

State-Permeated Capitalism and the Solar PV Industry in China and India

Matthew M. C Allen

Essex Business School; matthew.allen@essex.ac.uk

Maria L. Allen

Manchester Metropolitan University Business School

S. Imran Saqib

Manchester Metropolitan University Business School

Jiajia Liu

Huddersfield Business School

To be published in *New Political Economy*, <https://doi.org/10.1080/13563467.2020.1807486> .

DOI: 10.1080/13563467.2020.1807486

Abstract

Much of the existing business and management research on how ‘state capitalism’ influences industry outcomes focuses on the state as 1) the owner of companies, 2) a provider of key resources, such as financial support, to favoured companies and/or 3) a unitary actor. Whilst some of this literature highlights links between politicians and officials, on the one hand, and individual companies, on the other, it downplays how other political-economic factors, such as the relative importance of existing industries in terms of employment and links between state banks and state-owned companies impact developments within those emerging sectors that the state wishes to promote. Drawing on the ‘state-permeated model’ of capitalism, we undertake a comparative institutional analysis of the development of the solar photovoltaic (PV) industry in China and India. Both states prioritised domestic solar PV manufacturing and innovation; however, China’s industry is much stronger than India’s, reflecting, we argue, 1) the greater ability of China’s central state to co-ordinate other actors and 2) the greater importance of India’s coal industry compared to China’s. We discuss the implications of our work for policy makers and for research, highlighting the need to assess whether state-permeated capitalism is functional or dysfunctional in nuanced ways.

1. Introduction

China's and India's increasing economic importance have raised questions about how they have achieved their success. Explanations frequently focusing on the role of the state (Hsueh, 2012, 2016; Musacchio, Lazzarini, & Aguilera, 2015). This, in turn, has led to analytical models that seek to capture the role of the state in economic activity, ranging from 'the new statism' (Wood & Wright, 2015), to 'state capitalism' (Hu, Cui, & Aulakh, 2019; Musacchio et al., 2015) and 'state-permeated capitalism' (Nölke, ten Brink, Claar, & May, 2015). This work has revealed how state ownership can influence firm outcomes (Hu et al., 2019; Musacchio et al., 2015; Sun, Hu, & Hillman, 2016) and environmental outcomes (Chen & Lees, 2016). It has also highlighted the importance of resource dependencies between politicians and officials, on the one hand, and individual companies, on the other (Sun et al., 2016).

However, prominent business and management work on 'state capitalism' often 1) focuses on the performance of individual firms or the economy as a whole; 2) analyses outcomes in a single country, typically China; and 3) views the state as a coherent and unified actor (Cuervo-Cazurra, Inkpen, Musacchio, & Ramaswamy, 2014; Musacchio & Lazzarini, 2014). This downplays several key aspects of state capitalism (Brandt & Thun, 2015; Chen & Lees, 2016; Fuller, 2016; Hsueh, 2016; Hu et al., 2019; Naseemullah, 2017). First, focusing on firms rather than sectors results in an inability to assess whether the state has been able to achieve its objectives for those strategically important sectors (Musacchio et al., 2015; cf. Brandt & Thun, 2010a, 2016). Second, single-country studies cannot reveal other factors that may help to explain states' abilities to promote the growth and competitiveness of firms in certain sectors (Hu et al., 2019). Third, single-country studies downplay how economic developments in one state-capitalist country may impact upon developments in other

economies (Wallerstein, 2004). Fourth, by adopting a unitary view of ‘the state’, much of the existing business and management literature downplays how the central state’s authority varies across regions as well as sectors within the country (Brandt & Thun, 2010, 2016; Chen & Lees, 2016; Fuller, 2016; Hsueh, 2016; Hu et al., 2019). Finally, research that explores the success or failure of the state to boost sectors, especially in China (Hsueh, 2011; Brandt and Thun, 2010, 2016; Fuller 2013, 2016), often focuses on either the influence of inward foreign direct investment and technology transfer from developed economies (Fuller 2013, 2016) or cross-sectoral comparisons of policy and performance outcomes *within* one economy (Brandt and Thun, 2010, 2016).

We analyse of the relative success of the solar PV industry in two of the largest developing economies, China and India, enabling us to assess how variations in the coherence of the state and business actors, the relative speed of development and the interactions between existing and emerging sectors influence the growth and competitiveness of firms in this strategically important sector. We draw on the ‘state-permeated capitalism’ model (Nölke et al., 2015). It does not assume that the state is a unified actor with consistent and coherent goals. Instead, in common with key political-economy contributions (Fuller, 2016; Naseemullah, 2016; Sinha, 2005a; Swenson & Pontusson, 2000), it highlights the political nature of industrial strategies, drawing attention to the potentially different objectives and interests of various political authorities and business leaders. The central state in both China and India prioritised domestic manufacturing and innovation in the solar PV industry; however, China’s solar PV industry is much stronger than India’s. Drawing on a range of evidence, we argue that China’s superior record largely reflects 1) the Chinese central state’s greater (but not absolute) capacity to co-ordinate other political and social actors and 2) the greater importance of the coal industry in India compared to China.

The remainder of this paper has four sections. The following section reviews the current literature on state capitalism and justifies our choice of the state-permeated model of capitalism to underpin our research. We then discuss our research design before analysing our results. The final section concludes.

2. Literature Review

Much of the business and management literature on state capitalism builds on transaction-cost economics (Musacchio et al., 2015; Williamson, 1985), focusing on how the state in state-capitalist economies seeks to influence economic outcomes often through key companies. This results in analyses of 1) how the state can co-ordinate activities and 2) matters related to actor opportunism, the monitoring of others' behaviour, contract enforcement and asymmetric information, leading to an emphasis on state-owned and/or state-controlled firms and their governance (Musacchio & Lazzarini, 2014; Peng, Bruton, Stan, & Huang, 2016).

Consequently, assessments of the likely impact of state capitalism typically focus on individual firms (Cuervo-Cazurra et al., 2014; Li, Cui, & Lu, 2014; Peng et al., 2016); to assess the state's influence on the economy as a whole, such work often aggregates individual firms' performance. For instance, from a transaction-costs perspective, the state's dominant role in shaping economic outcomes are likely to have a detrimental effect on the financial performance of state-owned firms and, by extension, result in the less efficient allocation of resources within the economy overall (Musacchio & Lazzarini, 2014). Moreover, from a transaction-costs perspective, the state in state-capitalist systems reduces aggregate economic performance by selecting senior managers to run state-owned businesses based on managers' connections to potent officials rather than their managerial skills (Musacchio et al., 2015;

Zhou, Gao, & Zhao, 2017), potentially encouraging senior managers to behave opportunistically (Musacchio & Lazzarini, 2014; Sun et al., 2016).

Some approaches that draw exclusively or in part on transaction-cost economics as well as some political-economic approaches view the state as a unitary actor (Chen & Lees, 2016a; Musacchio & Lazzarini, 2014: 12; cf. Li et al., 2014). However, as some of the business and management literature and much political-economic and sociological work highlights, the state, especially in large emerging economies, such as China and India, is not a unified, coherent, centralised, administrative actor (Brandt & Thun, 2016; Fuller, 2016; Huang, 2008; Naseemullah, 2016; Sinha, 2005a, 2016).

Recent comparative institutional analyses focus on the role of the state in economic activity precisely because of its recent focus on emerging markets and have emphasised the state's uneven nature (Sallai & Schnyder, n.d.; Whitley & Zhang, 2016). Such work often conceives the state to be a network of national and sub-national political actors and domestic-business coalitions (Evans, 1989; Haggard, 2004; Nölke et al., 2015; Whitley & Zhang, 2016), meaning network members potentially have conflicting as well as overlapping interests. Therefore, the 'state' is partially fragmented rather than unified. Moreover, the emphasis on the range of different interests that constitute the 'state' suggests that policy making and policy implementation are likely to be complex, dynamic processes (Hu et al., 2019; Kennedy, 2005; Nölke et al., 2015: 543) and that history is likely to be important (Brandt & Thun, 2016; Naseemullah, 2016). In such a system, the activities that various state authorities carry out may, collectively, become incoherent and contradictory.

In the ‘state-permeated’ model of capitalism, the state’s ‘activity rests on a close cooperation between various state and domestic business coalitions at the national and sub-national level, which gives rise to the notion of a rather fragmented, yet dynamic, state-permeated market economy’ (Nölke et al., 2015: 543). A key idea within this model, therefore, is how closely different state and domestic-business actors work together to achieve the state’s objectives. The level of ‘fragmentation’ between different state actors (central and local), different domestic businesses in different sectors as well as between various state and business actors becomes important.

The model of ‘state-permeated capitalism’ opens up the possibility of both regional and inter-industry variation (Allen, 2013; Tagotra, 2017), requiring comparative assessments of different state-permeated capitalist economies to focus on political factors and the interplay between established economic sectors and those newer ones that the state wishes to promote. The advent of a new industry is likely to have implications for the importance and material gains of existing firms and industries. These vested interests may seek to limit the rise of the new industry, hampering the ability of (part of) the state to meet its objective. Therefore, the interactions between, and coalitions amongst, various state actors, business(es) and business representatives become important.

Some comparative institutional analyses refer to the ‘constellations of organized interests’ in developed economies as ‘dominant social blocs’, who are able to influence policies because of their cardinal economic importance and the ability to establish their interests as ‘the national interest’ (Baccaro & Pontusson, 2019: 3); this perspective on social blocs prioritises corporate interests. In developed economies where the state typically plays a less active role in firms’ activities and the economy, this is appropriate (Baccaro & Pontusson, 2016);

however, in emerging economies, the distinction between the state, public agencies and private firms can become indistinct (Sallai & Schnyder, n.d.).

Drawing on previous literature, we argue that China represents a less fragmented or more coherent form of state-permeated market economy than India does. The Chinese central state has more infrastructural power, which refers to state's capacity 'to actually penetrate civil society, and to implement logistically political decisions throughout the realm' (Mann, 1984: 189). We do not argue that China is a centralised or a unified state; merely that much research views it as less fragmented than India. For instance, the Indian state typically lacks effective mechanisms to co-ordinate activities between its various constituent parts, reflecting the contested nature of the use of state power (Naseemullah, 2016, 2017; Sinha, 2005a, 2005b, 2016). In China, by contrast, the social and party-political ties that link officials in the central government to policy makers in the regions mean that there is greater alignment of policies between the centre and periphery authorities in China compared to India. This alignment also means that regional governments can play a large role in developing firms and industry sectors to meet centrally set targets. The greater ability of regional governments in India to pursue relatively independent policies from those of the centre compared to that of Chinese provinces reflects the Chinese state's authoritarian nature compared to India's democratic one.

The use of solar PV technology to generate electricity has implications for other sources of energy, especially coal (Centre for Financial Accountability, 2018; Mundy, 2019). Solar PV modules can help to reduce pollution and carbon-dioxide emissions. To maximise its impact, solar PV should replace coal to generate electricity, as coal is the most polluting non-renewable source of energy (Greenpeace, 2019).

Both countries prioritise the solar PV sector as strategically important and have sought to promote domestic manufacturers’ competitiveness (ESMAP, 2013; Gandenberger, 2018; Prime Minister’s Office, 2019). However, China’s solar PV industry is, on a range of measures, much stronger than India’s: China has the largest production capacity in the world (Sun, Zhi, Wang, Yao, & Su, 2014), and more patents than India in solar PV energy, as Table 1 shows. Neither country had a single patent in solar PV energy registered in more than one country in 1990; however, since 2005, China has had significantly more solar-PV patent every year than India

Table 1 Patents (Number) in ‘Solar PV Energy’, China and India

	2000	2005	2010	2011	2012	2013	2014	2015	2016
China	2.17	21.05	146.64	170.68	174.60	184.82	172.37	182.00	194.67
India	0.50	5.58	37.84	37.62	18.54	24.12	18.92	12.19	18.33

Source: OECD; abstracted from https://stats.oecd.org/Index.aspx?DataSetCode=PAT_DEV#
 Note: based on family size ‘2 and greater’ (i.e. ‘claimed’ priorities), which counts only the higher-value inventions that have sought patent protection in at least two jurisdictions (national and regional application authorities, such as EPO or USPTO). The OECD uses data drawn from the Worldwide Patent Statistical Database (PATSTAT) of the European Patent Office (EPO) and its own algorithms. The data include only ‘patents of invention’, so they exclude utility models, petty patents, etc. (OECD, 2009).

In 2018, China had the world’s highest installed solar PV capacity at just over 34 per cent of the global total (or approximately 175 gigawatts (GW) out of the total 512.3 GW); India had the fifth highest share at 6.4 per cent (or c. 33 GW) (International Energy Agency, 2019). In short, China’s installed solar PV capacity is more than five times India’s. Such installations have resulted in changes to the sources to meet primary energy demand in both countries.

Primary energy consumption measures a country’s total energy demand, covering the

consumption by the energy sector itself, losses during the transformation and distribution of energy, and end-users' final consumption. Solar PV generated 1.2 per cent of China's total primary energy demand in 2018 (up from 0 per cent in 2008); in India, the figure was 0.9 per cent in 2018 (and similarly 0 per cent in 2008) (BP, 2019a, 2019b). Whilst both figures are relatively small, they illustrate, in part, how political structures have impeded a move away from coal in India compared to China, resulting in solar PV accounting for a lower increase in primary energy demand in India compared to China. Moreover, coal's share of primary energy consumption fell from 72 per cent in 2008 to 58 per cent in 2018 in China, but rose slightly in India over the same period from 54 to 56 per cent (BP, 2019a, 2019b).

3. Research Design

We focus on China and India for two reasons. First, we seek to hold certain factors, such as population, geographical location and levels of economic development, relatively constant. Second, we maximise variation on other factors, such as China's authoritarian, one-party and relatively coherent regime compared to India's democratic and relatively fragmented political system (Sallai & Schnyder, n.d.; Sinha, 2016; Witt & Redding, 2014). These latter factors reflect, in part, the countries' historical institutional legacies: China was never formally a colony and, when many other countries became part of European countries' empires, had an absolutist regime (Acemoglu & Robinson, 2012), while India had some democratic institutions at national and sub-national levels before its independence from Britain in 1947 (Lee & Paine, 2019). Whilst institutions in these countries have developed, existing institutions structure and influence that development (Thelen, 1999), often limiting change.

Drawing on a range of sources, we analyse the interactions between different parts of the state, including different state-owned enterprises, such as banks and mining companies, and

solar PV firms. We first assess Chinese and Indian central governments' policies to promote the industry. Although regional policies are important, central governments in both countries have provided the main impetus to encourage the growth of the solar PV industry (Gandenberger, 2018; Prime Minister's Office, 2019). We then examine the relative socio-economic and political importance of the coal industry, as they have relatively large domestic industries and coal is an important source of energy that supports economic activity. As noted above, moves to foster the solar PV industry are likely to have ramifications for the use of coal as a source of energy. The coal industry may, therefore, be a constituent part of one state-business coalition that stands against the expansion of the solar PV industry and its supporters. The extent of opposition from the domestic coal industry may be less if state support for domestic solar PV firms leads to higher exports rather than in-country consumption. We then examine the evidence on the links between the coal industry and state-owned banks, as such banks have often financed coal-mining activities. Any reduction in the relative importance of coal mining and its revenues will have implications for the banking sector and economy more widely.

4. Findings: A comparative analysis of policies, coal ties, and financial ties

4.1 Policies

Launched in 2014, India's 'Make in India' initiative aims to 'facilitate investment, foster innovation, enhance skill development, protect intellectual property & build best in class manufacturing infrastructure' (Prime Minister's Office, 2019), seeking to promote manufacturing in India in 25 key sectors, including renewable energy (Make in India, 2019). However, the policy is not very specific. Moreover, the focus of the programme for solar PV has changed since its launch. Initially, the programme promoted manufacturing and

investment in renewable energy in India. The policy now focuses on installing solar PV, reflecting and reinforcing the weakness of India's domestic solar PV industry.

To some extent, the lack of clarity over the degree to which the Indian government sought to promote the domestic production of, and innovation in, solar PV modules preceded the Make in India initiative. For instance, the Government of India and State Governments initiated the Jawaharlal Nehru National Solar Mission in 2010 to promote solar power in India. Its objective 'is to establish India as a global leader in solar energy, by creating the policy conditions for its *diffusion* across the country as quickly as possible. (Ministry of New and Renewable Energy, 2008; emphasis added). This aim suggests that the government's role should be to adopt policies to encourage the use of solar PV modules, which will then enable Indian firms to become 'global leader[s] in solar energy'. The initial target for grid-connected PV was 20 GW by 2022 (Ministry of New & Renewable Energy, 2012); it is now 100 GW by 2022. In 2018, as noted above, India had approximately 33 GW of installed solar PV capacity. The target relates to installed capacity only; importantly, it does not specify where those PV modules are manufactured. As the data on patents above indicate, targets for solar PV installation do not promote the development of domestic solar PV technology and/or manufacturing firms.

Recently, the central Indian government announced a plan to ensure that central public-sector organisations install 12 GW of solar PV capacity, using domestic manufacturing alone (Singh, 2019). Organisations linked to the Indian government, such as the All India Solar Industries Association, whose objectives are 'To further support MAKE IN INDIA by creating a sustainable ecosystem for the Solar industry and collectively addressing key common challenges to help India achieve its aim of achieving 100 GW of Solar Power by

2022' (All India Solar Industries Association, 2020), welcomed the initiative. However, other organisations, including Chinese firms, were sceptical of the targets being achieved, due to poor returns, low labour productivity and domestic manufacturers' out-dated solar PV technology (Singh, 2019).

In addition, in India, policy co-ordination is fragmented both along the value chain and across different regions. For instance, despite various incentives in the renewable-energy sector, responsibility for power is a 'concurrent' issue, meaning that the Indian constitution grants both the federal and state governments the ability to set and implement energy policies. Consequently, some states ignore federal targets for renewables (Gambhir, Jethmalani, Sarode, Das, & Dixit, 2016); a lack of clarity over the collective aims and policies of political authorities prevails (Lal, 2019). This lack of co-ordination helps to explain why India is unlikely to meet its federal goal of having 175 GW of installed renewable-energy capacity by 2022; in 2019 it had 64.4 GW (CRISIL, 2019).

By contrast, China's promotion of its domestic solar PV industry has been more consistent and more extensive. China's 2005 Renewable Energy Law prioritised the development of renewable energy as a 'national strategy' (Spratt, Dong, Krishna, Sagar, & Ye, 2014). Rooted in China's Five Year Plans, the targets for the solar PV industry relate to its general development and innovation (Chen & Lees, 2016; Gandenberger, 2018; Huang, Negro, Hekkert, & Bi, 2016). Importantly, the tenth Five Year Plan that ran from 2001 until 2005 was the first to 'translate' the importance of the solar PV industry into specific annual domestic production targets for solar PV cells and modules of 15 MW (Gandenberger, 2018; Huang et al., 2016). This specific target for domestic annual production was likely to have focused the attention of firms and officials on achieving it. Indeed, in 2005, domestic

production had reached 500 MW (Gandenberger, 2018). In addition, during 2000-2001, the three most important Chinese research programmes covered solar PV technology, resulting in greater R&D investment in solar PV and more patents (Huang et al., 2016). The US Patent Office granted some of the patents (Huang et al., 2016), illustrating how advanced some Chinese solar PV firms' technology is.

The central government's eleventh Five Year Plan (2006-2010) built on these developments and, compared to the previous Plan, placed greater emphasis on 1) research and development (R&D) that could boost productivity and 2) enhancing the domestic supply chain in solar PV (Ball, Reicher, Sun, & Pollock, 2017; Gandenberger, 2018). The twelfth Five Year Plan (2011-2015) focused on installing utility-scale solar PV facilities (Gandenberger, 2018).

The Chinese central state has also allocated resources to enable companies and other organisations to build on these policy initiatives and achieve their targets. For instance, the China Development Bank, which is a state-owned 'policy' bank with a remit to provide medium- to long-term funding to companies to help the state achieve its strategic economic objectives, established a 30 billion USD credit line for Chinese solar PV cell and module manufacturers between 2009 and 2010 (Huang et al., 2016). Moreover, some provincial authorities offer tax rebates to promote investment in the industry, including in manufacturing facilities (Huang et al., 2016). (See below for more on state banks' lending to solar PV firms.)

Although China's political structures sometimes enable local authorities to resist or re-shape central government priorities, they can also ensure good co-ordination between different levels of political authority (Xu, 2011; cf. Steinfeld, 1998). The central government's

emphasis on solar PV and the resources that it devoted to the sector encouraged local authorities to play an important role in developing China's domestic solar PV firms and industry (Corwin & Johnson, 2019; Xing, Liu, & Cooper, 2018). Indeed, some local authorities drew on the Chinese diaspora to establish solar PV firms, attracting Chinese technology experts working overseas back to China (Xing et al., 2018). For instance, local authorities actively and swiftly implemented national directives to ensure solar PV firms had sufficient funds; indeed, Jiangsu Province built on central-government initiatives to become a clean-energy manufacturing hub (Zhang, Andrews-Speed, & Ji, 2014). Local authorities sometimes extend central government's incentives and policies to promote local manufacturing and/or to increase tax revenues (Corwin & Johnson, 2019; Ye, Rodrigues, & Lin, 2017).

As a result of the scale and scope of China's solar PV policies as well as the relatively high levels of co-ordination of incentives to promote solar PV manufacturing, China has developed a much stronger domestic industry than India; importantly, it was able to do this relatively rapidly. China's solar PV production capacity is the highest in the world (Zhang, Andrews-Speed, Zhao, & He, 2013). China's technological achievements in solar PV, illustrated by its strength in patents (see Table 1), have helped to support the competitiveness of Chinese solar PV firms compared to Indian ones. Approximately 85 per cent of the solar PV modules in India originate from China, leading to calls to promote India's domestic industry (Pulipaka, 2019). Those areas where practitioners call for improvement, such as increased investment and R&D, greater subsidies for electricity generated from renewables and a preference for purchasing products made in India (Pulipaka, 2019), reflect in part the initial focus and weakness of the Indian government's renewable energy policy to deploy rather than manufacture these technologies.

4.2 Coal Ties

Coal India Limited (CIL), a state-owned coal mining company and the world's largest coal miner, employs over 278,000 workers directly (Press Information Bureau: Government of India Ministry of Coal, 2018). There may be close to half a million people working within the company permanently or temporarily, making it one of India's largest employers (Chandra, 2018). The central government owns other coal-mining companies in India and local governments own others, including Singareni Coal Collieries Limited (SCCL), which employs nearly 50,000 people, and Neyveli Lignite Corporation (NLC).

By providing direct employment to a large number of people, any move away from coal in India is likely to have ramifications for voters and, as a result, politicians, especially in those eastern provinces where coal deposits are located (Chandra, 2018; Kamboj & Tongia, 2018). CIL also provides social programmes, such as hospitals, housing, education and electrification, in the areas where it operates (Chandra, 2018), underpinning the interconnections between coal as a source of energy and coal as a source of social benefits in some areas. In addition, CIL pays fees and royalties to several regional states, reinforcing the importance of coal mining in these areas, which, in some provinces, represents 10 per cent of regional GDP (Chandra, 2018). Therefore, any significant reduction in coal-mining activities is likely to have important implications for direct and indirect employment, some social programmes and public finances within some provinces. The growth of the solar PV industry is unlikely to compensate for these losses, especially as the areas with the greatest amount of solar radiation are not those with the greatest coal deposits.

Coal mining in China also employs a significant number of people. However, the central government has, at certain times, limited the number of new regional coal-mining permits, restricting provincial governments' abilities to use coal mining to boost employment (Ren, Branstetter, Kovak, Armanios, & Yuan, 2019). In 2014, the central state devolved the approval process for coal mining as part of electricity-generating projects to provincial governments, resulting in a threefold increase in permits and a significant increase in investment and coal mining (Ren et al., 2019). This suggests that those Chinese provincial governments with abundant coal resources have used coal mining to boost local employment and industrial development. These investments underline the importance of conceptualising and analysing 'the state' as a fragmented entity in which some constituent parts seek to achieve goals that can be at odds with other parts of the state.

However, other developments illustrate the greater ability of the central Chinese state to coordinate solar PV policies compared to the federal Indian government. Since 2013, the dedicated State Administration of Coal Mine Safety in China has mandated closures of over 3,000 relatively small mines after safety audits. Financial incentives to local governments ensured implementation (Caldecott et al, 2017). Additionally, the central government's policy on coal has evolved from administrative mandates to include market mechanisms. For example, China has introduced a trading system for capacity replacement quotas. Under this scheme, the construction of any new mines must result in the closure of old mines and the coal they provide by a certain amount. The central government encouraged enterprises to trade in capacity replacement quotas with each other and across regions. This programme allowed the new coal mines to share the resettlement responsibilities associated with the closure of older coal mines, making up for the shortage of national funds to de-commission existing mines (Wu, 2018). Coal employment fell to 3.95 million in 2017 from 5.8 million in

2013 (CEIC Database). By contrast, employment in the solar PV industry grew to 2.5 million in 2018 (Mints, 2018), suggesting that employment in the solar PV industry and its growth are likely to be important factors for political authorities to consider.

In addition, China's State Council and its Deep Reform Leadership Group have sought to improve China's environment. For instance, the central government can hold all officials responsible for environmental damage even after they have left a particular position within the bureaucracy if the damage occurred when they were in post. This 'life-long traceability' of officials' environmental impact may make some reluctant to invest in coal, especially as the government has identified coal burning as a significant contributor to poor air quality in some parts of China (Cheng and Eikeland, 2015).

4.3 Financial Ties

The income from transporting coal, including imports, represents nearly 50 per cent of Indian Railways' total freight revenue; however, as Indian Railways charges more to transport freight and less to carry passengers, coal represents a higher share of its profits (Chandra, 2018; Indian Railways, 2018; Kamboj & Tongia, 2018). Indian Railways has over 1.3 million 'regular employees' (Indian Railways, 2018) and the central Indian government wholly owns it, meaning that any rapid and significant reduction in the use of coal to generate electricity is likely to have deleterious consequences for Indian Railways and its revenues. To counter the potential drop in revenue and profits, Indian Railways could try to increase its prices for other freight users or passengers; the latter may have political ramifications.

There are further ties between coal mining and state-owned companies in India. An analysis of funding for new electricity-generating projects in 2017 found that renewable-energy

facilities had backing from a mix of private and state-owned banks; the latter, however, were mainly involved in providing finance to coal-fired power stations (Centre for Financial Accountability, 2018). Amongst the top 10 providers of finance to electricity-generating facilities that rely on coal, the government either wholly or majority owned eight of them (Centre for Financial Accountability, 2018; see also Mundy, 2019; Shearer, Mathew-Shah, Myllyvirta, Yu, & Nace, 2018). Moreover, in some provinces, such as Chhattisgarh and Madhya Pradesh, lending to coal-fired power stations was more than three times that to renewable-energy facilities (Centre for Financial Accountability, 2018), suggesting strong ties in some locations between banks and coal-mining firms and greater resistance to renewable energy.

Liaising with the National Energy Administration (NEA), the National Development and Reform Commission (NDRC) and the Ministry of Industry and Information Technology, the China Development Bank played a key role in formulating the State Council's 2010 Decision on Cultivating and Developing Strategically Important and Emerging Industries (Barone & Spratt, 2015). Renewable energy formed one of those 'important and emerging industries'. The State Council's decision led to the creation of a special fund to promote these industries and also encouraged financial institutions to provide finance to relevant firms (Barone & Spratt, 2015). Between 2010 and 2013, the China Development Bank established credit lines worth at least USD 47.3 billion to support Chinese solar and wind companies (Sanderson & Forsythe, 2013: 149). Relatively easy access to financial capital is likely to have been beneficial for many of these companies as they operate in dynamic markets (Sanderson & Forsythe, 2013).

Some of the details of the credit lines to individual companies and a comparison to similar state funds elsewhere provides an indication of the scale of the Chinese state's role in promoting the solar PV industry. In 2010, the European Investment Bank lent EUR 8 billion for all clean-energy projects, including solar, wind and marine energy; in the same year, the China Development Bank established credit lines for specific companies: USD 9.1 billion for LDK Solar; USD 6.5 billion for Sinovel, USD 7.6 billion for Suntech Power Holdings and USD 4.6 billion for Trina Solar (Sanderson & Forsythe, 2013: 151).

Local governments have also provided financial support to some solar PV firms. When LDK Solar, which was once one of the world's largest solar PV companies, posted losses, the government of Xinyu city, where the firm was based, agreed to pay some of its debts in 2012 (Sanderson & Forsythe, 2013: 154). Indeed, local officials played a key role in securing large loans in LDK Solar's start-up phase (Gang, 2015: 97). Similarly, the local government required local state-owned banks to lend to Wuxi Suntech Power, leading to a significant increase in its finances (Gang, 2015; Spratt et al., 2014: 29). The Wuxi government also facilitated Suntech's access to publicly funded research programmes, helping the company to survive (Spratt et al., 2014).

The China Development Bank also undertakes an environment impact assessment before approving any loans and also monitors borrowers' environmental performance (Friends of the Earth US, 2016: 22). Environment impact assessments also require approval by relevant environmental authorities for borrowers in sectors, such as coal mining, that have a major impact on the environment (Friends of the Earth US, 2016). As noted above, however, provincial authorities can approve some coal-mining activities without central government's

imprimatur and some mining activities may not require borrowing from the China Development Bank.

The pressures on Chinese coal mines to improve safety and their efficiency resulted in the increased indebtedness of some state-owned coal mines, creating risks for the banks that had lent to these coal-mining firms. In 2013, following a drop in the price of coal, the coal industry in Shanxi incurred losses. In order to reduce the risk of these mines defaulting on their loans and the wider societal and financial consequences that this might have, the Shanxi government provided financial assistance to state-owned coal-mining firms (Bridle, Kitson, Duan, Sanchez, & Merrill, 2017).

5. Discussion and Conclusion

Existing business and management analyses of how the state influences economic outcomes in capitalist systems where the state seeks to achieve specific objectives tend to focus on either individual firms or the economy in general. This downplays the aim of such states, which is often to foster the growth of particular sectors. This has implications for specific firms within those sectors. It also, however, means, as key political-economic and sociological contributions have done, that assessments must focus on whether or not the state has achieved its objectives in those selected sectors, necessitating evaluations that go beyond individual firms to assess the development of those favoured sectors within the economy holistically.

Drawing on the state-permeated model of capitalism, we demonstrate how the nature of the state in China and India varies, facilitating the Chinese central state's efforts to promote domestic innovation and production, but hindering the Indian central state's attempts to do

the same. Our analysis contributes to the literature on the role of the state in contemporary economies (Musacchio et al., 2015; Sun et al., 2016; Wood & Wright, 2015; Zhang & Whitley, 2013). We underline the importance of adopting a sector-specific, yet holistic view of developments: prioritised sectors do not operate in isolation from existing sectors and their associated actors, such as state-owned banks and other firms.

Our work highlights the need to adopt a context-rich perspective, requiring an awareness of the positions of existing dominant state-business coalitions, their resources and the extent to which they are likely to perceive the emergence of a new sector and its interests as a threat to their existence. The nature of the state – the degree to which it is coherent or fragmented as well as how authoritarian or democratic it is – have important implications for the central state’s capacity to achieve desired objectives. In addition, our research emphasises the importance of the temporal variation of the composition of coalitions, reflecting shifts in the relative economic importance of different sectors and their associated actors.

Our findings indicate that assessments of states’ abilities to influence sectoral developments do not just depend on what happens domestically. Existing models of state capitalism tend to view states’ activities within their economies largely in isolation from developments in other economies, as if states and their economies were hermetically sealed (Crouch, 2005) and ignoring the internationalisation of some product, capital and labour markets (Allen, 2013). In other words, would strong solar PV manufacturing and innovation capabilities in China and India be ‘compossible’ with one another: are both possible at the same time? The existing business and management literature largely neglects this question. Our research shows that China emphasised solar PV manufacturing both earlier and more extensively than the Indian state did, making it harder for India firms to catch-up in an industry in which economies of

scale are important. What happens in one state can have important implications for other states' capacities to act.

Finally, our work highlights how assessments of both the Chinese and the Indian state capitalist economies are functional in the sense that they enable the central governments to achieve some of their desired objectives – albeit to differing extents. However, our results also reveal that the central Indian state has a lower capacity to co-ordinate business and other state actors, strongly hindering its ability to achieve its objectives. India's constitution makes co-ordination between central and regional political actors more difficult; however, other factors, such as the links between finance, employment and coal as well as the fact that it is a democracy, also play a key role. This is certainly not a reason to support authoritarian regimes with high levels of 'state capacity' (Evans, 1989), but a reminder that assessments of any state's functionality or dysfunctionality are complicated, highlighting the need to assess overall economic (in)equality as well as regional, and sectoral disparities, and democratic deficits.

References

- Acemoglu, D., & Robinson, J. A. 2012. *Why Nations Fail: The Origins of Power, Prosperity and Poverty*. Crown Business.
- All India Solar Industries Association. 2020. Objectives. <http://aisia.org.in/objectives/>.
- Allen, M. M. C. 2013. Comparative capitalisms and the institutional embeddedness of innovative capabilities. *Socio-Economic Review*, 11(4): 771–794.
- Baccaro, L., & Pontusson, J. 2016. Rethinking comparative political economy: The growth model perspective. *Politics and Society*, 44(2): 175–207.
- Baccaro, L., & Pontusson, J. 2019. *Social blocs and growth models: An analytical framework with Germany and Sweden as illustrative cases*. No. 7. Geneva.
- Ball, J., Reicher, D., Sun, X., & Pollock, C. 2017. *The New Solar System: China's Evolving Solar Industry and Its Implications for Competitive Solar Power in the United States*

- and the World*. <https://law.stanford.edu/wp-content/uploads/2017/03/2017-03-20-Stanford-China-Report.pdf>, Stanford, CA.
- Barone, B., & Spratt, S. 2015. *Rising Powers in International Development*. http://opendocs.ids.ac.uk/opendocs/bitstream/handle/123456789/5781/ER111_DevelopmentBanksfromtheBRICS.pdf?sequence=1, London.
- BP. 2019a. *China's Energy Market in 2018*. <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-china-insights.pdf>.
- BP. 2019b. *India's Energy Market in 2018. Statistical Review of World Energy*. <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-india-insights.pdf>.
- Brandt, L., & Thun, E. 2010. The fight for the middle: Upgrading, competition, and industrial development in China. *World Development*, 38(11): 1555–1574.
- Brandt, L., & Thun, E. 2015. Competition and upgrading in Chinese industry. In B. Naughton & K. S. Tsai (Eds.), *State Capitalism, Institutional Adaptation, and the Chinese Miracle*: 154–198. Cambridge: Cambridge University Press.
- Brandt, L., & Thun, E. 2016. Constructing a ladder for growth: Policy, markets, and industrial upgrading in China. *World Development*, 80: 78–95.
- Bridle, R., Kitson, L., Duan, H., Sanchez, L., & Merrill, T. 2017. *At the Crossroads: Balancing the Financial and Social Costs of Coal Transition in China*. Winnipeg, Canada.
- Centre for Financial Accountability. 2018. *India 2017 Coal vs Renewables Finance Analysis*. New Delhi: Centre for Financial Accountability.
- Chandra, R. 2018. *Embeddedness and Persistence: India's Coal Industry*. Baltimore.
- Chen, G. C., & Lees, C. 2016. Growing China's renewables sector: a developmental state approach. *New Political Economy*, 21(6): 574–586.
- Corwin, S., & Johnson, T. L. 2019. The role of local governments in the development of China's solar photovoltaic industry. *Energy Policy*, 130: 283–293.
- CRISIL. 2019. *Return to Uncertainty*.
- Crouch, C. 2005. *Capitalist Diversity and Change: Recombinant Governance and Institutional Entrepreneurs*. Oxford: Oxford University Press.
- Cuervo-Cazurra, A., Inkpen, A., Musacchio, A., & Ramaswamy, K. 2014. Governments as owners: State-owned multinational companies. *Journal of International Business Studies*, 45(8): 919–942.

- ESMAP. 2013. *Paving the Way for a Transformational Future Lessons from Jawaharlal Nehru National Solar Mission Phase I*. www.worldbank.org/esmap, Washington, D.C.
- Evans, P. B. 1989. Predatory, developmental, and other apparatuses: A comparative political economy perspective on the Third World state. *Sociological Forum*, 4(4): 561–587.
- Friends of the Earth US. 2016. *Emerging Sustainability Frameworks: China Development Bank and China Export-Import Bank*. <https://1bps6437gg8c169i0y1drtgz-wpengine.netdna-ssl.com/wp-content/uploads/wpallimport/files/archive/emerging-sustainability-frameworks-CDB-ChinaExim.pdf>, Washington, D.C.
- Fuller, D. B. 2016. *Paper Tigers, Hidden Dragons: Firms and the Political Economy of China's Technological Development*. Oxford: Oxford University Press.
- Gambhir, A., Jethmalani, R., Sarode, J., Das, N., & Dixit, S. 2016. *India's Journey towards 175 GW Renewables by 2022*. <http://www.prayaspune.org/peg/publications/item/329-india-s-journey-towards-175-gw-renewables-by-2022.html>, Pune.
- Gandenberger, C. 2018. *China's Trajectory from Production to Innovation: Insights from the Photovoltaics Sector*. No. 03/2018. [https://www.isi.fraunhofer.de/content/dam/isi/dokumente/sustainability-innovation/2018/WP03-2018_TIS Analysis PV in China.pdf](https://www.isi.fraunhofer.de/content/dam/isi/dokumente/sustainability-innovation/2018/WP03-2018_TIS%20Analysis%20PV%20in%20China.pdf), Karlsruhe.
- Gang, C. 2015. China's solar PV manufacturing and subsidies from the perspective of state capitalism. *Copenhagen Journal of Asian Studies*, 33(1): 90–106.
- Greenpeace. 2019. About dirty energy. <https://www.greenpeace.org/uk/what-we-do/climate/energy/dirty-energy/>, May 17, 2019.
- Haggard, S. 2004. Institutions and growth in East Asia. *Studies in Comparative International Development*, 38(4): 53–81.
- Hsueh, R. 2012. China and india in the age of globalization: Sectoral variation in postliberalization reregulation. *Comparative Political Studies*, 45(1): 32–61.
- Hsueh, R. 2016. State capitalism, Chinese-style: Strategic value of sectors, sectoral characteristics, and globalization. *Governance*, 29(1): 85–102.
- Hu, H. W., Cui, L., & Aulakh, P. S. 2019. State capitalism and performance persistence of business group-affiliated firms: A comparative study of China and India. *Journal of International Business Studies*, 50(2): 193–222.
- Huang, P., Negro, S. O., Hekkert, M. P., & Bi, K. 2016. How China became a leader in solar PV: An innovation system analysis. *Renewable and Sustainable Energy Reviews*, 64(145): 777–789.
- Huang, Y. 2008. *Capitalism with Chinese Characteristics: Entrepreneurship and the State*.

- Cambridge: Cambridge University Press.
- Indian Railways. 2018. *Indian Railways Year Book 2016-17*.
http://www.indianrailways.gov.in/railwayboard/uploads/directorate/stat_econ/IRSP_2016-17/Facts_Figure/Year_Book_2018_Eng.pdf.
- International Energy Agency. 2019. *Trends in Photovoltaic Applications 2019. Report IEA PVPS T1-36: 2019 Photovoltaic*. <https://iea-pvps.org/wp-content/uploads/2020/02/5319-iea-pvps-report-2019-08-lr.pdf>.
- Kamboj, P., & Tongia, R. 2018. *Indian Railways and Coal: An Unsustainable Interdependency*. <https://www.brookings.edu/wp-content/uploads/2018/07/Railways-and-coal.pdf>, New Delhi.
- Kennedy, S. 2005. Conclusion: China's Political Economies. *The Business of Lobbying in China*: 235–244.
- Lal, P. V. 2019. Interview: SunSource Energy says regulatory uncertainty is solar industry's biggest challenge. *PV Magazine*. <https://www.pv-magazine-india.com/2019/10/18/interview-sunsource-energy-says-regulatory-uncertainty-is-solar-industrys-biggest-challenge/>.
- Lee, A., & Paine, J. 2019. British colonialism and democracy: Divergent inheritances and diminishing legacies. *Journal of Comparative Economics*, 47(3): 487–503.
<https://doi.org/10.1016/j.jce.2019.02.001>.
- Li, M. H., Cui, L., & Lu, J. 2014. Varieties in state capitalism: Outward FDI strategies of central and local state-owned enterprises from emerging economy countries. *Journal of International Business Studies*, 45(8): 980–1004.
- Make in India. 2019. Make in India Sectors. <http://www.makeinindia.com/sectors>.
- Mann, M. 1984. The autonomous power of the state: Its origins, mechanisms and results. *European Journal of Sociology*, 25(2): 185–213.
- Ministry of New & Renewable Energy. 2012. *Jawaharlal Nehru National Solar Mission: Phase II Policy Document*.
- Ministry of New and Renewable Energy. 2008. *Jawaharlal Nehru National Solar Mission - Towards building Solar India*.
https://mnre.gov.in/sites/default/files/uploads/mission_document_JNNSM.pdf.
- Mints, P. 2018. Notes from the Solar Underground: Is China's Domestic Solar Industry Too Big To Fail? <https://www.renewableenergyworld.com/2018/12/20/notes-from-the-solar-underground-is-chinas-domestic-solar-industry-too-big-to-fail/#gref>.
- Mundy, S. 2019. India's renewable rush puts coal on the back burner. *Financial Times*.

<https://www.ft.com/content/b8d24c94-fde7-11e8-aebf-99e208d3e521>.

- Musacchio, A., & Lazzarini, S. G. 2014. *Reinventing State Capitalism: Leviathan in Business, Brazil and Beyond*. Cambridge, MA: Harvard University Press.
- Musacchio, A., Lazzarini, S. G., & Aguilera, R. V. 2015. New varieties of state capitalism: Strategic and governance implications. *The Academy of Management Perspectives*, 29(1): 115–131.
- Naseemullah, A. 2016. The contested capacity of the Indian state. *India Review*, 15(4): 407–432.
- Naseemullah, A. 2017. *Development after Statism: Industrial Firms and the Political Economy of South Asia*. Cambridge: Cambridge University Press.
- Nölke, A., ten Brink, T., Claar, S., & May, C. 2015. Domestic structures, foreign economic policies and global economic order: Implications from the rise of large emerging economies. *European Journal of International Relations*, 21(3): 538–567.
- OECD. 2009. *OECD Patent Statistics Manual*. Paris: OECD.
- Peng, M. W., Bruton, G. D., Stan, C. V., & Huang, Y. 2016. Theories of the (state-owned) firm. *Asia Pacific Journal of Management*, 33(2): 293–317.
- Press Information Bureau: Government of India Ministry of Coal. 2018. Coal Mine Workers and Safety Facilities Provided to Employees in Coal India Ltd (Cil) and Its Subsidiaries.
- Prime Minister’s Office. 2019. Major Initiatives: Make In India.
- Pulipaka, S. 2019. Manufacturing the Manufacturing Policy for Indian Solar Modules. *PV Magazine*. <https://www.pv-magazine-india.com/2019/03/14/manufacturing-the-policy-for-indian-solar-modules/>.
- Ren, M., Branstetter, L., Kovak, B., Armanios, D., & Yuan, J. 2019. *Why Has China Overinvested in Coal Power?*. No. 25437. <http://www.nber.org/papers/w25437.pdf>, Cambridge MA.
- Sallai, D., & Schnyder, G. n.d. What is “authoritarian” about authoritarian capitalism? The dual erosion of the private–public divide in state-dominated business systems. *Business and Society*.
- Sanderson, H., & Forsythe, M. 2013. *China’s Superbank: Debt, Oil and Influence:- How China Development Bank is Rewriting the Rules of Finance*. Singapore: Wiley.
- Shearer, C., Mathew-Shah, N., Myllyvirta, L., Yu, A., & Nace, T. 2018. *Boom and Bust 2018: Tracking the Global Coal Plant Pipeline*. San Francisco.
- Singh, P. 2019. Solar PV Manufacturing in India 2 Days After 12 GW Manufacturing ‘Stimulus’ Time For Reality Check. *Saur Energy International*.

- <https://www.saurenergy.com/solar-energy-articles/2-days-after-12-gw-manufacturing-stimulus-time-for-reality-check>.
- Sinha, A. 2005a. Understanding the rise and transformation of business collective action in India. *Business and Politics*, 7(2): 1–35.
- Sinha, A. 2005b. *The Regional Roots of Developmental Politics in India: A Divided Leviathan*. Bloomington: Indiana University Press.
- Sinha, A. 2016. *Globalizing India: How Global Rules and Markets Are Shaping India's Rise to Power*. Cambridge: Cambridge University Press.
- Spratt, S., Dong, W., Krishna, C., Sagar, A., & Ye, Q. 2014. *What Drives Wind and Solar Energy Investment in India and China?*
<https://opendocs.ids.ac.uk/opendocs/handle/123456789/4230>.
- Steinfeld, E. S. 1998. *Forging Reform in China: The Fate of State-Owned Industry*. Cambridge: Cambridge University Press.
- Sun, H., Zhi, Q., Wang, Y., Yao, Q., & Su, J. 2014. China's solar photovoltaic industry development: The status quo, problems and approaches. *Applied Energy*, 118: 221–230.
- Sun, P., Hu, H. W., & Hillman, A. J. 2016. The dark side of board political capital: Enabling blockholder rent appropriation. *Academy of Management Journal*, 59(5): 1801–1822.
- Swenson, P., & Pontusson, J. 2000. The Swedish employer offensive against centralized bargaining. In T. Iversen, J. Pontusson, & D. Soskice (Eds.), *Unions, Employers, and Central Banks: Macro-Economic Co-Ordination and Institutional Change in Social Market Economies*: 77–106. Cambridge: Cambridge University Press.
- Tagotra, N. 2017. The political economy of renewable energy: Prospects and challenges for the renewable energy sector in India post-Paris negotiations. *India Quarterly*, 73(1): 99–113.
- Thelen, K. 1999. Historical institutionalism in comparative politics. *Annual Review of Political Science*, 2(1): 369–404.
- Wallerstein, I. 2004. *World Systems Analysis: An Introduction*. Durham, NC: Duke University Press.
- Whitley, R., & Zhang, X. 2016. Introduction: The comparative analysis of changing business systems in Asia. In R. Whitley & X. Zhang (Eds.), *Changing Asian Business Systems: Globalization, Socio-Political Change, and Economic Organization*: 1–31. Oxford: Oxford University Press.
- Williamson, O. E. 1985. *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. New York: The Free Press.

- Witt, M. A., & Redding, G. 2014. China: Authoritarian Capitalism. In M. A. Witt & G. Redding (Eds.), *The Oxford Handbook of Asian Business Systems*: 11–32. Oxford: Oxford University Press.
- Wood, G., & Wright, M. 2015. Corporations and new statism: Trends and research priorities. *Academy Management Perspectives*, 29(2): 271–286.
- Xing, Y., Liu, Y., & Cooper, C. L. 2018. Local government as institutional entrepreneur: Public–private collaborative partnerships in fostering regional entrepreneurship. *British Journal of Management*, 29(4): 670–690.
- Xu, C. 2011. The fundamental institutions of China’s reforms and development. *Journal of Economic Literature*, 49(4): 1076–1151.
- Ye, L. C., Rodrigues, J. F. D., & Lin, H. X. 2017. Analysis of feed-in tariff policies for solar photovoltaic in China 2011–2016. *Applied Energy*, 203: 496–505.
<http://dx.doi.org/10.1016/j.apenergy.2017.06.037>.
- Zhang, S., Andrews-Speed, P., & Ji, M. 2014. The erratic path of the low-carbon transition in China: Evolution of solar PV policy. *Energy Policy*, 67: 903–912.
- Zhang, S., Andrews-Speed, P., Zhao, X., & He, Y. 2013. Interactions between renewable energy policy and renewable energy industrial policy: A critical analysis of China’s policy approach to renewable energies. *Energy Policy*, 62: 342–353.
- Zhang, X., & Whitley, R. 2013. Changing macro-structural varieties of East Asian capitalism. *Socio-Economic Review*, 11(2): 301–336.
- Zhou, K. Z., Gao, G. Y., & Zhao, H. 2017. State Ownership and Firm Innovation in China: An Integrated View of Institutional and Efficiency Logics. *Administrative Science Quarterly*, 62(2): 375–404.