beneficiaries of tightened regulation. Specifics in the Technical Guideline have brought the manufacturing and approval processes of biosimilars in China more closely in line with US and European standards (at least on paper). If properly implemented, these new standards will pave the way for Chinese-made biosimilars to be assessed, and possibly approved, in these markets in the future. This is an important incentive for domestic pharmaceutical enterprises to make more sophisticated biological drugs that could compete in international markets. Indeed, several Chinese biotech start-ups have leveraged the new guideline and developed domestic versions of Humira, the blockbuster biological drug that treats autoimmune diseases. Qletli, a Humira biosimilar developed by Bio-Thera Solutions, was approved by the NMPA in November 2019 (Reuters 2019). This was followed by Sulinno (another Humira biosimilar), developed by Innovent Biologics, which was approved in September 2020 (Biosimilar Development 2020). Governed by the new Technical Guideline for biosimilars, these new drugs are subject to more rigorous examinations that align with international standards. As biosimilars, Qletli and Sulinno will become serious rivals to the patented Humira and low-quality Chinese-made bio-generics in the market. In this way, the introduction of the new Technical Guideline represents an institutional means to facilitate the more competitive fraction of domestic capital, in this case Chinese biotech start-ups, to compete in the domestic and international markets.

Although a lot of regulations in China tend to be interpreted as part of the mechanism of state capitalism, whereby the state controls resources to safeguard its linked interests, regulatory reforms in the pharmaceutical sector are also driven by international pressures. In chemical drugs, where Chinese-made ingredients have made their way to overseas markets, ongoing scandals regarding fake and faulty drugs have caused international alarm. In July 2018, a Chinese-made API in a commonly used heart

medicine was recalled worldwide, affecting at least 22 countries in Europe and North America (Westcott and Xiong 2018), after it was found to have been contaminated. More international scrutiny on Chinese drugs has put pressure on the CCP to improve overall drug quality and industry standards. International scrutiny also comes in the form of multilateral agreements: as a member of the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH), China is obliged to synchronise its local regulatory practices and technical standards on pharmaceuticals with international norms.

Despite the new regulatory framework, the battle to improve drug innovation continues. To implement the tightened rules effectively, China's regulatory authorities must confront various political and commercial interests that are vested in a large number of domestic generic drug manufacturers, which not only supply important medicines to Chinese patients, but also provide local jobs. The more stringent drug-making rules have provoked resistance from subnational government officials, who see the survival of their local drug producers being threatened. According to a healthcare expert, a majority of the more than 5,000 drug manufacturing firms in China operate on a small scale with low-level manufacturing technologies; if the new regulations of industry standard are strictly implemented, around 70 percent of these smaller manufacturers, who are unable to meet higher standards, are likely to be forced out of the industry, adversely affecting local employment and manufacturing activities. The sheer volume of local drugs already circulating in the Chinese market only adds to the problem; it will take years, plus strong political will, to get substandard manufacturers and their drugs out of the industry.

New contenders under hyperglobalisation

Biomedicine is a field in which the successful development of products relies heavily on close collaboration between scientists, academia, and business enterprises. Scientists engaged in bioscience research depend on business enterprises to commercialise their research output. In this relationship, the availability of national resources, including talent and financial investments, is critical, while the regulatory environment and the international context also play important roles in facilitating and/or constraining such developments. Since designating the biotechnology industry as a priority development sector in the 11th FYP (2006–2010), the Chinese government has poured massive financial incentives into facilitating catch-up development among home-grown biotech and pharmaceutical firms. Targeted firms receiving state support enjoy reductions in taxes and land costs, as well as favourable credit from state-owned banks. In a knowledge-intensive industry, human capital is of critical importance; financial incentives have therefore also been introduced to attract scientific talent. The CCP's Thousand Talents Programme aims to lure young professionals

(both local and overseas Chinese), by means of attractive salaries and generous research grants, to start new ventures in various scientific and tech areas. Furthermore, venture capitalist funds also identify potential biotech start-ups and provide funding and opportunities for the new contenders to collaborate with leading global drug manufacturers.

A key feature in a hyperglobalised economy is the operation of a world market where cross-border trade and investment, as well as the movements of human capital, encounter few restrictions. While the state stresses the need to nurture Chinese pharmaceutical companies to become competitive multinational enterprises, this has been aided by a liberalised international environment which facilitates technology diffusion and transfers of knowledge, and provides alternative sources of funding via competitive financial markets. Given these conditions, a group of 'sea turtle' (*haigui*) companies have tapped these advantages and emerged as a new force in the pharmaceutical market in China. Unlike the majority of domestic drug manufacturers, these start-ups (mostly established within the last 10 years) are founded and run by foreign-educated and foreign-trained Chinese returnees; the term 'sea turtles' refers to foreign-educated Chinese returning home to 'lay eggs'. One notable example is Dr Michael Yu, the founder and chief executive of Chinese biotech firm Innovent Biologics. A life scientist with post-doctoral training from the University of California in San Francisco, Yu spent years in the United States working for global pharmaceutical companies before returning to China to start his own company in 2011. He was one of the scientists who developed Oncorine, the world's first approved oncolytic virus drug mentioned above. Similarly, the founders of Junshi Biosciences had years of experience in the global pharmaceutical industry before returning to China to set up the biotech start-up. The company's current CEO, Li Ning, previously served as a reviewer of oncology drugs in the US FDA, and also worked for the French pharmaceutical company Sanofi before joining the company. Foreign-trained Chinese returnees like Yu and Li bring much-needed entrepreneurialism, technical expertise, and industrial experience to their Chinese start-ups.[11] Other fast-growing home-grown biotech start-ups include Bio-Thera Solutions, BeiGene Sciences, and Shanghai Henlius Biotech; together, they have emerged as competitive players in the sector, targeting advanced biomedical fields such as cancer therapies.

For biotech start-ups to succeed, access to funding is a critical condition. This is due to the nature of the drug development process, which involves high investments throughout all stages of development—from discovery to development and commercialisation. Nowadays, the cost of developing a new drug can exceed US$2.6 billion, compared with US$179 million in the 1970s (International Federation of Pharmaceutical Manufacturers & Associations 2021, 41). In China, since the central and local governments largely control the distribution of research funding, funds may not always be allocated on the basis of merit but rather on bureaucratic connections and other relationships. In most cases, state-linked interests almost by default become

the prime beneficiaries of state support, leaving other non-state-linked enterprises to search for financial support elsewhere.[12] Nascent Chinese biotech start-ups therefore depend on the inflows of capital facilitated by global financialisation to provide the funds they need to pursue R&D. As part of its reform to promote technological innovation, the CCP has relaxed restrictions on sectors receiving venture capital. Currently, China is the second largest venture capital market in terms of deal value, just behind the United States. Sectors including internet technology, AI, and healthcare, are drawing most interest from investors. In 2018, venture capital investments in Chinese start-ups accounted for about 29.4 percent of global venture capital financing (PitchBook 2019). The Chinese biotech sector received a record US$11.7 billion in venture capital investment in 2017, with drug developers accounting for 22 percent of that total (Hancock and Xueqiao 2018b). With venture capital funding, 'sea turtle' start-ups can invest in constructing biotech laboratories that meet international standards. In addition to financial support, venture capital is an important source of management expertise and mentoring in the early stage of development of start-ups (Petr 2017). In China, venture capital funds also offer *guanxi* (personal relationships and networks) that could help potential domestic newcomers collaborate with established foreign biopharmaceutical companies in areas covering R&D, seeking overseas regulatory approval, marketing, and sales.

Chinese biotech start-ups are thus largely funded by foreign and domestic private equity and venture capital funds, whereas domestic, state-linked private equity funds generally favour established state-owned pharmaceutical companies. In fact, biotech start-ups have become beneficiaries of strong competition in global capital markets in which stock exchanges compete for listings of firms pursuing breakthroughs in frontier technologies. In 2018, as part of its broader reforms to attract potential companies to file IPOs, Hong Kong Stock Exchange (HKSE) changed its rules to allow loss-making, pre-revenue biotech firms (mostly from China) to list on its main board. These capital-friendly rules make it possible for Chinese biotech start-ups to access public funding while bypassing financial eligibility tests. The relaxation of listing rules is driven by the strong competition that HKSE faces from exchanges in mainland China and Singapore; the more liberal listing rules also allow HKSE to compete with NASDAQ which—with the advantage of having more specialist investors—has the largest number of biotech listings globally. The new rules were implemented on 30 April 2018; by 31 August 2019, 15 Chinese biotech start-ups had been listed on the HKSE main board.

Chinese 'sea turtle' companies are more innovative than many incumbent domestic state-owned drug producers. As they target novel biologics in the higher-end market segment, their commercial interests align with those of the ruling elites—namely, to improve the competitiveness of the industry and to secure a supply of domestically made advanced medicines to treat complex diseases. One area in which these new contenders are playing catch-up is the competitive, lucrative, and high-demand cancer drug market. Cancer

research is a rapidly developing field as scientists continue to search for better treatments to deal with different variants of cancer. Around the world, cancer was responsible for nearly 10 million deaths in 2020 (World Health Organization 2021); this means that one in six deaths globally was caused by cancer. For more than 100 years, scientists and medical professionals have been experimenting with better ways to fight cancers, including chemotherapy, bone marrow transplants, and hormone treatments; however, these treatments all have significant side-effects and their outcomes vary. More recently, immunology has been regarded as a leading and promising therapy for tackling cancerous cells. In particular, anti-PD-1, an antibody biologic, has been identified as being capable of activating the immune system's ability to combat tumours. The market potential for immunotherapy is therefore high, as indicated by the fact that anti-PD-1 therapy can potentially be applied to over 20 types of cancers, far more than the number that current developments have managed to cover. The global immunotherapy market is predicted to grow from US$7 billion in 2016 to US$48 billion by 2022, accounting for more than a quarter of the projected US$180 billion cancer treatment market that year (Ng 2018).

Not surprisingly, global biopharmaceutical leaders dominate the field of immunology research. Currently, four global leaders have developed an edge in immuno-oncology drugs: Merck, Bristol-Myers Squibb, Roche, and AstraZeneca. To compete in the expanding market of immuno-oncology treatments, Chinese biotech start-ups are investing in developing biological drugs that rival established, proven therapies; and there have been some notable results. In December 2018, Tuoyi, a monoclonal antibody developed by Junshi Biosciences, became the first locally developed anti-PD-1 drug to be approved by the NMPA for treating advanced or metastatic melanoma after standard therapy failure. This positions Tuoyi as a rival to Merck's blockbuster drug, Keytruda (the world's second best-selling drug by sales in 2019), in the Chinese market. Another biotech start-up, BeiGene, developed its anti-PD-1 drug, Baize'an, which was approved by NMPA in December 2019, for treating classical Hodgkin's lymphoma. One large, state-owned pharmaceutical company has also successfully developed an advanced biological drug to treat classical Hodgkin's lymphoma. Jiangsu Hengrui Medicine, which is a dominant producer of generic drugs, has shifted its focus to developing novel biological drugs. Its first novel product, AiRuiKa, was approved by NMPA in May 2019 (Mak 2019). The approvals of these home-grown monoclonal antibodies were expedited through the priority review and approval pathway of the NMPA, an institutional mechanism designed to facilitate domestic development and advanced biologics.

R&D partnerships play an important role in the development of biomedicine. The discovery and research of advanced drugs demand expertise and resources that span national borders. International collaboration is a key feature of the knowledge-intensive pharmaceutical industry, given the high financial inputs involved and the advantage of drawing together

specialised knowledge and skills of different partners. It is common, if not a prerequisite, for biotech firms and drug developers to collaborate on medical research. While building strong, competitive domestic pharmaceutical companies remains the overriding industrial upgrading objective of Chinese policymakers, the challenge is to navigate between protecting domestic interests and tapping frontier technologies in a globally interdependent, yet competitive, value chain. Traditionally, most partnerships are forged between pharmaceutical companies from more advanced countries which share similar standards for clinical tests and drug regulation. One notable recent development in China's pharmaceutical sector is the emergence of domestic–foreign private capital as a new competitive force challenging the more established state-owned players which focus on generic drugs. The emergence of 'sea turtle' biotech firms has made it possible for Chinese companies to forge alliances with global leaders in the industry. In particular, the foreign experience of Chinese returnees, and the original drugs that the start-ups target, make the 'sea turtle' companies better candidates for industrial and scientific collaboration compared to established, state-owned pharmaceutical firms. For example, Innovent Biologics developed its anti-PD-1 biological drug, Tyvyt, jointly with US biopharmaceutical firm, Eli Lilly. The collaboration, established in 2015, marked the first partnership between a Chinese enterprise and a global biopharmaceutical firm to co-develop new biologics.

Licensing agreements have become an attractive option for pharmaceutical companies hoping to collaborate on research and tap the domestic market of partnering firms. For Chinese firms playing catch-up, collaboration with global biopharmaceutical firms is one way of overcoming their own technical inferiorities. New Chinese drug developers also benefit from the experience of industry incumbents in producing and commercialising new drugs. For example, the licensing deal between Junshi Biosciences and AstraZeneca exploits the expertise of the British drug maker, which has already established a strong marketing network in China, to promote Tuoyi to hospitals and physicians outside cities in China. In the case of BeiGene's new biological drug, Baize'an, German firm Boehringer Ingelheim provides chemistry, manufacturing, and control services for the development of the new drug. With resources and expertise in production, the foreign partner also provides full contract manufacturing support, and supplies the new drug via its biotech facilities in Shanghai (PharmTech 2020). For some multinational biopharmaceutical companies, the Chinese market presents great potential, but it is also extremely difficult to navigate due to its constant changes and lack of transparency. Complex approval pathways and registration procedures often delay the launch of new drugs. Joint domestic–foreign private capital partnerships can help overcome some of these obstacles and extend capital accumulation to a market where the demand for advanced immunotherapies is rising. Table 6.5 shows domestic–foreign partnerships in developing and commercialising Chinese-made anti-PD-1 drugs.

Table 6.5 Leading Chinese biopharmaceutical companies and their anti-PD-1 drugs as of April 2020

Approval by NMPA (month/year)	*Company*	*Drugs (brand name)*	*Indication*	*International partnership*
December 2018	Innovent Biologics (Suzhou)	Tyvyt	Classical Hodgkin's lymphoma	Tyvyt is jointly developed with Eli Lilly
December 2018	Junshi Biosciences (Shanghai)	Tuoyi	Melanoma	Licensing agreement with Coherus Biosciences to market Tuoyi in North America Licensing agreement with AstraZeneca to market Tuoyi in China
May 2019	Jiangsu Hengrui Medicine (Lianyungang)	AiRuiKa	Classical Hodgkin's lymphoma	Licensing agreement with Incyte which has exclusive rights to develop and commercialise AiRuiKa worldwide, other than mainland China, Hong Kong, Macau, and Taiwan
December 2019	BeiGene (Beijing)	Baize'an	Classical Hodgkin's lymphoma	Partnership with Boehringer Ingelheim to commercialise Baize'an

Source: Company publications and media reports; compiled by author

Conclusion

This chapter has examined current research in global drug innovation and assessed the efforts and progress that China has made in shifting from a mass manufacturer of generic drugs to a pharmaceutical innovator. If it is to build a strong pharmaceutical industry capable of catering for its domestic medical needs, China cannot rely on the mass production of low-quality drugs. Rapid institutional reforms in the Chinese pharmaceutical industry in recent years have been characterised by centrally led policies intended

both to further open up the Chinese market to highly sought-after, cutting-edge foreign patented drugs and to promote domestic drug innovation. The institutionalisation of new rules and practices in the Chinese pharmaceutical industry is driven by the ongoing revolution of medical research worldwide, resulting in a changing global landscape of competition, as well as domestic conditions within China. The pressures to tackle rising domestic medical needs and associated social instability have led Chinese policymakers to acquiesce to certain demands of competitive global capital by changing market rules for imported drugs. Such rule changes include new procedures expediting the complex processes of new drug approval that are applicable to both foreign and domestic drugs—although the former accounts for the majority of such approvals. Multinational pharmaceutical companies, with ownership of essential advanced biological drugs that many Chinese patients need, have become big beneficiaries of the latest round of loosened market restrictions.

That being said, intense negotiation between state actors and competitive foreign capital persists as they contest market rules and state power. Multinational capital negotiates with CCP policymakers and Chinese regulators over the pricing of patented drugs and their listing on national insurance schemes, and demands stronger IP enforcement on the part of Chinese authorities in order to stamp out domestically produced copies of drugs that undermine revenue. It has also become evident that the broader aim of enhancing the competitiveness of China's pharmaceutical industry inevitably involves the disruptive creation of a new competitive terrain that favours particular key interests and dominant players. Chinese 'sea turtle' companies, in many cases partnering with leading global pharmaceutical companies in developing innovative biological drugs, have become a new force in the industry, benefiting from state subsidies and new drug regulations which enable them to compete in international markets. Thus, state protection of domestic industries has taken the form not only of state investments and commitment of human resources but also, importantly, of the upgrading of industry regulation to enhance the competitiveness of this segment of hybrid capital which involves R&D collaboration between domestic and foreign companies.

Nevertheless, China's breakthroughs in innovative drugs should not be overstated. So far, such advances are restricted to a few new domestic players with a unique mix of scientific research skills, industrial experience, and international opportunities. Whether China can continue to attract foreign-educated and foreign-trained returnees to contribute to its biotech and pharmaceutical sectors is contingent on the country's economic performance, living conditions, and career opportunities, as well as the international climate. US immigration policies under the previous Trump administration, and current geopolitical tensions between the United States and China, have reportedly encouraged more Chinese graduates of

US universities to return home to pursue better opportunities (Deng and Chen 2018). Like other priority sectors handpicked by the CCP, China's pharmaceutical sector is still short of expertise in basic scientific research; it is also in need of specialist researchers capable of conducting clinical trials that meet international requirements. These shortages are reflected in the need for domestic biotech firms to work with more experienced international players in developing new drugs.

Notes

1. The word 'pharmaceutical' is used throughout the chapter to describe the industry that discovers, manufactures, and distributes medicines. The word 'biopharmaceutical' denotes firms which develop and produce both conventional chemical drugs and the newer, more sophisticated biological drugs. One of the major breakthroughs in modern medicine is the development and usage of biological drugs—those that are made of living cells—to treat a wide spectrum of diseases. Nowadays, most of the multinational pharmaceutical manufacturers are biopharmaceutical companies which produce both chemical and biological drugs.
2. An active pharmaceutical ingredient is the main component of a drug that produces the desired therapeutic effects.
3. Despite the advantages to global pharmaceutical companies from the perspective of costs, China's emergence as a site for the bulk production of APIs and common medicines has raised health and political concerns. In their book, Gibson and Singh (2018) express concern over China making essential ingredients for thousands of medicines that the US military, citizens, and patients depend on. Given that 97 percent of antibiotics in the United States come from China (Huang 2019), certain sectors of American society are worried that China could use its supply of medicines as a weapon against the United States. In this sense, medicines have become an important strategic asset, and China's control of these assets is said to pose threats to US national security. A heavy global dependence on Chinese-made APIs also means that any disruption to the Chinese supply chain would have far-reaching repercussions.
4. Biologics are drugs made out of living cells. They include various types of vaccines and antibodies. Unlike conventional chemical (small-molecule) drugs, most biological drugs contain very large, complex molecules or a mixture of molecules.
5. A blockbuster drug is one that generates annual sales of at least US$1 billion.
6. The modernisation of traditional Chinese medicine is also identified as one of the target areas in the pharmaceutical industry. Traditional Chinese medicine is beyond the scope of discussion in this chapter.
7. In 2017, about 97 percent of the drugs sold by domestic Chinese manufacturers were generics (World Health Organization 2017, 1).
8. This was noted by several interviewees including a senior executive at Pfizer in China and a manager at Volkswagen in China.
9. The US FDA and EMA have stringent guidelines and approval pathways for biosimilars. High-quality biosimilars, which have gone through rigorous clinical trials and tests of safety and efficacy, and are approved after patents of the original biologic have expired, should not be confused with bio-generics mentioned above. Global biopharmaceutical companies also compete in the biosimilar market. For example, in the United States, five biosimilar equivalents to Humira, developed by Amgen, Boehringer Ingelheim, Samsung Bioepis, Novatis, and Mylan, have been approved by the US FDA.

10. Genetically engineered oncolytic viruses infect, replicate, and lyse tumour cells without harming normal ones. They also release antigens that trigger immune responses against tumours.
11. Ibata-Arens (2019) calls this 'networked technonationalism', which facilitates late developing China to strengthen innovation capacity through harnessing global diaspora networks for technology investments and entrepreneurial gains.
12. The lack of transparency of research funding allocation is also noted by Appelbaum et al. in nanotechnology (another frontier technology) development in China (Appelbaum et al. 2018, 135–6).

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Conclusion

Rethinking Institutional Change, Market-making, and China's Technological Upgrading

Introduction

> Within China it may be argued in Marxist terms that Deng's strategy of developing the productive forces will necessarily have consequences for the superstructure, including of course how China is ruled. Indeed it may be argued that the tension between the two is at the heart of many of China's domestic problems. But in its external relations too there has developed great tension between holding on to the political and organizational structures of Communist rule and the deepening interdependencies with the outside world.
>
> —*Michael Yahuda, in Deng Xiaoping: The Statesman, 1995, 146–7.*

The COVID-19 pandemic has tragically claimed millions of lives worldwide and led to tremendous economic losses. It has also exposed the strengths and weaknesses of different political-economic systems across the world, challenging the ability of governments to tackle the twin public health and economic crises and associated problems. In China, a profound contradiction emerged: the incompetence of local governments in reporting suspected cases at an early stage contributed to the spread of the virus beyond Chinese borders, yet the actions taken by the central government subsequently were successful in controlling local transmission of the disease, and the Chinese economy became one of the first in the world to recover, achieving growth in the last quarter of 2020 when many countries were struggling with the pandemic. However, this does not mean that China has won the battle against COVID. The pandemic and its handling have exposed several fundamental issues and created new pressures associated with China's development.

In relation to industrial upgrading, the disruptions to supply chains during the pandemic affected manufacturing production across Chinese industries, with the impact furthered heightened by US trade sanctions on exports of products involving US technologies. One report suggests that in 2020, in the context of its technological rivalry with the United States, the Chinese government poured RMB213.6 billion (US$34 billion) into domestic strategic

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industries (Cho 2021). The effects of such investment are yet to be seen but this in no small part reflects China's vulnerabilities in strategic sectors and the need to strengthen its self-reliance in science and technology. Meanwhile, domestic internet conglomerates—the BAT companies, as well as Meituan and Bytedance—benefited from the crisis as lockdowns and COVID restrictions shifted people's social behaviour to rely heavily on online platforms for daily necessities and entertainment. Increased wealth and influence of private internet-linked capital is a concern for the political regime. COVID, the emerging new Cold War, and the political interests of ruling elites—including the need to present a resilient China to domestic audiences—are propelling a shift in development strategies to place greater emphasis on securing supply chain autonomy, strengthening domestic capacity for core technologies, and developing deep technology (that is, those associated with advanced manufacturing such as semiconductors, robotics, and AI, rather than business innovations such as internet platforms). Alongside these new initiatives to boost domestic technological capacity is the 'common prosperity' appeal, once advocated by Deng Xiaoping but now reinvigorated by Xi Jinping. Its aim is to address worsening social inequalities and to provide a socially appealing cause to encourage the public to rally behind the Party, and more precisely, Xi's third term as the President of China. These shifts are significant as they will likely condition the power relations among different tech-linked actors, local political elites, and central Party leaders, thus impacting how China's innovation and technology policies will play out in the future.

This book has aimed to provide some tools to better understand institutional transformations associated with innovation and technological upgrading in China—for example, the drivers behind policies, and the constraints confronting industrial upgrading in late development. Drawing upon social conflict theory, I have argued that the development patterns of China's technological upgrading are characterised by two important forces: first, the struggle of state actors to leverage opportunities and overcome constraints under the condition of hyperglobalisation; and second, the ongoing efforts of transnational and domestic capital to contest institutional rules in order to safeguard their interests. This approach gives us the capacity to understand actually existing local cases of institutional formation and change, illuminating not only their general patterns but also the particular variations, both historically and across sectors, within the dynamic and hyper-competitive context of hyperglobalisation. Empirically, the book has analysed and compared innovation and technological upgrading reforms in three important, fast-growing, yet economically distinct sectors of China; the internet, automotive, and pharmaceutical industries. Each of these sectors has its specific historical, industrial, and regulatory context, and each requires different levels and combinations of financial, human, and technological inputs if successful upgrading is to be achieved. The arguments and key findings of the book are summarised below.

Domestic challenges and new tensions

China's contemporary industrial transformations are strongly associated with the need for the ruling elites to tackle multiple domestic development challenges, as the country, and the many actors within it, interact with external forces unleashed by hyperglobalisation. As Rodrik (2007) argues, for institutions to best support national development, local realities are an important consideration, since the appropriate growth policies and institutional arrangements 'are almost always context specific' (Rodrik 2007, 4). In China's case, this means making institutions work to tackle development challenges under the 'new normal' condition. Yet the various developmental issues confronting China are interwoven in such a way that policymakers face a number of contradictions and constraints when addressing them. Subject to different political and economic pressures, Chinese political elites have to rely on different resources and sometimes work expediently with 'unlikely partners' to meet multiple development objectives. In this sense, Chinese state actors at national and local levels have become part of a multitude of interests, confronting different challenges and constraints, rather than being dominant players with firm control over policies at all times. Within the Party, economists, scientists, and bureaucrats compete for resources and power to push their respective agendas. The making of innovation and technology policies such as MIC2025 is itself a contentious process. Moreover, evidence from the internet sector shows that strong political and economic imperatives underpin the Party's shift in the national strategy to embrace internet technology in development. The CCP's push for Chinese automakers to become global leaders in EVs is primarily driven by heightened domestic needs regarding public health, the environment, and energy security. Similarly, rising medical needs, along with social discontent over limited access to affordable drugs and advanced medical treatment, are major reasons for the government to change market rules to facilitate foreign drug imports and approval.

If the Chinese state is seen as adopting appropriate policies to make development work, does this suggest that the Chinese government is rational and capable enough to manage development outcomes? As explained in Chapter 3, Chinese political elites have crafted ambitious development plans and set indicators of technological progress, yet these have not yielded expected outcomes consistently due to competing interests from local governments and the self-interested behaviour of individuals and companies involved (as in the case of meeting patent targets and the allocation of research funds). International pressures also constrain Chinese political elites, explaining why the Chinese government has toned down MIC2025 in recent years. As pointed out in the Introduction, though the CCP is conventionally portrayed as authoritarian and omnipotent, there are still forces of resistance, or at least significant trade-offs, which the ruling elites are bound to confront when making decisions which favour or disadvantage certain

actors. As shown in Chapter 4, the creation and rapid growth of Chinese tech giants have been contingent on state sponsorship of a protected domestic market, advances in digital and AI technology, and the alignment of political and commercial interests between Chinese state actors and tech capital at a particular point in development. This is not to suggest that Chinese state actors have complete autonomy over the leading Chinese technology companies and absolute control over their market power; they clearly do not, despite a series of political crackdowns from the central government in 2021 targeted at domestic tech monopolies. The disruptions to the economy and the society will be enormous if the Party completely controls how these tech platforms are run. The Party still relies on innovative tech companies to make breakthroughs in emerging technologies, such as AI and robotics. Internet platforms have become an integral part in China's economy, and there will be serious resistance if these platforms are overhauled. Alibaba's Taobao villages have created numerous jobs in rural areas. Even local governments, partnering with businesses, are using online streaming platforms to promote local products to a much larger online audience. These connections and vested interests associated with the leading tech firms are conditioning policy options.

The Chinese state is better understood as battling various fault lines of instability—financial risks, social inequalities, slowing economy, and social unrest—and this is reflected in the shift in relations between the ruling elites and the fraction of capital which they once vigorously protected. Market rules governing private capital in China change, and are contested, from time to time. At some points, powerful tech capital exercises leverage over market rules but at other times, tech firms have to adapt to changing rules when certain interests of dominant political elites prevail. These changes in policies (which can be abrupt at times) are largely the result of policymakers juggling competing development goals and manoeuvring rival interests—for example, between creating internationally competitive home-grown technology companies and maintaining national financial stability, and between promoting innovative private enterprises that can take to the world stage and safeguarding the interests of the less dynamic, but still influential, state-owned enterprises.

In China, as elsewhere, policies that aim to promote sustainable development through exploiting technological advances have privileged some players over others. In China's political economy, the interests of the CCP have historically been associated with state-owned and state-linked capital. The state-dominated financial system controls which firms have access to capital to support industrialisation. In tackling development challenges in the present time, state actors have sought to align with more competitive entities—primarily private domestic firms, but also increasingly multinational ones—whose skills, technologies, and core businesses are regarded as conducive to achieving certain developmental outcomes. The case studies show that the Chinese state responds differently to market forces and capitalist interests

across sectors. Policies and rules in relation to promoting innovation are influenced by entrenched powerful interests, including those which leverage frontier technologies and their application for competitive capital accumulation. This trend is in part driven by global capitalism under hyperglobalisation, in which the successful acquisition of tech- and innovation-linked assets and capital has become crucial in defining national competitiveness.

There is also evidence that the state is happy to delegate economic freedoms to domestic, or even foreign (in the case of Tesla and multinational biopharmaceutical firms), market players when necessary. Sometimes, these market players also forge new alliances in order to strengthen innovative capacity and market power, such as the partnerships between domestic biotech start-ups and leading multinational biopharmaceutical companies in developing new biological drugs. In the internet sector (Chapter 4), the initial growth of home-grown, non-state-owned internet firms in China was a largely unintended and uncontrollable outcome of the regime's struggle to revitalise the slowing economy through digitalisation. A few leading tech firms became state-favoured enterprises, enjoying a monopolistic status which allowed them to lead high-profile R&D projects, such as those related to AI. Such favouritism tends to be time-limited, as counter pressures gradually build, for example from SOEs who see their commercial interests and political influence being undermined, and from political elites who regard the growing market power of tech companies as a threat to the social fabric and political legitimacy.

In the automotive sector (Chapter 5), privileged players under the state's plan for technological upgrading include domestic NEV manufacturers and EV battery producers (both state-owned and non-state-owned) who receive generous state subsidies on NEV production and sales. More recently, domestic NEV start-ups positioning themselves as potential challengers to Tesla have also benefited from state-backed investments, signalling a further readjustment of market power in the premium market of the industry, triggered by Tesla's entry into the Chinese market. In the pharmaceutical sector (Chapter 6), one of the centrepieces of healthcare reform in the past few years has been the expediting of new drug approvals, particularly for advanced foreign patented therapies to treat cancers and other chronic diseases. Global biopharmaceutical firms and more competitive domestic biotech firms, such as the 'sea turtle' companies established by Chinese overseas returnees, have benefited significantly from policies that facilitated R&D in original biological drugs. Accounting for differential upgrading outcomes in the electronics industry, Fuller (2016) is right to argue that in China's high-tech sector, the relationship that a firm has with the CCP not only determines its access to finance, but also affects its capacity to upgrade. Adding to this argument, the case studies in this book have demonstrated that this relationship is less contingent upon the ownership type of the firm, and more dependent on how its core business can contribute to state-defined goals within particular periods of development.

Following the points above, it is precisely the increasing wealth and economic power of non-state-owned competitive domestic capital, coupled with the demands of powerful tech- and innovation-linked multinational capital to change market entry terms, that have generated much of the political tension within each of the three studied sectors and in China's political economy as a whole. These tensions have arisen from competition and conflicts between different social forces in their pursuit of both material gains (revenue, market share, access to finance, and other resources) and non-material assets (IP, economic influence, and political legitimacy). The rise of new economic players, predominantly non-state-owned, has disrupted the balance of power and influence in their respective markets, leading to declines in the market share and economic influence of the more established state-owned behemoths, as shown in the automotive and pharmaceutical sectors. Meanwhile, the extensive scope of commercial activities undertaken by the BAT companies has encroached on the market territory and undercut the profits of established players in other sectors such as traditional banking.

In addition to new domestic contenders, multinational corporations and their governments have also been a source of increasing political and economic pressures on China's institutional rules in relation to technological upgrading. Decades of hyperglobalisation have buttressed the growth of finance capital, which large technology- and knowledge-intensive corporations exploit to reap greater profits through engaging in speculative financial activities and raising funds on international markets to support R&D. As detailed in the case studies, the innovation and production of advanced medicines are highly concentrated in a few global pharmaceutical companies; the same is true in the automotive industry, with large automakers in the United States, Europe, Japan, and more recently China in the case of EVs. Global tech conglomerates have also become some of the world's largest companies through market capitalisation. These various forms of capital have all eyed the huge potential of the Chinese market and have persistently demanded—as individual companies, as industry collectives, and through lobbying their governments—the complete abolition of market entry barriers so that they can access new markets more easily. The interests of multinational capital in gaining a bigger share of new markets in China, as well as their rivalry with domestic tech- and innovation-linked capital, are important sources of contention over policy decisions, as exhibited in the competition over cloud technology (Chapter 4), NEVs (Chapter 5), and advanced biologics (Chapter 6).

Sector-specific conditions and new constraints

China's ambitions are clear: it is striving to make breakthroughs in frontier technologies, including internet technology, AI, NEVs, and medicines, which are expected to bring significant national wealth and commercial benefits. Across the three sectors studied in this book, processes and outcomes

of upgrading are shown to be affected by sector-specific structural conditions and variable levels of technological inputs. For AI and NEVs, Chinese firms are entering the race at the nascent stage, and hence enjoy first-mover advantage. China's closed market conditions offer an institutional advantage for domestic internet technology companies as they flourish in the Chinese market without having to confront foreign rivals. Moreover, the internet sector involves innovation in business processes (e.g., the creation of online, interactive sales platforms) and requires technological inputs that are less sophisticated compared to the other two sectors. In contrast, the divide between the world's leading biopharmaceutical companies and Chinese drug manufacturers, in terms of the sophistication of their research and their production of biological drugs, remains stark. Successful upgrading to the higher market segment of the pharmaceutical sector involves developing new, innovative drugs that are eligible for patenting across key international markets, and demands the highest levels of technological, financial, and human capital inputs. It requires a strong base of scientific research capabilities and innovation capacity, in addition to massive amounts of capital investment, to support clinical trials for cutting-edge, high-value drugs. In the modern automotive industry, assembling an EV is less technologically demanding than making an internal combustion-engine vehicle; however, the competitive edge of the modern EV market lies in optimising the driving range of an EV, extending the life and power of its battery, as well as its overall design and integration of driving assistance technologies and connected devices.

The upgrading experiences and leapfrogging potential of Chinese enterprises thus vary across sectors. With the benefit of comparatively low technology inputs and a protected domestic market, Chinese tech giants have extended digitalisation across numerous fields. They have also ventured into AI-powered innovations such as autonomous driving, establishing themselves as new contenders rivalling leading foreign players. The ability to quickly adopt digitalisation and mobile technology, having skipped several stages of fixed-lined communication experienced by earlier developers, is evidence of leapfrogging in the Chinese tech industry. Similarly, the production of EVs imposes lower entry barriers for Chinese automakers; with the aid of government incentives, these domestic players have led the global production of EVs in terms of sales volumes. On the other hand, the development and production of advanced biological drugs continues to be dominated by leading biopharmaceutical companies in the United States and Europe. Apart from a limited number of new biologics developed by Chinese biotech companies and approved in China, Chinese pharmaceutical companies remain at the lower end of the global supply chain, with only a select few competing in the advanced biological drugs market. As discussed in Chapter 6, international IP rules have protected the interests of dominant global pharmaceutical companies by blocking competition to their popular drugs. In general, the sophistication and complexity of biomedicine mean

that the conditions facilitating successful technological upgrading are quite different from those in the internet and automotive sectors. Despite huge investments in new biotech firms, the development of the biotech industry in Singapore, Taiwan, and South Korea has yet to deliver results that are comparable to the achievements made in less technology-intensive sectors (Wong 2011), and the same is true of China.

While state-led plans and the availability of investments provide the blueprint and support mechanisms to build an innovative nation, the processes of nurturing creative minds and encouraging competitive firms in frontier technology are conditioned by ongoing and shifting power relationships between social forces. The outcomes of reforms in these sectors are affected by the efforts of different interests and social forces to maximise gains by leveraging emerging technologies, economic resources, and political influence. These interests have expanded significantly in number as a result of China's marketisation. They have also evolved in scope, from a small number of primarily elite state interests at the onset of reform, to multidimensional forms of power constellations, including state-linked actors, private capital (both domestic and foreign), joint domestic–foreign capital, and multinational organisations, all of which impact the national agenda and development strategies to varying degrees. The articulation of new interests and their conflicts with existing key actors have led to important twists and turns in the policy environment. For example, the strong political imperative to maintain, and even tighten, censorship of online information trumps any intention or action to open China's internet market to foreign competitors, unless the latter agree to censorship terms dictated by the political regime. Conversely, as demonstrated by the discussion of the pharmaceutical sector, rising medical needs, along with the accompanying social and political pressures exerted on political elites, have afforded multinational drug manufacturers relative success in negotiating favourable terms of entry to the advanced drug market segment in China.

Turning to the NEV market, while Tesla enjoys favourable terms of sole ownership, access to financial resources for constructing and maintaining its production facility, and (most importantly) entitlements to NEV state subsidies—all of which were previously available exclusively to domestic automakers—it represents an exception to the conditions facing most foreign automakers. Tesla's innovation, technical skills, and quality products, together with the job opportunities its facility in Shanghai will bring, proved to be powerful bargaining chips for the company. Chinese policymakers anticipate potential economic and technological spillovers to the domestic automotive industry, which, after more than a decade of centralised efforts to promote NEVs, boasts a large number of NEVs but few high-quality, internationally competitive models. The bigger political struggle involving Tesla, China, and the Trump administration also played a role. The reluctance of the Trump administration to extend US federal tax credits for green energy sales created much business uncertainty for Tesla and resulted

in declining sales, pushing it to look for more competitive terms in new markets. At a time when former President Trump was advocating an 'America first' approach, of which bringing jobs back to the United States was a central element, China's generous offers to Tesla, along with the CCP's success in courting the US automaker to create more domestic jobs in China, dealt a severe blow to the Trump administration.

Despite certain differences in institutional mechanisms and outcomes, there are discernible patterns that hold across the three industries showcased here and their interactions with the state. Recent state-led programmes that aim to strengthen the innovation and technology upgrading of Chinese enterprises have involved the creation of favourable rules for competitive tech- and knowledge-linked capital, regardless of domestic, foreign, or hybrid ownership. The ways these rules are designed to promote or discourage particular interests are significantly contingent on developmental needs at different junctures—stimulating technological innovation, boosting competitiveness in higher-end manufacturing, and addressing domestic medical needs. For instance, closer relationships have been formed between the CCP and Chinese tech-linked capital, whose commercial interests intersect with the regime's political agenda. This has resulted in privileging domestic tech capital with financial and human resources to develop the new technologies involved in building smart cities, smart cars, and surveillance systems. Similarly, in the automotive sector, although the government's strong alignment of interests with state-owned automakers remains important due to the vested interests of high-level CCP members and provincial governments in these enterprises, the CCP has gradually shifted to seeking mutual gains with selected state-favoured private domestic enterprises such as BYD and certain global automakers. New relationships have also been forged between the Chinese state and new rising stars in the pharmaceutical industry, namely the 'sea turtle' companies, that combine scientific skills, technical experience, and international collaboration opportunities in their commitment to the development of domestic industry.

Across the three sectors, hyperglobalisation offers opportunities for different degrees of leapfrogging and technological breakthroughs. At the same time, China faces new constraints that are hindering development, given the historical juncture in which its industrial transformation is taking place. In stark contrast to its state of underdevelopment in the late 1970s, China's economy in the 21st century is highly integrated with the world via global production chains and various forms of capital flows. Such interconnectedness implies that China's economic growth also depends on external economic and political actors. The reorganisation of production and the resulting dominance of global production chains suggest that a key aspect of China's technological ambitions will depend on the supply of core technologies such as advanced memory chips from other countries. Hierarchical GVCs also mean that Chinese enterprises trying to move up production and innovation ladders need to overcome structural constraints. In many GVCs,

lead firms have transformed the industrial structure across the entire GVC through their relationships with suppliers. Late developers participating in GVCs have to adapt to these changes while trying to catch up with the lead firms.

Furthermore, China's state-led, protectionist approach to spurring innovation and technological advances in various domestic industries has drawn severe criticism from multinational capital and leading advanced economies. China's high-profile technological aspirations and industrial policies, which are strongly tied to Xi Jinping's political agenda, are responsible for increased resentment in the United States and Europe over China's mercantilist approach to technological development. Issues surrounding forced technology transfers, IP infringements, and substantive CCP subsidies given to domestic enterprises have heightened tensions between China, the United States, and some other trading partners. As a result, Chinese tech firms encounter more rigorous scrutiny over their investments and purchases of core components in the United States. To protect their interests and increase their leverage over negotiation of market entry terms in China, US political elites, supported by some multinational capital, have taken measures to frustrate efforts of overseas investment and the sourcing of essential core components by Chinese tech companies. The heightened tensions also help explain recent changes in market rules by the CCP as part of its efforts to appease its critics and to defuse the antagonism that could impede the growth of China's high-tech sector. Typically, the domestic automotive and pharmaceutical markets have been further opened to foreign capitalist interests. Despite this, it is likely that certain areas in the internet sector will continue to be subject to tight scrutiny. The increased value and relevance of data as a tool of capital accumulation, combined with digital technology, provide strong motivations for state actors to protect these assets from external interference and possession; here, political interests have hindered the opening up of the domestic sector to foreign internet firms such as Facebook and Google. Chinese political elites have to manage all these pressures while continuing to foster technological development. As such, institutions and policies are connected to social forces and their associated power configurations. Instead of being independent subjects, they are socially constituted and politically driven.

Limits of institutionalist approaches

How do we understand institutional transformations in relation to technological upgrading in China in a theoretical sense? Regarding the constitution of institutions, it can be said that the construction of markets and the rules around institutions are politically driven. Attempting to understand development by treating the state and the market as two ends of a governance yardstick (as is common in dominant development policy agendas which draw upon new institutional economics) remains restrictive; the

institutionalisation of policies is much more dynamic and political than this would suggest, and is shaped by social processes and the relative power exercised by different actors and groups to achieve their goals in specific historical circumstances. Behind the narrative of modernisation and sustainable development upheld by Chinese political elites lie rigorous interactions among social forces, operating in varying modes of competition and/or collaboration, to gain market power and influence. Importantly, the institutionalisation of market rules at the local level is hardly insulated from the condition of the 'global'. Hyperglobalisation has accelerated the diffusion of neoliberal ideas, rules, and policies to late-developing economies, resulting in the extension and deepening of market forces, and the restructuring of social relations in these countries. The liberalisation of trade and investment, fought for by market proponents, continues to eliminate the barriers obstructing multinational capital in its quest for cross-border capital accumulation. All these forces demand local political elites to respond to exogenous pressures while attending to endogenous developmental needs, rendering technocratic understandings and approaches towards fostering 'market-complementing' institutions problematic. This is the big issue for development today.

In the light of these findings, this book argues that prevalent institutionalist approaches (including new institutional economics and historical institutionalism) and the developmental state and China Model literature, while not entirely unhelpful, remain inadequate for explaining institutional transformations related to innovation and industrial upgrading in China. For these institutionalist approaches, explaining development outcomes has been reduced to the creation of appropriate market institutions, the effects of path-dependent tendencies, and the establishment of a meritocratic state or bureaucracy, with little attention paid to how development patterns have been affected by political conflicts or the broader historical and political contexts beyond borders. While not uniformly culpable, these approaches have generally neglected the power relationships and politics, including those within which nation-states are immersed, that are intrinsic to institutions and their evolution. Taking the case study of the automotive sector, adherents of new institutional economics might chastise the Chinese state's subsidy-heavy approach to creating a NEV market on the grounds that market-distorting measures would only lead to greater inefficiencies and low levels of innovation in the industry. For these scholars, the scaling back of state subsidies amounts to a correction of previously misguided policies and a return to using market signals to regulate supply and demand. While such a position reflects, in part, the limitations of most domestic NEV manufacturers in China, it fails to capture and explain the domestic and international sources of tension surrounding the implementation of NEV subsidies. Tesla's entry into China is not simply a classic adoption of free-market competition principles. Rather, it entails a larger political story involving the power of global capital to relocate, as well as domestic

environmental regulatory pressures, and bilateral political and economic tensions. It further demonstrates that policies of technological upgrading can be instruments exploited by elite interests to pursue broader political objectives. Likewise, mounting social pressures over access to affordable drugs and advanced therapies within China, coupled with the profit incentives of global pharmaceutical capital, are strong forces behind changing market rules in the pharmaceutical industry that govern the import of foreign patented drugs and their listing on the national insurance scheme.

Similarly, the emphasis of historical institutionalism on path-dependent tendencies, and the preoccupation of the developmental state literature with a goal-oriented state featuring a meritocratic bureaucracy and state-capital typologies, render their respective explanations of developmental outcomes only partial when it comes to understanding contemporary China's innovation and industrial upgrading policies. The methodologically nationalistic position adopted by the Varieties of Capitalism and developmental state literatures largely ignores historically unique conditions and the effects that global political-economic developments have on the course of national development at particular junctures. It is also problematic to base development—in a methodologically nationalist sense—on a strict formula or particular 'model', as the broader political conditions to which the state must respond also need to be considered. In the case of China, the rise of domestic tech giants should be understood in the context of the ascendancy of global tech capital, which has been facilitated by financial capitalism, alongside revolutions in ICT leading to a global economy that is increasingly driven by data and intangible assets. The resulting development outcomes, namely the growth and overseas expansion of Chinese tech giants, are conditioned by the political and economic relationships that China has, primarily, with the United States, as well as with other trading partners.

Many of the limitations of dominant institutionalist approaches can be overcome by adopting a social conflict theoretical rubric, as this book does, giving precedence to the role of key social forces, as well as their conflicts and collaborations within a changing global economy, in explaining particular development processes and outcomes. These include varied interests within the state apparatus, segments of capital (including commercial actors with variable links to both state and foreign capital), international institutions, and ordinary citizens. The context in which development and institutional transformations take place is also a central consideration. China's experience of slowing growth has made the country more exposed and vulnerable to internal troubles, as well as being more intimately tied to its external environment. The course of its national development in the first two decades of the 21st century is a story of a late developer pursuing technological breakthroughs and other opportunities to overcome development constraints and political legitimacy challenges. The journey has involved political battles and economic tensions on many fronts. Driving these conflicts is the condition of hyperglobalisation, together with an expanded range of interests

and their conflicting (and sometimes complementary) relationships, which contest institutional arrangements in China and beyond. Reform strategies and measures have revealed the different approaches adopted by Chinese political elites to reconcile dilemmas between internal necessities and global demands. The contemporary Chinese state, which is often portrayed as an omnipotent hand intervening in markets for the sake of development, actually confronts multiple challenges, including social stability, political legitimacy, slowing growth, rival demands from key social actors to maximise capitalist gains, and escalating international pressures to constrain the technological progress of this late developer.

Prospects

In the 14th FYP (2021–2025), Xi Jinping outlined more state action to support China's technological self-sufficiency in order to reduce reliance on foreign technology imports. Since the onset of the trade war with the United States, and amidst what Xi Jinping described as profound changes unseen in a century (Xinhua 2020), the latest development plan stresses capacity and technological independence in deep technology and in critical sectors. Within China, there is a sense that China has missed out on previous industrial revolutions and reforms, and consequently trails behind other countries in development. The current opportunities presented by the fourth industrial revolution—one that is anticipated to extend capabilities of humans and machines and further embed cyber technology into daily lives—are therefore too precious to be missed. Some reckon that trade frictions between China and the United States could accelerate the efforts of domestic Chinese companies to research and develop core technologies (Wang 2021). Others contend that more fundamental issues, such as the nurturing of human capital, need to be addressed before important breakthroughs are likely to be made (To 2021). In terms of development, enhancing innovation and technological capacity is a logical step for China to overcome development bottlenecks and foreign sanctions. The ability to leapfrog development presents exciting possibilities for late developers like China; they can take developmental shortcuts by jumping directly to more advanced levels of industrial activity, skipping certain preceding stages of development. By pursuing technological advances, late developers will be able to compress development, and could even become leaders as a result of developing or competing in a new technology paradigm.

For years, China's ambitions to catch up with advanced economies have been accompanied by grand strategies and active state involvement. Government spending on R&D hit an all-time high at 2.4 percent of GDP in 2020 (Bloomberg 2021). From the narrative of China being a copycat to now being treated as a serious player in the field of technology, Chinese firms have come a long way in developing their technological capabilities and making certain gains in the higher segments of different industrial value chains. In

2020, China ranked 14th among 131 economies in WIPO's global innovation index, compared with its 29th place just five years earlier (WIPO 2020). Nonetheless, scholars and policy advisors have warned against overstating China's technological lead. Zhang (2018) argues that it will take time for China to maintain an overall lead in cutting-edge core technologies. Gupta and Wang (2011) contend that the huge gap between innovation inputs and outputs in China, with the former significantly exceeding the latter, implies that innovation efforts in China suffer from a low efficiency rate. Similarly, Kennedy (2017) calls China a 'fat tech dragon', since the resources being mobilised towards nurturing technological catch-up have not brought consistent, solid results in upgrading. He (2021) cautions that despite China filed the most patents in the world in 2019, surpassing the United States for the first time, most Chinese patents filed were less valuable compared to US and European ones. One fundamental element appears to be constraining innovation and technological capacity in China. With respect to successive S&T-oriented development plans, little has been mentioned about promoting more open approaches to research and scientific discovery; this has been acknowledged as a factor hindering China's ambition to become a leading global innovator (Appelbaum et al. 2018). China's authoritarian political system is said to circumvent freedom, while its 'duck-fed' education system is criticised for producing rote learners (The Economist 2010; Abrami, Kirby, and McFarlan 2014; Gupta and Wang 2016). In light of Xi Jinping's public call for Chinese scientists to be patriotic (Creemers et al. 2020), and given that scientific research continues to be guided by national and state interests, innovation and scientific breakthroughs are likely to be constrained by elite-dictated national political imperatives.

Leveraging the first-mover advantage, will China be able to lead in emerging technologies such as AI? At present, global R&D in AI is led by US and Chinese companies. Google, Microsoft, Amazon, and a handful of US research institutes remain the leading players, but the BAT companies, with state support, are catching up. China has a number of competitive start-ups which are strong in AI applications, yet the country still trails behind other rivals in areas such as AI investment, human talent, and hardware development (Fisher 2015; Ding 2018). Success is still contingent on the availability of financial resources, as well as access to talent and core technologies. For example, several Chinese AI start-ups have been affected by US sanctions on targeted Chinese tech firms, as their access to essential chips has been cut off. AI research in China could also be hampered by a shortage in domestic talent. The fact that the BAT companies have set up AI research labs in the United States is an indication of the need to draw the right kind of talent, which continues to be in short supply in China. In the area of business process innovation, the BAT companies have successfully created their own digital business ecosystems in the domestic market. In some cases, they have been praised for their innovation and ability to adapt and tailor their business models to the changing

social and economic behaviour of their users; their successful models are replicated by internet companies elsewhere, for example in southeast Asian countries. In terms of originality, however, they score less well. The initial business models of Chinese internet firms bear a striking resemblance to tech giants in the United States. Baidu is similar to Google; Alibaba is the Amazon and eBay of China. The initial form of Tencent's instant message app, WeChat, resembles WhatsApp. The leading group-buying platform in China, Pinduoduo, models its business operations on Groupon.

In sum, the business success of Chinese internet technology firms owes much to the closed market in which they operate, and their ability to contextualise their service offerings to suit local market needs. However, they now face a vastly more challenging environment. With new players entering the industry and second-generation internet technology companies vying for greater market share, the leading Chinese internet conglomerates have sought to consolidate their position through M&A deals, and to branch out into alternative fields for capital accumulation. Political pressures will continue to condition the prospects of leading Chinese internet firms, following their rapid development in a relatively relaxed regulatory environment over the past 20 years. Recent moves by the CCP to impose regulatory restrictions on leading domestic internet technology firms in China, which will affect not only the BAT companies, but also other dominant online platforms such as Meituan, Pinduoduo, and Didi, indicate that large Chinese internet firms will face increased constraints. For example, national security concerns have led to new rules, released by the Cybersecurity Administration in China in August 2021, which require any Chinese company with over one million users to pass a data security review before obtaining an approval for overseas listing (Reuters 2021). As a result, several Chinese internet technology firms have scrapped plans to list on the US market. This includes Didi which has announced de-listing from the NYSE. In addition, ByteDance, parent company of TikTok, has postponed its US listing originally scheduled for 2021 as it undertakes measures to comply with the CCP's requirements on data security. Yet it is too early to suggest that the growth of Chinese internet technology companies will be seriously hampered following the latest round of regulatory measures. Tencent, Alibaba, and Pinduoduo have answered the regime's call for a more equitable society by setting up 'common prosperity' funds to help small businesses and to contribute to rural development (Zhang 2021). Activities on deep technology led by the BAT companies will continue to be supported by the state. Again, these tech firms will continue to test and push institutional boundaries in order to protect and increase market share. The development prospects for Chinese Big Tech will be contingent upon the ability of these companies to adapt to the new governance framework of 'common prosperity'.

As for the automotive industry, NEVs in China currently represent just 5 percent of the entire market. The growth potential of the Chinese market

is anticipated to outstrip that of other major automotive markets in the world. Given its size, and the income disparity supporting different market segments, the automotive sector in China will continue to be a site of contestation for domestic and foreign automakers who are desperate to make gains in China as growth in other markets slows. Tesla, for example, expects 40 percent of its sales to come from China. On the institutional front, government policies to accelerate the adoption of NEVs (including the plan to ban sales of internal combustion-engine vehicles from 2035) have exerted pressure on foreign automakers to bring forward their plans for electrification, which involve adjusting their global production and product development strategies. In response, the race by automakers to introduce more NEV models in China has created a crowded and cutthroat market, further intensified by the abolition of investment restrictions for foreign automakers.

CCP policymakers have undertaken various measures to boost the technological capacity of domestic automakers, and this has resulted in some achievements in the higher-end market segment, particularly among the more innovative privately owned automakers. For example, Geely has just begun exporting units under its premium brand, Lynk & Co., to European markets, and Xpeng Motors and BYD have introduced their NEV models in Norway; overall, though, the number of units shipped to markets of advanced economies remains limited. Larger overseas destinations for Chinese automakers continue to be developing countries such as Ukraine, South Africa, Thailand, Indonesia, Egypt, and others. Chinese carmakers are primarily developing models that suit the domestic market. To penetrate into more diversified markets of advanced economies, they need not only more competitive models but products that meet more stringent regulatory policies in terms of safety and environmental standards. One important hurdle to overcome is IP. The resemblance to foreign cars and the adoption of foreign-owned technologies often make Chinese-made cars the subjects of IP lawsuits. While Chinese carmakers may be able to circumvent these issues at home, they will encounter pressures from foreign IP owners if they market their cars overseas.

With technological advances, autonomous driving will become a battlefield for a handful of leading automakers and their software development partners. Key players in this frontier technology include Tesla, Waymo (of Alphabet), Cruise (of General Motors), and Aurora (backed by Amazon). In China, autonomous driving is a frontier technology prioritised by the state, with state investments and support being channelled to competitive capital, including several internet companies and domestic automakers which have invested into developing the new technology with their own commercial interests in mind. Alibaba is building driverless trucks to support its e-commerce business; Baidu, partnering with state-owned BAIC Group, is taking the lead in testing its robotaxis; Tencent backs NIO in developing autonomous driving technologies in passenger cars. However, given uncertainty over the new technology, and issues

around safety and regulatory standards, doubts remain about the prospects and potential value of commercialising the new technology. This is likely to be a contested area where different segments of capital and their associated social interests will try to negotiate favourable market and regulatory rules with policymakers.

Several Chinese start-ups have also emerged in the premium market segment of electric passenger cars. Technological advances, access to international funding, and the national push of electric vehicles have given new entrants an opportunity to compete in a sector that was traditionally dominated by SOEs. Yet the growth of these new domestic entrants relies heavily on burgeoning domestic demand, which the government is battling to sustain. Meanwhile, political pressures from multinational capital, foreign governments, and the WTO to further liberalise the automotive sector in China (through abolishing unfair trading practices such as state subsidies and procurement policies) confront the CCP's top-down, massive state-investment approach to industrial upgrading. Looking ahead, it will be challenging for Chinese home-grown automakers to become the global players envisioned by Chinese leaders. As private capital ventures, NIO, Xpeng Motors, and Li Auto do not enjoy the extent of state support that is given to state-owned carmakers; they have to fund exorbitant costs in R&D and product development via other sources. Political tensions between China and the United States, the latter's demand for reciprocity in trade and investment, and the narrative of containing the technological rise of China, all limit the opportunities for private Chinese capital to tap overseas human and financial resources.

In catching up with global pharmaceutical leaders, Chinese pharmaceutical companies face different opportunities and constraints. Over the years, increased investments in human capital and R&D in China have delivered some progress. China is now among the world's leading patent filers in pharmaceuticals. In 2016, China secured 349 OECD triadic patent families (more competitive patents that are filed in the three locations, the United States, the EU, and Japan) in pharmaceuticals, putting it in third place globally (OECD 2021). While China had narrowed its gap with Japan, which secured 577 such patents, it still trailed significantly behind the United States, which successfully applied for 2,288 triadic patent families in the pharmaceutical sector in 2016 (OECD 2021). However, the progress made by China over the years should not be overlooked. In 2006, China only filed 104 triadic patent families in pharmaceuticals, behind not only the United States and Japan, but also Canada, South Korea, and a handful of European countries in global rankings (OECD 2021).

Benefiting from a more liberalised global economy that encourages cross-border flows of finance and human capital, Chinese companies have also made some advances in drug development and production. 'Sea turtle' companies enjoy special privileges from the state in terms of access to financial resources and less state scrutiny over overseas investments related, for

instance, to the establishment of R&D centres and laboratories with foreign biopharmaceutical manufacturers. These favourable conditions help spur the growth of more competitive segments of capital in the industry. A few Chinese companies have joined the race to develop biosimilars and even novel cancer drugs. Even so, it will take time for these nascent enterprises to catch up with their Western counterparts. So far, domestic biopharmaceutical firms in China are largely confined to producing 'me-too' products at lower prices, and rely on partnerships with foreign firms for much-needed expertise and basic research capabilities. In developing biologics and even biosimilars, most of the R&D is carried out via contract agreements or in collaboration with multinational corporations, while the new drugs they develop remain highly concentrated in a few areas, such as immuno-oncology, rather than having a more diversified product portfolio.

Both the specific industry context and global institutional structures continue to impose constraints on late developers trying to become competitive players in the global pharmaceutical industry. Success in securing patents is only the first step; the ability to commercialise and apply cutting-edge knowledge is equally important, and this is where Chinese pharmaceutical and biotech companies need to catch up with industry leaders. R&D, in particular, requires significant inputs of human and financial capital, as well as advanced technology. It is therefore not surprising that research into and manufacture of novel drugs to treat complex human diseases is largely the domain of developed economies, especially given the stringent demands of manufacturing processes and drug efficacy trials imposed by regulatory authorities. Besides the input-intensive nature of research, new drug development is subject to high failure rates. In the case of less sophisticated chemical drugs, on average, only one to two of every 10,000 substances synthesised in laboratories manage to pass all phases of development and obtain regulatory approvals (European Federation of Pharmaceutical Industries and Associations 2021, 6). Drug development is thus an expensive venture. The world's top pharmaceutical companies are highly concentrated in a few industrialised economies—the United States, Europe, and Japan. These transnational firms lead global medical advances, while at the same time retaining exclusive ownership of expertise and knowledge used in production, which in turn enables them to reap huge commercial benefits. Global financialisation has helped consolidate the leading positions of these industry leaders; in particular, M&As between global biopharmaceutical firms have created bigger and bigger pharma giants that dominate the research and production of cutting-edge medicines. These giant firms also raise funds on financial markets to support the exorbitant costs of R&D. Importantly, the exclusive ownership of knowledge and production by transnational pharmaceutical capital has been facilitated by the construction of global IP institutions that effectively help extend the monopolisation of knowledge (May and Sell 2006; May 2010; Pagano 2014). Both TRIPS and national IP rules in the United States and Europe protect innovative drug

manufacturers by ensuring that they enjoy a period of exclusive ownership of their new products. Multinational drug makers have also exploited various IP safeguards to extend the patent life of their best-selling drugs. For instance, AbbVie, the manufacturer of Humira (see Chapter 6), has constructed a patent thicket strategy to inhibit rival products from challenging the drug's market position after its main patents expire. Since its introduction in 2003, Humira has been protected by over 100 patents filed at different points over its lifetime (Loftus 2017).

Conclusion

For decades the CCP has adhered to the strategy of managing markets and supporting domestic strategic sectors with massive investment in the hope of achieving technological breakthroughs. The tactics of protecting domestic enterprises and fending off external competition, in the context of an internationally liberalised global economy, have indeed helped narrow the technology gap between China and other advanced industrialised countries. However, in a hyperglobalised economy where demands for reciprocal market openness are growing, it is increasingly questionable whether these institutional arrangements, successful in the past, will remain tenable in the future. China today confronts a more complex, and sometimes more hostile, external environment, prompting its ruling elites to reorient existing institutions in order to balance competing interests that are deemed vital to both growth and political legitimacy. All of this prompts reflections on the peculiarities of the context in which China pursues post-catch-up industrialisation and the capacity of the Chinese state to construct a comparative advantage in strategic sectors in the 21st century.

This book has emphasised the centrality of conflict and cooperation between class and other social forces within the dynamic and contradictory context of late capitalism, to explain the making of China's innovation and technology policies. Social forces, and the interests that they represent at particular junctures, have important impacts on development. The dynamics of hyperglobalisation helps explain the processes and outcomes of technological upgrading in contemporary China. In sum, the nature and evolution of China's development do not reflect a linear, straightforward process, but rather a series of contentious political struggles fought on multiple fronts by state actors and non-state players, individually and collectively, to pursue their goals. In many ways, institutional change in China has been an ongoing process of the state conceding, often reluctantly, greater room to private capital, with the reversal of this trend evident when powerful forces demand and weaker forces are unable to resist. In this apparent tug of war, there are many different interests pulling in different directions. Global forces are influential in shaping these battles. Successive phases of reforms in China reflect how certain capitalist interests, in many cases working closely with or through states, further advance

the neoliberal agenda of global capitalism by preaching the merits of market mechanisms, international free trade, and cross-border investment. Though these interests encounter institutional resistance from time to time, they are able to recuperate sufficiently to demand—and secure—incremental changes. Policies around innovation promotion and industrial upgrading in China are not simply about efficiency and outcomes in a narrow sense but about whose interests these institutions serve, how, and why. It is the politics associated with China's innovation and technology reforms, as well as the new patterns in power relationships that have emerged as a result of global technological advances and hyperglobalisation, that have shaped and will continue to shape China's transition to an innovation-driven economy.

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