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Globalization as Domestic Adjustment: Chinese Development Finance and the Globalization of China's Coal Industry

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ABSTRACT

As China has begun a shift away from coal fired power at home, it has emerged as the largest financier of overseas coal fired power abroad. According to a new dataset devised for the purposes of this and related studies, China's two global policy banks, the China Development Bank and the Export-Import Bank of China, provide the most financing for overseas coal fired power relative to the rest of the world. In an analysis of the determinants of Chinese overseas coal fired power finance, we find that that the domestic drivers of the globalization of China's global coal finance between 2002 and 2018 is an effort on the part China's national development banks to boost domestic demand, export national champions and excess capacity, and green the Chinese economy with respect to the Chinese coal and power sector. These findings pose significant challenges to 'economic statecraft' theories of Chinese overseas investment, and to the global effort to combat climate change.

Introduction

Because energy-related emissions account for almost three quarters of the global anthropogenic greenhouse gas (GHG) emissions (International Energy Agency 2018a), success in climate action worldwide principally hinges on whether these emissions can be mitigated. Although the burning of all forms of fossil fuels produces GHG emissions, 90% of which takes the form of CO2 emissions, due to its heavy carbon intensity coal represents the largest source of CO2 emissions, accounting for 44% of the global CO2 emission in 2016 (International Energy Agency 2018a). Meaningful progress in climate action requires a transition beyond all fossil fuels. But curtailing coal combustion must bear the brunt of the transition as it represents about 40% of the global GHG emissions. In its 2018 special report, the Inter-governmental Panel on Climate Change (IPPC) went further to suggest that in order to keep the average global temperature rise under 1.5**°C** on the basis of pre-industrial levels, countries should halt investment in unabated coal by 2030 and stop using coal for electricity generation by 2050 (Inter-governmental Panel on Climate Change 2018).

Two factors dictate that China play a pivotal role in the global effort to address climate change. First, it is the world's largest coal user. As a matter of fact, China has been the primary driver behind the increased demand for coal worldwide since the beginning of the 21st century. Specifically, it is responsible for more than 60% of the world's incremental growth in coal demand from 2000 to 2016 (International Energy Agency 2017). Accordingly, there comes little surprise that that the country has been the world's leading carbon emitter since 2005 contributing to 29% of CO2 emissions worldwide in 2014 (World Bank 2019).

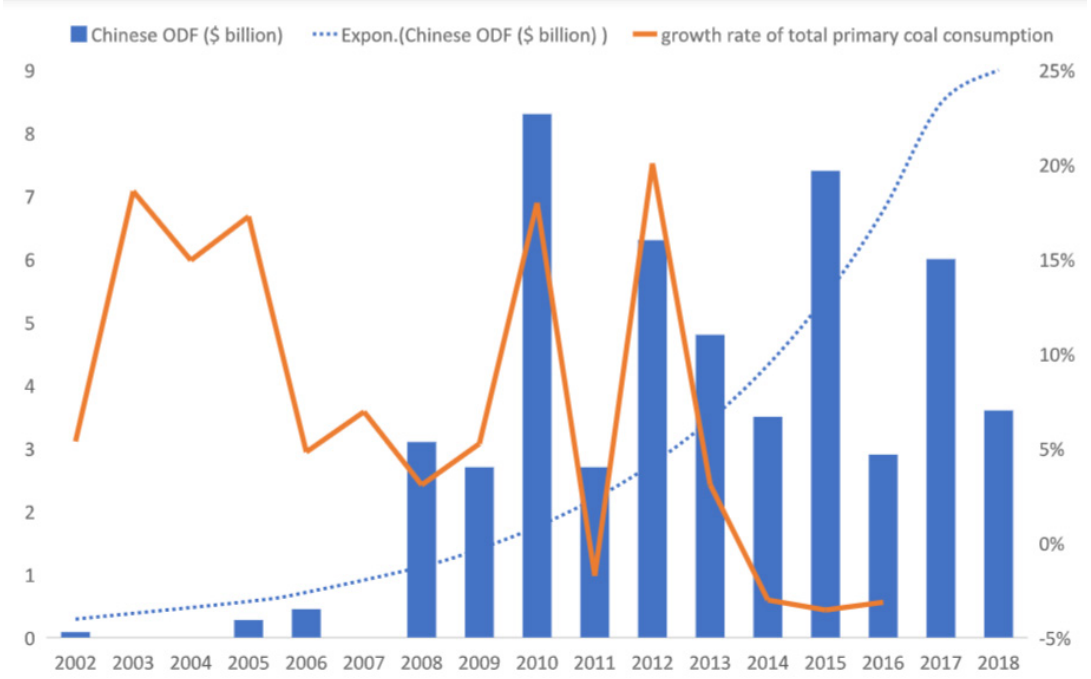
Second, it has become one of the most prominent financers for coal fired-power (CFP) worldwide. Between 2002 and 2018, China has provided twenty countries around the world with more than $52 billion worth of loans for CFP (Gallagher 2018). To be sure, other leading economies also provide overseas CFP financing but the scale of their provision pales in comparison with that of China's. According to a recent study sponsored by the Natural Resources Defense Council (NRDC) and the Oil Change International, G20 economies collectively have channeled more than $76 billion worth of public financing to coal projects around the world from 2007 to 2015 and are considering more, which, once put in place, will be around for decades and thus create a carbon trap by locking recipient countries of the coal finance into many years of harmful GHGs (Chen, Doukas, Schmidt, et al. 2016). However, the magnitude of Chinese global CFP finance is simply much larger. Gauged by the NRDC estimate, China leads the G20 nations in overseas CFP financing and is responsible for about one third of the group's total between 2007 and 2015. However, the NRDC estimate proves to be conservative at best. Boston University's Global Development Policy Center maintains a China Global Energy Finance dataset that tracks the global energy finance China provides to governments around the world for all forms of energy through its two policy banks—China Development Bank (CBD) and China Export and Import Bank (CHEXIM).[1] According to this dataset, China's provision of international CFP financing through its two policy banks amounted to $39 billion in 2007-2015 (Gallagher 2018), which is almost 60% higher than the above-mentioned NRDC estimate and almost equal to the total public financing for coal from all of the G7 nations combined during the same time frame (Chen, Doukas, Godinot, et al. 2016).

- 1 For more information about the methodology employed in the collection and verification of this dataset, please refer to https://www.bu.edu/cgef/#/all/Country.

There thus arises a question for analysis: Why does China engage in public financing for CFP around the world? This question gains one more layer of analytical suspense when examined in the context of the decline of coal consumption in China. As depicted in Figure 1, the trend of declining coal use in China has become pronounced since 2012. This decline manifests itself in both the decrease in the country's coal demand growth rate and a contraction in the absolute quantity of its apparent coal consumption since 2013. According to the National Bureau of Statistics of China, the country's coal consumption registered an annual reduction of 1.2% between 2013 and 2017, which translates into a shrinking of more than 380 million tons of coal during the same time frame (National Bureau of Statistics of China 2019). Meanwhile, the Chinese economy grew by 7.1% (World Bank 2019), which, as will be discussed later, in historical terms amounts to a slowdown. Nevertheless, this seeming decoupling between economic growth and coal use has prompted some scholars to conclude that China has entered into a new era of post-coal economic growth (Qi et al. 2016). When juxtaposed with the country's growing international CFP financing, this decline in domestic coal use points to a bifurcation in China's stance on coal, i.e., China has increasingly financed CFP abroad as it reduces coal consumption at home as shown in Figure 1. Hence, it is this bifurcation that this study seeks to explain. To put it succinctly, this study seeks to illuminate why China has simultaneously cut back on coal use at home and increased financing for CFP around the world since the beginning of the 21st century?

Answering the above-mentioned question carries both theoretical and practical significance. Theoretically speaking, while the past several years have witnessed a growing body of literature about the globalization of China's development finance in general and for energy in particular, the bifurcation in China's stance on coal has received scant analytical attention. Having said that, two perspectives in the broad literature could offer an explanation for China's bifurcating approach to CFP. From an economic perspective, Japan, a leading provider of international financing for CFP around the world in the G7 nations (Chen, Doukas, Godinot, et al. 2016), finances CFP abroad primarily to facilitate the export of its CFP equipment, technology, and services (Chen, Doukas, Schmidt, et al. 2016). Thus, it is plausible that China has adopted the same profit-seeking logic in its increasing financing for CFPPs worldwide. Strategically speaking, the literature on economic statecraft alerts one to another possibility, i.e., China uses its growing financing for overseas CFPPs as a means to pursue strategic and geopolitical goals around the world. However, as will be discussed later in this study, neither perspective provides a satisfactory explanation. To begin, the profit-seeking hypothesis is economic reductionist and fails to capture the political logic for Chinese state to produce the necessary conditions behind the expansion of the Chinese public financing for CFPPs around the world. Next, the strategic argument exaggerates the dividends associated with the so-called "economic statecraft" that often turns out to be ambiguous at best in reality. As a result, the question this study seeks to address represent a gap in the literature.

FIGURE 1: CHINA'S GLOBAL FINANCING FOR CFP AND DOMESTIC COAL USE GROWTH (2002-2018)



Source: (Gallagher 2018, National Bureau of Statistics of China 2018a)

In addition to filling the theoretical void, answering the afore-mentioned question also carries enormous policy implications. Specifically, it points to a third approach to appraise China's carbon footprint. Currently, the effort to track China's CO2 emissions centers on two approaches—the production-based and consumption-based accounting, with the latter separating the emissions driven by production geared for net foreign consumption from those driven by net domestic consumption. This dichotomous approach has led to a growing recognition that China is responsible for a significantly smaller share of its aggregate CO2 emissions when measured through a consumption-based accounting as opposed a production-based accounting (Liu, Jayanthakumaran, and Neri 2013). Contributions to understanding China's carbon profile notwithstanding, neither approach tracks the CO2 emissions associated with the country's growing investment activities overseas. This is increasingly anachronistic as China has emerged as a major exporter of capital, especially in the aftermath of the 2008 Global Financial Crisis (GFC). According to the United Nations Conference on Trade and Development (UNCTD), since 2012 China has surpassed the United Kingdom as the world's third largest source of foreign direct investment (FDI) outflows, accounting for almost 8.7% of the FDI outflows worldwide and only trailing behind Japan and the United States (UNCTAD 2018). Considering the carbon implications of the CFP that China finances worldwide, it is increasingly important to incorporate an investment-based accounting into the analysis of China's climate action. This importance is further elevated by the fact neither the Chinese policy banks, i.e., CDB and CHEXIM, which have been behind China's increasing public financing for CFP worldwide nor the country's commercial banks, which have provided financing to Chinese utilities and power engineering companies to build coal-fired power plants worldwide, have instituted restrictions in investment into CFP (Gallagher and Qi 2018). In contrast, the world's leading multilateral development banks (MDBs), such as the World Bank, Asian Development Banks (ADB), African Development Bank (AfDB), and Inter-American Development Bank (IDB), have pledged to withdraw from coal-power financing (Chen, Doukas, Schmidt, et al. 2016).

We argue that the globalization of China's public financing for CFP as a product of push factors on the supply side and pull factors on the demand side. On the demand side, we maintain that an integration of economic, political, financial realities confronting the emerging economies depicted in Figure 1 coalesce and form the situational logic that prompt these countries to turn to China, which is looking for opportunities because of the push factors to be mentioned below, into their countries for an expedient solution. Economically, with these economies experiencing a rapidly growing demand for power and boasting a significant amount of coal deposits, CFP represents the most affordable option over the immediate term. Politically, meeting the growing demand for power in these countries, together with expanding the local economy and creating jobs, carries profound urgency for the incumbents as their legitimacy and re-electability depend on the perceived resolution of these challenges. The combination of indigenous coal deposits and the potential job creation and growth dividends that are expected to come with the construction and operation of coal-fired power plants thus makes CFP both the expedient and rational choice despite its long-term carbon implications. Financially, the withdrawal of the West and its-backed MDBs from CFP, together with China's readiness to provide both attractive financing packages, competitive CFP technologies, and the promise to deliver projects on time and on budget, provides another reason for these emerging economies to pull China into their markets. In this paper we will not focus on the pull factors on the demand side, which we will pursue in a separate study. Instead, we will center our investigation primarily on the push factors from the supply side.

Viewed from the supply-side perspective, we adopt a structural approach to our research problem by situating our investigation in the structural challenges confronting China's coal and power sector at home. We base the premise of our analysis on the fundamental observation we have established elsewhere, that is CDB and CHEXIM are arms of the Chinese state and their mission is to execute the will of the state through dedicated financial targeting (Kong and Gallagher 2017, Kong 2019). On this basis, we argue that the globalization of China's public financing between 2002 and 2018 is an effort on the part of CDB and CHEXIM to boost domestic demand, export national champions and excess capacity, and green the Chinese economy with respect to the Chinese coal and power sector.

This study consists of seven parts. Section II will define the key terms of the study and examine the profile of China's public financing for CFP worldwide. Section III will analyze the structural challenges confronting coal in China and draw out the relevant implications for CDB and CHEXIM. Section IV-VI will then provide evidence to substantiate our argument that CDB and CHEXIM have globalized their public financing for CFP to boost domestic demand, to export domestic capacity, and to green the Chinese economy. We will respond to an alternative hypothesis that may challenge our argument in Section VII. Section VIII concludes our discussion and draws out areas for further research.

Parameters and profile of China's financing for CFP worldwide

Before embarking on the investigation, it is important for us to establish some basic parameters about our central research question so as to avoid unnecessary confusion and misunderstanding. Specifically, we will first define what we mean by CFP and financing before discussing the magnitude, regional distribution, and sources of Chinese financing for CFP worldwide.

To begin, we adopt a value chain approach when conceptualizing CFP in this study. We see CFP as a sector comprising four segments: 1) inputs, including equipment manufacturing, project design, project engineering, project construction, project operation, and project maintenance, 2) power generation, 3) transmission and

distribution (T&D), and 4) the end market, which includes distribution to both residential and industrial end users. So far as China's financing for CFP worldwide is concerned, it is primarily targeted segment 1 and 2, which as to be discussed later often entails contracting with Chinese firms or procurement of Chinese equipment, materials, labor, or services. Thus, when we discuss China's financing for CFP worldwide we refer primarily to Chinese public financing through CDB and CHEXIM for inputs into CFPPs and CFP T&D.

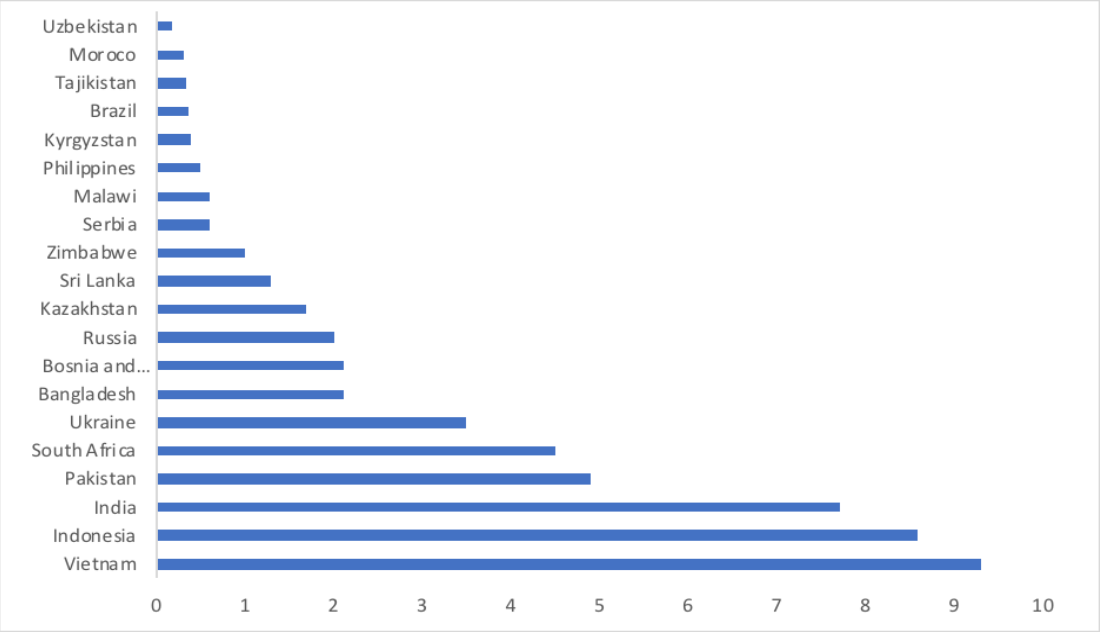
Next, we use the term "financing" to denote the public lending that China provides to governments around the world for CFPPs buildout through its two policy banks—CDB and CHEIXM. Consistent with China's international financing for oil and gas since the beginning of the 21st century, which we have already analyzed elsewhere (Kong and Gallagher 2017, Kong 2019), this public lending for CFPPs worldwide primarily has three manifestations—concessional loans, preferential export credit, and non-concessional loans, with CHEXIM providing all three types of loans while CDB only issuing the last kind. In terms of business model, when China lends to foreign governments for CFPPs through CDB and CHEXIM, its public financing includes base capital plus international capital markets. This is exactly the same practice as the International Bank for Reconstruction and Development (IBRD) and the non-concessional window of the multilateral development banks (MDBs). As a matter of fact, China's public financing for CFP worldwide is consistent with the official development finance (ODF) as defined by OECD Development Assistance Committee (OECD 2013). Thus, we use the three terms—financing, public lending, and ODF—interchangeably in this study when describing China's official financial support for CFPPs buildout worldwide.

Finally, having defined the basic parameters of China's financing for CFP around the world, we now draw on the China's Global Energy Finance dataset (Gallagher 2018)to shed light on its profile. A careful examination of this dataset reveals two stylized facts. On the one hand, China has greatly expanded its financing for CFP worldwide from 2002 to 2018. Despite the fluctuations in the annual outflows of China's financing for overseas CFP, as Figure shows that the magnitude of the outflow has grown exponentially in the aftermaths of the 2008 GFC. For instance, the total outflow of Chinese financing for overseas CFP was merely $86 million in 2002, it soared to $3.1 billion in 2008; while it peaked at $7.4 billion in 2015, it still hovered around $3.6 in 2018 (Gallagher 2018). On average, the annual outflow of Chinese financing for foreign CFP exceeds $3 billion from 2002 to 20018.

On the other hand, the exponential growth of China's global financing for CFP is associated with some disconnect between its geographical distribution, energy poverty, and income levels. in terms of geographical distribution, as illustrated in Figure 1 Chinese financing for CFP is scattered across 20 countries around the world from 2002 to 2018. However, the distribution varies greatly across countries, with over two thirds of China's global financing for CFP during the time frame concentrated in four Asian economies—Vietnam, Indonesia, India, and Pakistan—and one African economy—South Africa. Aggregated on a regional basis as shown in Figure 2, these 20 countries spread primarily across four regions, with Asia, Russia and Eastern Europe, Africa, and Latin America accounting for 71%, 16%, 12%, and 1% of China's global financing for CFP between 2002 and 2018. When measured against the International Energy Agency's data on the global population without access to electricity as shown in Table 1, it is clear that the correlation between China's global financing for CFP and the regional distribution of population without access to electricity runs very low. Specifically, whereas Africa is home to 61% of the world population without access to electricity, it only captures 12.3% of China's global financing for CFP. In contrast, although 35% of the world's population without access to electricity live in Asia, the continent has received more than 70% of China's global financing for CFP. Furthermore, it is worth noting that while the Middle East hosts 2% of the world's population with no access to electricity China has not provided any financing for CFP in the region. Similarly, the area of Russia and Eastern Europe are not particularly plagued the lack of electricity access, it

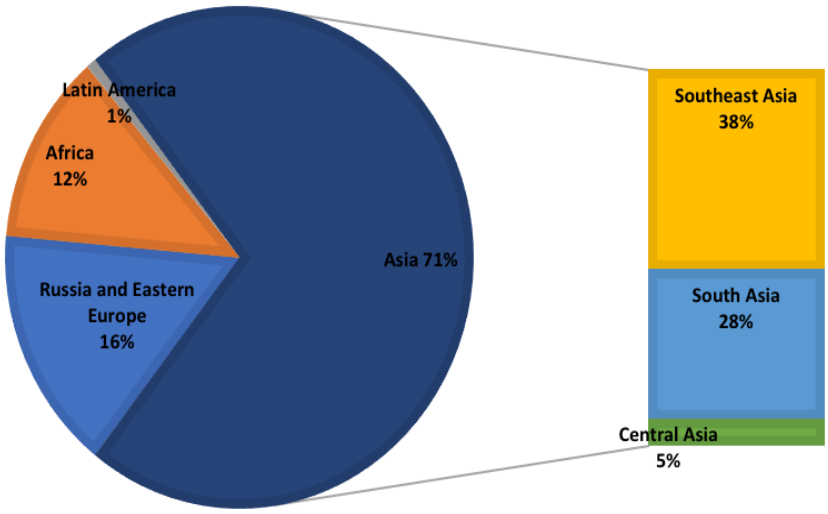
has received 16% of China's global financing for CFP, which eclipses Africa's share. This disconnect is further illustrated when one organizes the distribution of China's global financing for CFP on income basis. Adopting the World Bank's classification of economies by income (World Bank 2018), economies of low income, lower middle income, and middle income account for 3.7%, 74.6%, and 21.7% of China's global financing for CFP between 2002 and 2018 respectively. Coincidently, energy poverty, defined as the lack of access to electricity, is positively correlated with low income level. Thus, it is clear that electricity access enhancement is neither is the goal nor the motivating factor behind the expansion of China's global financing for CFP.

FIGURE 1: DISTRIBUTION OF CHINA'S FINANCING FOR CFP BY COUNTRY (2002-2018), $US BILLION



Source: (Gallagher 2018)

FIGURE 2: REGIONAL DISTRIBUTION OF CHINA'S FINANCING FOR CFP (2002-2018)



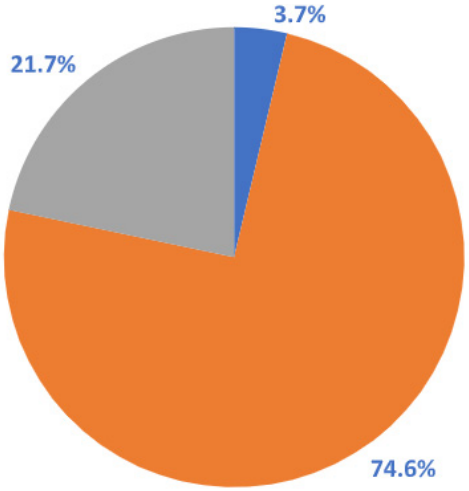
Source: (Gallagher 2018)

TABLE 1 : ELECTRICITY ACCESS WORLDWIDE 2017

	number of people without access to electricity	% of world population without access to electricity
Africa	603	61%
Developing Asia	351	35%
Central and South America	20	2%
Middle East	18	2%

Source: (International Energy Agency 2018b)

FIGURE 3: DISTRIBUTION OF CHINA'S FINANCING FOR CFP BY INCOME LEVEL (2002-2018)



Source: (Gallagher 2018, World Bank 2019)

In short, since 2002, China's global financing for CFP has grown rapidly, especially in the aftermath of the 2008 GFC, and expanded across the world. This expansion has extended to 20 countries worldwide and exhibits two distinct patterns. First, the distribution of China's global financing for CFP in middle income economies. As a matter of fact, as Figure 3 indicates that middle income economies, including both lower-middle income and upper-middle income ones, have received a total of 96% of the Chinese financing whereas low income economies have merely captured 4% of the total between 2002 and 2018.Second, geographical proximity appears to be an important variable that shapes the global distribution of China's financing for CFP. As a matter of fact, Figure 2 speaks to a pecking order of this distribution that is consistent with an underlying principal of geographical proximity, with China's neighboring countries in developing Asia receiving 71% of the Chinese financing for CFP since 2002, countries further distant in Russia and Eastern Europe capturing 16% of the total, and those that are most remote in Africa and Latin America accounting for 12% and 1% respectively.

Structural challenges for coal in China and the implications for CDB and CHEXIM

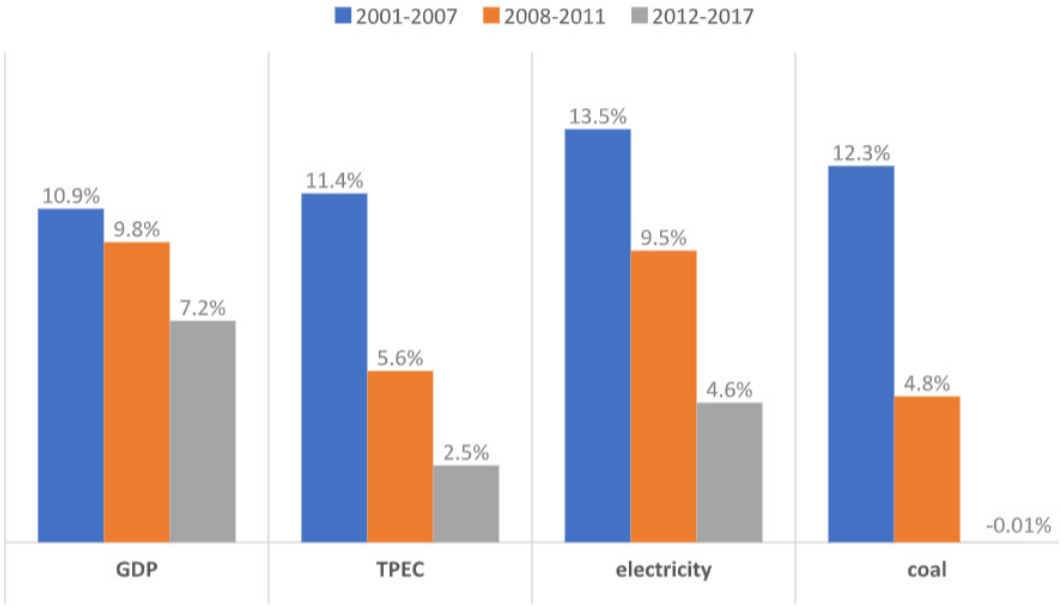
Since it first emerged as a modern fuel in China over 150 years ago, coal has always been considered as essential for the nation's quest for modernization and its standing in the international system. Shellen Xiao Wu's recent book, *Empires of Coal: Fueling China's Entry into the Modern World Order, 1860-1920,* documents how the late Qing Dynasty, while struggling to adopt and adapt modern European geology and mining technologies to exploit its coal resources in the late 19th century, came to the realization that coal was not only essential for the Chinese drive for modernization and but also for the imperial China to achieve parity with modern European powers in the world (Wu 2015). Sun Yat-sen, the founding father of the Republic of China, saw coal as "a necessity of civilized community and the sinews of modern industries" and called for international assistance in the development of a mining industry in China capable of producing an output of "four times as much coal as the United States" so that the country could be "equally developed" as the United States (Yat-sen 1922, 224). After the Chinese Communist Party of China (CCP) established the People's Republic of China (PRC) in 1949, perceived as what Lenin once called "the veritable bread of industry," coal saw its importance on the ascendant. Measured by its share of the country's total primary energy consumption (TPEC), coal accounted for more than 90% in the 1950s, over 80% during the 1960s, and well above 70% between the 1970s and much of the first decade of the 21st century on average (National Bureau of Statistics of China 1999, 2018b). With this preeminence in China's energy mix and by extension the country's economic development, king coal has formed the backbone of China's emergence as the world's second largest economy measured in terms of exchange rate in the era of the country's reform and opening up. This remains true in absolute terms despite the gradual decline of coal's share in TEPC due to the diversification of the country's energy mix. The fact that king coal has maintained its prominence also speaks to its power to defy the hidden environmental, public health, and public safety costs associated with its production and consumption (Mao, Shen, and Yang 2008, Wright 2012).

However, there have emerged three structural challenges for coal over the past decade that have not only conspired to squeeze its use but also turned it into a sociopolitical target. First, the growth in coal/power demand has peaked and the coal power sector has become a sunset industry. This decreasing demand for coal power is also attributable to three factors. To begin, following the 2008 GFC, the Chinese economy has been growing a much slower pace. This means less growth for power, the primary form of which remains coal power in China. As depicted in Figure 4, the demand for power and coal in China started to soften in the aftermath of the GFC with a slower-paced economy. But the already softening demand took a nose dive starting from 2012 as the Chinese economy entered into a "new normal" characterized by the an even slower growing economy that is more geared toward consumption and the tertiary sector (National Bureau of Statistics of China 2019). With the Chinese economy growing a rate that has been one of one the lowest rates over the past two decades or so since 2012, the demand for power and coal has also witnessed the slowest growth, with coal use having registered an actual contraction over the past six years.

Next, as shown in Figure 4, while the Chinese economy has slowed consistently since 2008, the growth in the demand for energy in general but electricity and coal in particularly has slowed at a much more substantial scale. This difference speaks to a growing decoupling between economic growth and energy consumption that is an outcome of one of the most aggressive energy intensity reduction programs the Chinese government has instituted through its development planning since 2005, which will be discussed further below. This program has targeted primarily at sectors that are high energy-intensive. As a result of this energy-intensity reduction program, the iron and steel sector has seen its energy intensity decline by one third while the cement industry has experienced a more than 50% of reduction in its energy intensity from

2005 to 2016 (International Energy Agency 2017). However, the scope of the program transcends a specific sector. According to the International Energy Agency, while none of the Chinese industrial economy was subject to mandatory energy efficiency constraints in 2005, by 2016 more than 80% of it have been targeted for energy intensity reduction (International Energy Agency 2017). Consequently, China's industrial energy intensity currently is merely half of its level 20 years ago (International Energy Agency 2017). Considering that industry accounts for an average of 74% of apparent power consumption and 94% of apparent coal consumption between 2001 and 2017 (National Bureau of Statistics of China 2019), the industrial energy efficiency improvement directly translates into less power and coal use in China. Thanks to this improvement in conversion efficiency, to generate one kilowatt hour of electricity in 2015, China would only need to use about 14% less of coal it used in 2005 (China Electricity Council 2016).

FIGURE 4: GROWTH IN GDP, TPEC, ELECTRICITY CONSUMPTION AND COAL USE IN CHINA (2001-2017)



Source: (National Bureau of Statistics of China 2019, World Bank 2019)

Finally, coal is heavily squeezed by its competitors in China. This trend of substitution has emerged since 2007 when China passed the Renewable Energy Law and natural gas consumption started to take off. Indeed, the share of coal in the country's TPEC peaked in at 73% in 2007 and then dropped to 62% in 2016 (National Bureau of Statistics of China 2019). Meanwhile, non-hydro clean energy, including nuclear, wind, and solar, saw their share in the country's TEPC rising by 5.8% while natural gas's share increased by 3.4% during the same time frame, picking up 55% and 32% of share vacated by coal(National Bureau of Statistics of China 2019). A similar trend has taken place in coal's share in the country's power generation. While the share of coal in power generation decreased by 15.2% from 2007 to 2016, the non-hydro renewable power increased by 15.9% during the same time (National Bureau of Statistics of China 2019).

Second, both the coal and the power sector are plagued by enormous excess capacity. However, since excess capacity transcends the coal and power sector, a treatment of its systematic cause is in order. Two distinct features of the Chinese political economy amplify the propensity the country's investment-led economy to excess capacity. On the one hand, although the central government in Beijing plays a major role in collecting

tax revenues, especially since the tax reform in 1993 (Loo and Chow 2006), it merely controls about 15% of the national fiscal expenditure while the remaining 85% of government spending is done at the regional and local levels (National Bureau of Statistics of China 2019). Thus, whenever the central government initiates a push for investment in the form of economic stimulus or industrial policies, the push gets significantly magnified at the local level. A case in point is China's response to the 2008 GFC. To stimulate the Chinese economy in response to the GFC, the central government announced a stimulus package of 4 trillion yuan for the next 27 months following November 2008, but Wong (2011, 13) estimates that the stimulus actually executed to be a minimum of 9.5 trillion yuan, which is 2.4 times the size of the announced stimulus package. On the other hand, China's de facto "fiscal federalism" (Yang 2014), together with a leadership promotion system biased toward local growth (Li and Zhou 2005), provides local governments with a structural incentive to engage in a race to promote economic growth through aggressive measures to lure investment, many of which involve various subsidies and lax environmental standards. Chen and Sun (2013) shows how this incentive structure rooted in the Chinese political economy makes excess capacity a recurring and thorny challenge in the steel sector and highlights the role centrally-directed industrial policies play in contributing to excess capacity in China. Because of these two structural political economy factors, China's investment-led model has resulted in excess capacity across the broad spectrum of its industrial economy, especially in the aftermath of the 2008 GFC. Table 3 provides a list of the industrial sectors that the State Council, i.e. China' cabinet, identified between 2005 and 2017 as suffering from overcapacity. It shows how systematic excess capacity has become over time under China's investment-led growth model.

TABLE 2: SECTORS IDENTIFIED BY THE STATE COUNCIL IN 2005-2017 AS PRIORITIES FOR EXCESS CAPACITY ELIMINATION

2005	2006	2007	2009	2010	2013	2016	2017
iron and steel	iron and steel	electrical power	iron and steel	electrical power	iron and steel	iron and steel	coal
electrolyzed aluminum	electrolyzed aluminum	iron and steel	cement	coal	cement		
ferroalloys	ferroalloys	building materials	plate glass	iron and steel	electrolyzed aluminum		
coke	coke	electrolyzed aluminum	coal chemicals	cement	plate glass		
calcium carbide	calcium carbide	ferroalloys	silicon	nonferrous metals	ship building		
automobiles	automobiles	calcium carbide	wind-power equipment	coke			
copper smelting	*cement*	coke	electrolyzed aluminum	paper			
cement	*electrical power*	coal	*ship building*	leather			
electrical power	*coal*	plate glass	*soy bean crush*	printing and dyeing			
coal	*textiles*						
textiles							

Source: (Yu and Jin 2018)

As shown in Table 3, excess capacity in coal sector attracted attention the State Council since 2005 while the electrical power was identified as a priority sector for eliminating excess capacity since 2017. According to some recent estimate, the excess capacity in the country's industry was at least 1.5 billion metric tons at the end of 2015 (Yang, Hou, and Zhang 2018). As Table 4 shows, the overwhelming majority of the investment in coal comes from local governments. Similarly, overinvestment on the part of power utilities and local governments has also led to excess coal power capacity across China. In fact, a large number of new CFPPs has been approved and built since the central government decentralized the approval right over CFPPs and then the approval right over environmental impact assessment of CFPPs to local governments in 2014 and 2015 respectively. One estimate puts China's coal power excess capacity in the neighborhood of 140-160 GW in 2015 and 210-260GW in 2020 (Feng et al. 2018). To put these numbers in perspective, the total installed electricity generation capacity in Canada is 140 GW. This enormous excess capacity against the backdrop of China's economic slowdown in the aftermath of the 2007 GFC put the country's coal industry and coal power industry under great strains. For instance, by the end of 2015, more than 90% of large- and medium-sized coal enterprises suffered a loss (Zhang et al. 2017). Similarly, all of the top five leading power generating corporations incurred losses in 2017 while the average hours of operation for CFPPs dropped by more than 16% from 5021 to 4216 hours on an annual basis (China Electricity Council 2018).

TABLE 4: FIXED ASSETS INVESTMENT IN COAL IN CHINA (UNIT: BILLION YUAN)

	local investments	central investments	Total Investments	share of local investments	share of central investments
2004	62.34	6.699	69.039	90.3%	9.7%
2005	108.21	8.08	116.29	93.1%	6.9%
2006	131.53	14.37	145.9	90.2%	9.8%
2007	160.77	19.68	180.45	89.1%	10.9%
2008	214.88	25.05	239.93	89.6%	10.4%
2009	276.74	28.96	305.7	90.5%	9.5%
2010	347.77	30.7	378.47	91.9%	8.1%
2011	452.19	38.53	490.72	92.1%	7.9%
2012	441.4	27.04	468.44	94.2%	5.8%
2013	484.42	36.84	521.26	92.9%	7.1%
2014	496.95	40.7	537.65	92.4%	7.6%

Source: (Zhang et al. 2017)

Third, coal now bears the brunt of the burden in the country's campaign to clean up its environment at home and to meet its international commitment to reduce carbon abroad. As shown in Table 5 since the 11th Five Year Plan (FYP), the Chinese government has incorporated into its development planning more and more stringent environmental standards as part of its endeavor to reduce the environmental footprint of its economic growth (Gallagher and Qi, 2018). Here, one sees the convergence between its environmental goals with the earlier discussed energy efficiency goals. This overlap manifests itself in the mandatory phasing out small coal-fired power plants (CFPPs). According to the Ministry of Industry and Information Technology (MIIT), the country phased out small CFPPs totaling 76.8 GW during the 11th FYP(Ministry of Industry and Information Technology 2011). Even after the low-hanging fruits were picked, the country, according to its leading energy regulating agency the National Energy Administration (NEA), still managed to shut down another 28 GW of CFPPs during the 12th FYP (National Development and Reform Commission and National Energy Administration 2016). In total, China has phased out about 105 GW of coal power generation

capacity, which is equivalent to the entire power generation capacity of South Korea from 2005 to 2016. Since China launched its war on pollution in 2014 (Wong and Karplus 2017), coal again became the target, with another 20 GW of coal power generation slated to be phased out and the share of coal in the country's power generation mix dropping to 55% from 2016 to 2030 (National Development and Reform Commission and National Energy Administration 2016).

TABLE 5: CHINA'S MAJOR ENVIRONMENTAL TARGETS

	11th FYP (2005-2010)		12th FYP (2011-2015)		13th FYP (2016-2020)
environmental indicator	Target	Actual	Target	Actual	Target
SO_2	-10	-14.29	-8	-8	-15
COD	-10	-12.45	-8	-12.9	-10
NOX	-	-	-10	-18.6	-15
Ammonia Nitrogen	-	-	-10	-13	-10
Energy supply intensity per unit of GDP (%)	-20	-19.1	-16	-18.2	-15
Carbon dioxide emission intensity per unit of GDP (%)	-	-	-17	-20	-18
Share of non-fossil energy in primary energy supply (%)	-	-	11.4	12	15
Air Quality	-	-	-	-	
Days with good air quality in cities at or above prefecture level	-	-	-	-	>80
Reduction of PM2.5 concentration in substandard cities at or above prefecture level (%)	-	-	-	-	-18

Source: (Development Research Center of the State Council and OECD 2017; Gallagher and Qi, 2008)

With downward pressure on its demand growth, enormous excess capacity, and an environmental pushback that is gathering momentum, the coal and coal power sector have passed their prime in China. As a matter of fact, their prospect is unlikely to change in the future either as the economy transitions more toward to consumption-driven and tertiary sector-oriented, which has taken place since 2012 (National Bureau of Statistics of China 2019). Thus, the era of runaway expansion for the coal power sector has come to an end in China and the coal power sector has transformed into the poster child of the sunset industry.

With the arrival of this new era of sunset industry for the coal power sector at home, opportunities for expansion are likely to be increasingly constrained and hard to come by. With the colossal excess capacity that has been put into place and a wave of environmental protection that is gaining momentum, the coal power sector exhibits a huge impulse to expand overseas. Indeed, it is against this backdrop that we see how China's global financing for CFP dovetails with the structural challenges confronting its coal and coal power sector at home. Specifically, we see the globalization of China's public financing for CFP worldwide a way for the country's two policy banks, i.e. CDB and CHEXIM, to boost domestic demand and eliminate excess capacity for the Chinese coal power sector at home. More broadly, we see the globalization of China's public financing for CFP as a way to green its domestic economy. The reason is two-fold. On the one hand,

as discussed earlier, excess capacity transcends across the entire industrial economy in China. As to be discussed below, CDB and CHEXIM have been called by the central government in Beijing to facilitate the export China's excess capacity. On the other hand, the majority of China's excess capacity is concentrated in high pollution-intensive sector, as in the case of the coal power sector; thus, exporting excess capacity in these sectors amounts to an indirect way of greening the Chinese economy.

Globalizing China's public coal financing as a way to boost domestic demand

There are two ways to understand why the globalization of China's public financing for CFP represents a deliberate effort on the part of CDB and CHEXIM to boost domestic demand through exporting Chinese inputs into CFPPs abroad, especially those produced by the country's national champions specialized in CFP. Before the domestic demand for coal and coal power took a plummet during the 2008 GFC, as depicted in Figure 4, promoting the export of Chinese inputs into CFP worldwide is largely designed to support the global expansion of the country's national champions specialized in CFP and dovetails with the country's going out strategy. After the demand for coal and power nosedived after 2012, exporting Chinese inputs makes more sense as the domestic demand collapsed and excess capacity morphed into a systematic challenge across the industrial economy.

On the one hand, since the power sector remains heavily monopolized, there thus come little surprise that it is dominated by a few national champions. Unlike many Western countries and their backed MDBs, China does not impose conditionalities on its financing when engaged in international development finance. As a result, China is known for its "no-strings-attached approach." In reality, recipients of China's financing are frequently obligated to source inputs for their development projects from China, which often takes the form of three primary contract types: build, operate, and turn (BOT), engineering, procurement and construction (EPC), design and build (DB). Turning to the CFPPs China finances through CDB and CHEXIM, many of these projects entail recipient countries of Chinese financing contracting with Chinese national champions or giving equity to Chinese investors. For instance, between 2002 and 2017, 21% and 26% of CDB's and CHEIXM's loans respectively are tied to Chinese equity investment in the CFPPs in question while the share of the two policy banks' financing tied to Chinese exports is much higher—64% for CDB and 81% for CHEXIM (Gallagher 2018). Thus, Chen, Doukas, Schmidt, et al. (2016, 12), when discussing the role of leading G20 economies in international coal finance, note that "China promotes coal finance because Chinese companies win an increasing share of the construction and equipment contracts" and "given the overcapacity of coal power within China, overseas projects provide international business opportunities for coal-plant equipment manufacturers and state-owned enterprises doing engineering, procurement, and construction overseas." Empirically, Gallagher and Irwin (2014) find that China has used its policy banks to help its "national champion" companies to expand in Latin America.

On the other hand, this commercial logic is also evident when one looks at the role of the policy banks—CDB and CHEXIM—in "crowding in" the commercial financing from China's state-owned commercial banks (SOCBs) to support the global expansion of Chinese national champions. In addition to providing financing to a borrowing country for a line of credit, CDB and CHEXIM also provide foreign investment support (CDB) and seller's credits (CHEXIM) to Chinese firms to go abroad and bid for the same projects, such as those depicted in Figure 1. For instance, the SOCBs have been behind the global expansion of the Chinese national champions in the power sector, such as Harbin Electric and the Huaneng Group, which have provided approximately $35 billion in direct investment (both greenfield and M&As) in CFPPs abroad for 23.4 GW

between 2002 and 2017 (Li, Gallagher, and Mauzerall 2018, Gallagher et al. 2018). Thus, the policy banks' support tends to create the "crowding in" effect on the SOCBs for two reasons. On the one hand, receipt of their backing is often seen as endorsement of the Chinese firms from a creditworthiness point of view or as an embrace of their coveted projects from the vintage point of the priority in the country's foreign relations. On the other hand, CDB and CHEXIM, with aid form the Ministry of Commerce (MofCom) at times, provide a borrowing country a battery of non-concessional (CDB), concessional (CHEXIM), and grants (CHEXIM and MOFCOM). These loans are mainly used to help recipient countries to undertake manufacturing projects, and large- and medium-sized infrastructure projects, such as CFPPs, that bring economic and social benefits, or to finance the supply of complete plants, machinery and electronic products from China, thus creating opportunities for a large cluster of Chinese companies to export and invest. Hence, China's SOCBs also provide directed financing to Chinese (and sometimes other foreign or domestic) firms for the same projects. To be sure, these interactions do not occur in every project for they are negotiated by Chinese entities and host country governments. But when do, they fit into the pattern of "coordinated credit spaces" in the globalization of Chinese development finance (Chin and Gallagher 2019).

Globalizing China's public coal financing as a way to eliminate excess capacity

To address the systematic excess capacity plaguing the Chinese industrial economy, the Chinese government resorted to a top-down public campaign approach. This top-down campaign takes the form of a broad Supply-Side Structural Reform (SSSR) the Central Economic Work Conference of the CCP Central Committee launched December 2015, according to which capacity reduction is the top priority of the SSSR (Chen, Ding, and Mano 2018). Under this campaign, the Chinese government has adopted a two-pronged approach to capacity reduction. On the one hand, it has set specific target for capacity reduction in key priority regions and specific sectors. Table 6 provides a list of the detailed capacity target for the coal power sector at home. On the hand, the Chinese government has increasingly turned to the global markets for CFP as a solution to its domestic adjustment challenge.

TABLE 6: TARGET FOR CFP CAPACITY ELIMINATION (2016-2020)

	Targeted CFP generation capacity to be phased (GW)	CFP to be abandoned or postponed (GW)	Cumulative efficiency improvement and emissions reduction in CFP (GW)
2016	5	12	400
2017	65		
2018	4		
2016-2020	20	150	420

Source: National Development and Reform Commission, State Council

The evidence that establishes the linkage between the two policy banks' global financing for CFP and the top-down campaign to eliminate excess capacity at home is found in official Chinese thinking and its two recent high-level policy documents. In an op-ed on *the South China Morning Post*, He Yafei, Vice Minister of the Overseas Chinese Affairs Office of the State Council, advocated that China should move out its overcapacity on the basis of the country's development strategy abroad and foreign policy so as to share her development dividends with other developing nations for common prosperity (He 2014). This thinking is echoed two official documents, with one issued by the country's cabinet body and another by all of financial

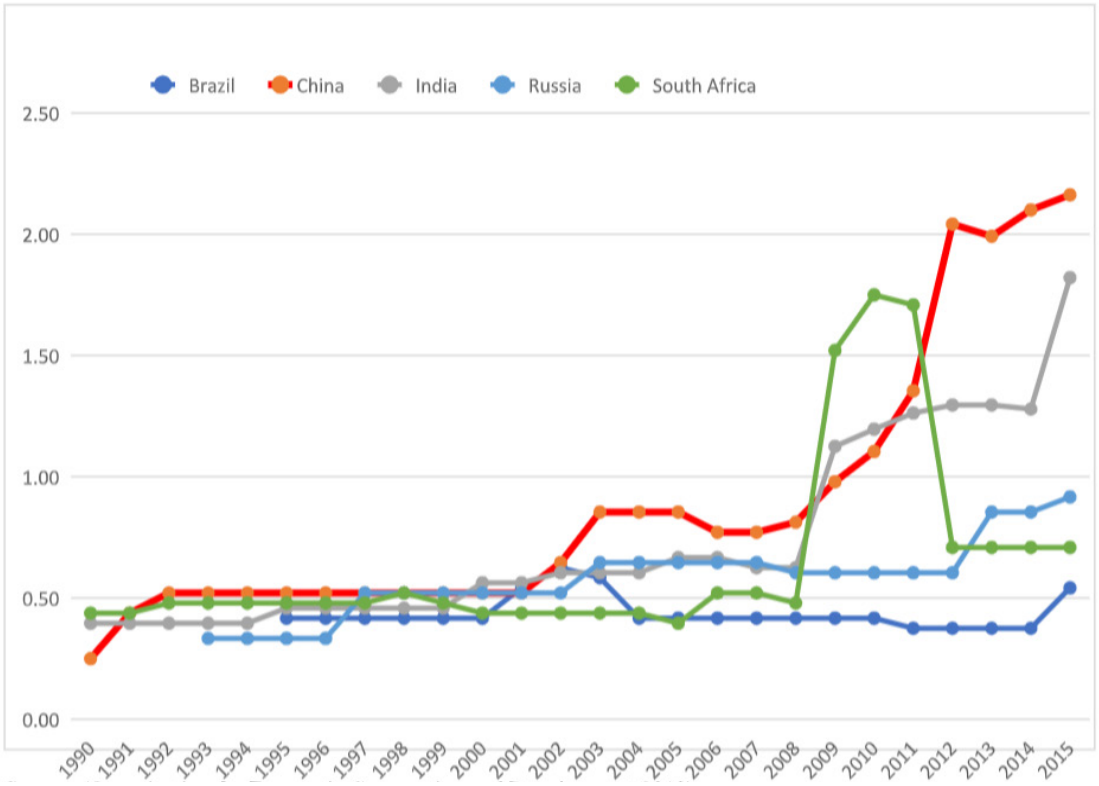
regulatory bodies. Specifically, in its *Guiding Opinions on Promotion of International Production Capacity and Equipment Manufacturing Cooperation* issued in May 2015 (State Council of the People's Republic of China 2015) as a specific guidline for the implementation of the country's BRI, the State Council called on the country's financial institutions, especially its policy banks, to facilitate the exportation of industries, especially in the 13 designated sectors as pertinent to production capacity and equipment manufacturing, which largely overlap with the sectors the State Council as suffering from excess capacity in Table 2. As a follow-up on the above-mentioned State Council decree, four central financial regulatory agencies, including the PBOC, the China Banking Regulatory Commission (CBRC), the China Insurance Regulatory Commission (CBRC), and the China Securities Regulatory Commission (CSRC), jointly issued their *Opinions On Providing Support for Reducing Overcapacity in the Iron and Ore and the Coal Sector to Achieve Development by Solving Difficulties* in April 2018 and detailed 16 specific measures of support, two of which called CDB and CHEXIM, together with their commercial counterparts, to accelerating financial support for international production capacity and equipment manufacturing cooperation in two sectors (People's Bank of China et al. 2016).

Globalizing China's public coal financing as a way to green domestic economy

In addition to boosting domestic demand and facilitating the elimination of excess capacity, the globalization of the Chinese public financing for CFP speaks to the effort on the part of CDB and CHEXIM to assist with industrial upgrading and greening at home. While one is pressed to find some trace of paper trail that can establish the linkage, the indirect evidence exists on two fronts. On the one hand, as discussed above, both the State Council and the country's central financial regulatory agencies have directed the two policy banks to provide financial support for the export of China's industrial economy that is plagued by excess capacity. The majority of these 13 sectors mentioned in the above-mentioned State Council decree are consistent with the sectors listed in Table 2 and heavily resource-intensive and pollution intensive. Thus, it goes beyond doubt that the effort to export China's industrial economy dovetails with the country's underlying effort to move its resource-intensive and pollution-intensive economy overseas. Moving overseas this "dirty" industrial economy will by default vacate space and create an opportunity for the Chinese industrial economy to upgrade and go green. This is consistent with the effort at home to shut down dirty and low-ended industrial activities to green and high-end manufacturing at home (Development Research Center of the State Council and OECD 2017; Gallagher and Qi, 2008).

On the other hand, while China remains an upper-middle income country according to the World Bank's classification, it has progressively and substantially ratcheted up its environmental protection standards recently due to domestic and international pressure. This is evidenced by the growing pollution abatement costs businesses face in China. For instance, despite a significant contraction in the total number of entities paying pollution discharge fees, the total pollution discharge fees collected in China increased almost by five-fold from $700 million in 2000 to $2,905 million in 2015 (National Bureau of Statistics of China and Ministry of Environmental Protection of China 2017). Similarly, the recent "war against pollution" China launched in 2013 (Wong and Karplus 2017) also attests to the country's hardening approach to environmental enforcement. As a result, measured in terms of environmental policy stringency index compiled by the Organization for Economic Cooperation and Development (OECD), China has attained a level that is equal to some member of the club, such as Ireland, and even higher others, such as Turkey (Organization for Economic Cooperation and Development 2019). This means that due to its aggressive regulatory approach to pollution at home China has emerged as a leader in environmental policy enforcement stringency amongst the emerging economies. A comparison amongst the so-called BRICS countries, including Brazil, Russia, India, China, and South Africa, plus Indonesia, as shown in Figure 5, provides a case in point. The same

pattern exists with respect to emission limit for existing and new power plants. As Table 7 shows, although still less robust than those in industrialized economies, China's standards are systematically higher than those in Vietnam, Indonesia, India, and South Africa, which collectively have received 58% of China's global financing for CFP between 2002 and 2018.



Source: (Organization for Economic Cooperation and Development 2019)

TABLE 7: EMISSION LIMITS FOR EXISTING AND NEW POWER PLANTS IN SELECTED COUNTRIES/REGIONS

	SO2 (mg/m3)		Nox (mg/m3)		PM (mg/m3)	
	Active	New	Active	New	Active	New
China	200-400	100	200	100	30	30
Vietnam	1500	500	1000	650-1000	400	200
Indonesia	750	750	850	750	150	100
India	200-600	100	300-600	100	50-100	30
South Africa	3500	500	1100	750	100	50
U.S.	160-640	160	117-640	117	23	23
EU	200-400	150-400	200-450	150-400	20-30	10-20
Japan	-	-	125-513	123-513	30-100	30-100

Source: (International Energy Agency 2016, 47)

However, it is premature for anyone to jump to the conclusion, as some analysts have (Sherwin 2016), that China is engaged in a systematic effort to outsource pollution. As a matter of fact, the coal-fired power plants (CFPPs) China exports are on average more efficient than their non-Chinese counterparts. Li, Gallagher, and Mauzerall (2018) examined the technology level of Chinese overseas CFPPs relative to those CFPPs from the rest of the world—examining only operational coal plants and excluding those under construction or in earlier phases of development. A total of 5.7 GW of new coal plants came online during the period through Chinese outward investment in Indonesia, Cambodia, Pakistan, Vietnam and India. The authors found that 58 percent of these power plants were equipped with more efficient supercritical technologies, compared to only 44 percent of those power plants from the rest of the world.

Nevertheless, the two pieces of indirect evidence presented above substantiates our argument that CDB and CHEXIM globalize their public financing for CFP as a way to support the domestic effort to upgrade and green the Chinese economy at home.

Alternative view: strategic interests drive China's global financing for CFP

While providing our structural analysis of why China has increased its public financing for CFP worldwide while moving away from coal since 20002, we are cognizant of an alternative hypothesis. This hypothesis ascribes China's global financing for CFP to an attempt to pursue strategic purposes, such as geopolitical power and influence. In a recent study, Hervé-Mignucci and Wang (2015, 10) hold that China's engagement in CFP worldwide "helps it strengthen strategic political ties and increase its sphere of influence." This is a variation of the realist argument of states pursuing power in the international relations (IR) literature and assumes a high level of coordination between the execution of China's provision for CFP financing worldwide and its pursuit of "strategic goals."

However, this hypothesis is of limited explanatory power on both practical and theoretical grounds. Practically, the evidence of a strategic logic behind China's global financing for CFP is dubious. The Pew Research Center conducts surveys about global attitudes toward China. This survey reveals how people around the world think of China. Although imperfect, this attitude indicator could be used as a proxy for identifying countries that seek or maintain strategic ties with China. Intuitively, people in countries that perceive China as a strategic partner are likely to view China more favorably than those without. A juxtaposition of the Pew dataset and the China Global Energy Finance dataset allows us to see how the top ten recipients of China's global financing think of China as shown in Table 8. A quick glimpse at Table 8 points to the mismatch between a country's share of China's global financing for CFP and its importance for China. For instance, 70% of the respondents view China favorable in Russia, suggesting that Russia is a strategic patterner for China. This is consistent with the growing strategic ties between the two countries as evidenced by their deepening bilateral economic and security cooperation and strategic coordination in regional and international institutions, such as the Shanghai Cooperation Organization (SCO), the BRICS (Brazil, Russia, India, China, and South Africa), G20, and even the United Nations. Despite the strategic importance of Russia for China, its share of China's global financing for CFP is ranked at the bottom of amongst the top 10 recipients of the Chinese financing for CFP from 2002 to 2018. In contrast, only 10% of the respondents view China as favorable in Vietnam, indicating that Vietnam is not a country that seeks or has a strategic relationship with China. Considering the dispute between the two countries over the South China Sea and Vietnam's decision to upgrade its military relationship with the United States, of which China is very suspicious, Vietnam is likely to occupy a much lower level of strategic importance for China. However, it has received more than four times more of Chinese financing for CFP from 2002 to 2018 than Russia.

TABLE 8: DISTRIBUTION OF CHINA'S GLOBAL FINANCING FOR CFP AND OPINIONS OF CHINA

	Total inflow of Chinese financing for CFP in 2002-2018 $ billion)	share of total Chinese financing for CFP (2002-2018)	% responding favorable	% responding unfavorable
Vietnam	9.3	17.9%	10%	88%
Indonesia	8.6	16.6%	55%	36%
India	7.7	14.8%	26%	41%
Pakistan	4.9	9.4%	-	
South Africa	4.5	8.7%	45%	32%
Ukraine	3.5	6.7%	-	
Bangladesh	2.1	4.0%	-	
Bosnia and Herzegovina	2.1	4.0%	-	
Russia	2	3.9%	70%	24%
Kazakhstan	1.7	3.3%	-	

Source: (Gallagher 2018, Pew Research Center 2017)

Theoretically, as Norris (2016) notes, what constitutes strategic dividends are often quite ambiguous; as a result, there is little consistent and overwhelming evidence that supports the view that China has successfully deployed its growing economic presence around the world to obtain "strategic externalities" beyond its economic goals. The root cause of this ambiguity over strategic dividends is chiefly caused by the three fundamental problems embedded in a principal-agent relationship, i.e., ambiguity over goals, complications over delegation in implementation, and asymmetric information over service monitoring, which Fukuyama identifies as the classic problems of governance (Fukuyama 2004). A case in point is the assertion Hervé-Mignucci and Wang (2015, 10) make that China finances CFPPs worldwide to increase "its sphere of influence" without providing any clarification how one can measure and assess the "influence."

However, if one defines strategic goals in economic or structural terms along the lines of our analysis above, the verdict is different. In other words, if one sees the objectives of boosting China's domestic demand, exporting its excess capacity, and upgrading/greening its industrial economy at home, the outcome of which not only affects the competitiveness of the Chinese economy but also dictates its sustainability and impacts on the rest of the world, as strategic, then China's globalization of its public financing for CFP fits in with the typical IR realists perspective.

Conclusion

Our systematic investigation into China's bifurcating stance on coal at the beginning of the 21st century speaks to a distinct economic logic. This logic echoes the fundamental premise of our research, i.e., CDB and CHEXIM are two potent arrows in Beijing's policy quiver and their mandate is to execute national policy objectives. Consistent with this logic, we have found that these two policy banks have globalized the Chinese public financing for CFP to primarily boost domestic demand, export national champions and domestic excess capacity, and to facilitate upgrading and greening of the Chinese economy.

While revealing a heavy "homeward linkage" tied back to the country's fundamental economic interests at home, China's increasing global financing for CFP, nevertheless carries profound global implications. Indeed, it points to this growing need for an investment-based accounting of carbon emissions. Our study shows that this is increasingly important a major carbon emitter may cut back on its emissions at home but contribute to more emissions indirectly overseas. In this regard, China has eclipsed all of the other G20 nations in exhibiting this domestic-overseas disconnect in its coal-related CO2 emissions. Figuring out how to keep track of the investment-led carbon emissions is increasingly important as China has emerged as one of the largest exporters of capital around the world, trailing only behind the United States and Japan. Further, China's transition toward a consumption-driven and services-oriented economy, together with its industrial upgrading and greening, will, as indicated by our study, only provide further push for China to globalize its economy and thus its industrial policy. One factor that may limit this push is the growing recognition that coal investments may increasingly become 'stranded assets' as the price of alternatives decreases and the social costs of coal are more realized (see Caldecott, 2017).

This paper has focused on the domestic, supply-side drivers of Chinese overseas CFP finance by its policy banks, and has not examined the demand side pull factors (see Gallagher et al, 2019). These factors, as hypothesized earlier, may include, but not limited to, the growing demand for power, the existence of large coal deposits, and the withdrawal of development financing from the West and its led-MDBs. Obviously, a systematic analysis of those factors will be essential to compete the story about the globalization of China's global financing for CFP. Thus, it is to the pull factors that our future work will turn.

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