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Chinese development finance for solar and wind power abroad

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ABSTRACT

This study seeks to shed light on a puzzle about China's role in global energy finance. The past two decades have witnessed China's rise as the world's leading provider of official development finance (ODF) for energy. However, the overwhelming majority of the Chinese ODF has flown to fossil fuels projects, with solar and wind power representing 2.6% the total for electric power worldwide and 1.1% of the total for all forms of energy combined. This is puzzling because that China has maintained its global leadership in solar and wind energy investment, manufacturing, and deployment since 2008, its two policy banks have been tasked to promote the global expansion of the Chinese renewable industry under its international development strategy, and the investment potential for solar and wind power worldwide is gargantuan. To understand why China has merely mobilized such a small fraction of its ODF for solar and wind power worldwide, this study examines both the push factors inside China and the pull factors in the countries that have received Chinese ODF for their solar and wind power projects. It finds that the direct push from the central government in China for its two policy banks, i.e., China Development Bank (CDB) and China Export and Import Bank (CHEXIM), to finance solar and wind power overseas has had a limited impact. On the contrary, the two policy banks have responded to the pull factors in the recipient countries of Chinese ODF and financed solar and wind power projects there to promote the global expansion of Chinese renewable firms and the export of Chinese renewable energy equipment and product, which is also consistent with what the two policy banks are mandated to do. In this sense, Chinese ODF for solar and wind power worldwide is a byproduct of an indirect push from the Chinese government and pull from overseas. The miniscule proportionality of solar and wind power out of the aggregate Chinese ODF for energy worldwide has to do with the following three factors—the policy banks' reservations about solar and wind projects overseas, the setback CDB encountered in Europe, and the required government-to-government involvement that makes it difficult for solar and wind power projects overseas to secure Chinese ODF.

Introduction

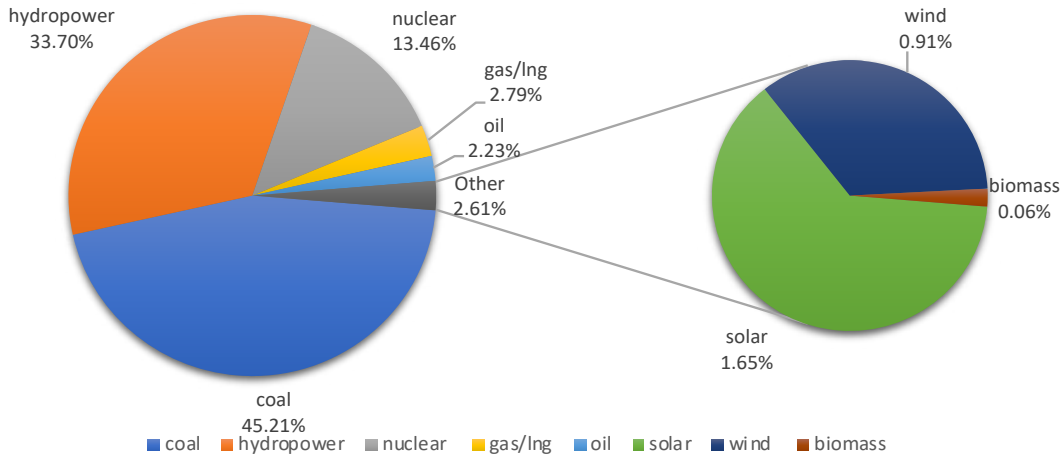
Considering that the power sector accounts for 40% of global CO2 emissions and represented nearly two-thirds of the world's emissions growth in 2018 (International Energy Agency 2019a), China's emergence as a global leader in financing the investment, manufacturing, and deployment of solar and wind energy for the past decade since 2008 (Frankfurt School-UNEP Centre/BNEF 2019; REN21 2019) carries profound implications. In addition to facilitating the transition of the world's biggest energy consumer and CO2 emitter toward carbon-free electricity and augmenting the country's endeavor to peak its emissions around 2030 (Climate Action Tracker 2019), the global implications of China's leadership in renewable energy are at least three-fold. To begin, China's push for renewable power expansion domestically not only creates some positive demonstration effect but also helps drive down the costs of solar and wind power worldwide through the export of made-in-China equipment and technologies (Lacal-Arántegui 2019; Liu and Goldstein 2013). Next, China's emergence as the global leader in renewable energy coincides with the country's rise as the world's No. 2 origin of foreign direct investment (FDI) outflows (United Nations Conference on Trade and Development 2019) and its pursuit of an international development strategy comprised of the "going out" strategy and the Belt and Road Initiative (BRI) (OECD 2018), the latter of which lists energy infrastructure, including renewable energy, as one of its top priorities (Zhou et al. 2018). Thus, it comes as little surprise that Chinese firms engaged in renewable energy technology production and renewable power project development have been increasingly globalizing their operations since the country rolled out its international development strategy (Buckley and Nicholas 2017; Curran et al. 2017; Li et al. 2020; Tan et al. 2013; Zhang et al. 2015). Finally, China's ascent in the global renewable energy market occurs against the backdrop of the country's transformation into the world's leading player in official development finance (ODF) for energy (Gallagher et al. 2018; Kong and Gallagher 2017; Kong 2019), thus invoking the prospect that China could mobilize its ODF to facilitate renewable power expansion overseas.

There are at least four factors that enhance the likelihood of China mobilizing its ODF to finance solar and wind energy worldwide. First, with a decade of global leadership in renewable energy investment, manufacturing and deployment, China has nurtured a globally competitive solar and wind industry that has already expanded overseas and is ready to expand more. Second, the two providers of Chinese ODF—China Development Bank (CDB) and China Export and Import Bank (CHEXIM)—have a mandate to promote the globalization of the renewable energy industry under the aforementioned two pillars of the country's international development strategy. Third, Cabré et al. (2018) estimate there to be almost $800 billion dollar solar and wind investment potential worldwide based on the renewable energy development targets outlined in the National Determined Contributions under the Paris Climate Accord. The Chinese solar and wind energy industry is uniquely positioned to take advantage of this opportunity with the support of the two policy banks. Finally, financing solar and wind energy overseas dovetails with China's growing readiness to engage in and lead global energy and climate governance (Kong 2011; Preston et al. 2016; Zhu 2016).

With the above-mentioned four factors in mind, one should expect to see some massive Chinese ODF for solar and wind energy worldwide. The empirical reality, however, calls into question this assumption. While China has become the world's largest financier for electric power projects around the world over the past decade or so (Han Chen and Schmidt 2017; S&P Global Platts 2018), it has thus far channeled a minuscule fraction of its ODF for the power sector overseas to solar and wind projects worldwide. As Figure 1 reveals, the proportion is only 2.6%. In contrast, as illustrated in Figure 1, over three quarters of Chinese ODF for the power sector has flown to coal-fired power (45.3%) and hydropower (33.8%) overseas (Gallagher 2018). Measured in terms of the proportion of the aggregate Chinese ODF for all types of energy projects around the world since the beginning of the 2000s, the share of solar and wind power overseas is even smaller. As Figure 2 shows, foreign solar and wind power projects have thus far attracted just slightly over 1% of the total Chinese ODF for energy worldwide whereas fossil fuels projects received 75%. Hence, it goes beyond doubt that the above-mentioned prospect has failed to materialize, raising the question of why China has dedicated

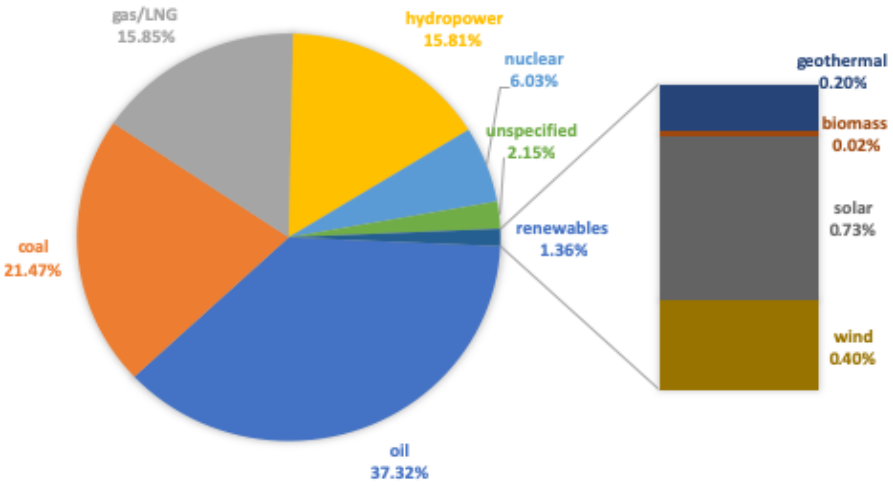
so little of its ODF to solar and wind power overseas. The puzzle is more intriguing when we look at the role of the CDB and CHEXIM in financing the expansion of solar and wind power in China and the push in China for the twin policy banks to support the globalization of the Chinese solar and wind industry as part of the country's "going out" strategy and BRI. Further, considering the growing footprint of Chinese ODF for energy worldwide, which in turn carries profound climate implications, this puzzle also gives rise to an important policy question—under what circumstances will China channel more its ODF to support solar and wind power expansion abroad?

Figure 1: Power projects financed by CDB and CHEXIM worldwide by sector (2000-2018)



Source: (Gallagher 2018)

Figure 2: Global energy projects financed by CDB and CHEXIM by type (2000-2018)



Source: (Gallagher 2018)

While much ink has been spilled on China winning the clean energy race and the globalization of its renewable energy industry through export, overseas contracting, and outward FDI (OFDI) in the form of both greenfield investment and mergers and acquisitions (M&As), little is known about the limited role of Chinese ODF for solar and wind power overseas. Given China's outsized importance in global development finance for energy, the scant attention this topic has received thus represents a lacuna in the broad literature. Viewed from a policy perspective, this lack of understanding also hampers any comprehensive endeavor to properly assess China's contribution to the global expansion of carbon-free electricity and by

extension the global energy and climate governance.

To tackle the puzzle, we will adopt a push-pull analytical framework to examine both the factors inside China that push CDB and CHEXIM to finance solar and wind projects overseas and those outside in the seven recipient countries of Chinese ODF that pull CDB and CHEXIM in to support their solar and wind power expansion. On the push side, we will examine the role of the top-down policy drivers put in place by Beijing and the pressures building up in the Chinese solar and wind power sector, which call for the help of CDB and CHEXIM. Then, we will draw on our field research to understand the mentalities of the two Chinese policy banks about when, why, and how they finance solar and wind projects overseas. After that, we will switch to the demand side and conduct an in-depth analysis of all of the solar and wind projects in the seven countries that we have confirmed receipt of financing from CDB and CHEXIM over the past decade.

Our analysis shows that the demand-side factors in the countries that turn to CDB and CHEXIM for capital that are the primary drivers behind the Chinese ODF for renewable power worldwide. In contrast, the direct push in China has not led to Chinese ODF of any serious magnitude for solar and wind power overseas. As our investigation into the seven countries that have received Chinese ODF will show, CDB and CHEXIM have financed solar and wind power in those markets primarily to promote the global expansion of Chinese renewable energy firms and Chinese export, which dovetails with Beijing's push for the two policy banks to mobilize ODF for solar and wind power overseas under its international development strategy. Hence, it is clear that the push factors have a played role in facilitating Chinese ODF for international solar and wind power overseas but they have exerted their impact mainly indirectly.

We structure the study as follows. We will review the parameters and profile of Chinese ODF for solar and wind power worldwide in Part II. Then we test the hypotheses about three supply-side factors that are thought of being hurdles to Chinese ODF for solar and wind power overseas. After rejecting these hypotheses. we will advance an alternate view in Part IV to account for the puzzle of the study. We will conclude and draw out the policy implications of the study in Part V.

Profile of the Chinese development finance for solar and wind power worldwide

Table 1: Solar and wind projects financed by CDB and CHEXIM (2010-2018)

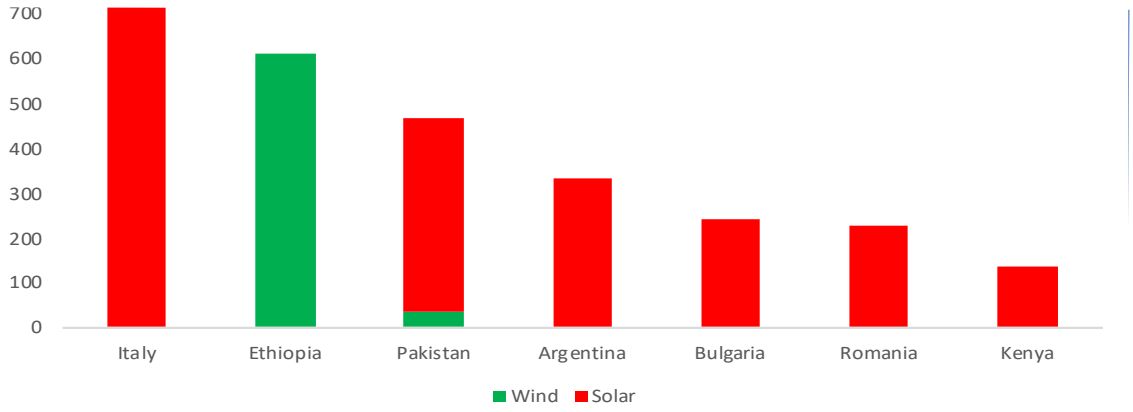
Year	Country	Project	Installed capacity (MW)	$ million
2010	Italy	Global Solar Fund Sicar	142	730
2011	Ethiopia	Adama Wind Farm	51	99.45
2013	Ethiopia	Adama Wind Farm II	153	293.25
2013	Bulgaria	PV plants built by Haeron Solar and Chaori Solar	103	180
2013	Romania	Ucea de Sus solar Park and ESPE	59.1	112
2014	Pakistan	Three Gorges Second & Third Wind Power	49.5	34
2015	Pakistan	Quaid-e-Azam Solar Park Phase II	300	247.4
2015	Pakistan	UEP Wind Power Plant in Jhimpir, Thatta	99	187.5
2017	Kenya	Garissa solar	50	135.7
2017	Argentina	Cauchari Solar I, II and III	315	332
2017	Ethiopia	Aysha I wind farm	120	218.45
Total			1441.6	2522.75

Source: Authors' compilation

Table 1 lists all of the solar and wind projects CDB and CHEIXM have financed from 2010 to 2019. Before discussing these data, we will first explain where and how we have compiled our data. We draw our data primarily from the China Global Energy Finance dataset maintained by the Global Development Policy Center at Boston University and then corroborate them with the following sources: annual reports of CDB and CHEXIM and the official reports from the Chinese firms that participated in the projects financed by the two policy banks, including their annual reports, press releases, annual filings to the U.S. Securities and Stock Exchange Commission (SSEC). When engaged in this rigorous cross-check, we find ourselves unable to establish the veracity of the following three projects reported in the China Global Energy Finance data set. They include one solar project in Chile, another one in Cuba, and a wind project in Ecuador, all of which were reportedly financed by CDB. Accordingly, we have decided to remove all three projects from the data we report in this study. Further, our intensive verification process also alerts us to some of the M&As not included in China Global Energy Finance dataset, all of which occurred in Bulgaria and Romania. As we located the data in the official corporate annual reports or filings to the U.S. SSEC, we deem them to be reliable and have thus included them. With these adjustments, all of the data we report in this study represent solar and wind projects that have been completed under the auspices of financing from CDB and CHEXIM. While CDB and CHEXIM have been reportedly committed to finance the Quaid-e-Azam Solar Park Phase II and III, we only include in our analysis Phase II of the project as it has been completed. Therefore, the amount of Chinese ODF we report in this study appears smaller than those that include both Phase II and Phase III of the Quaid-e-Azam Solar Park.

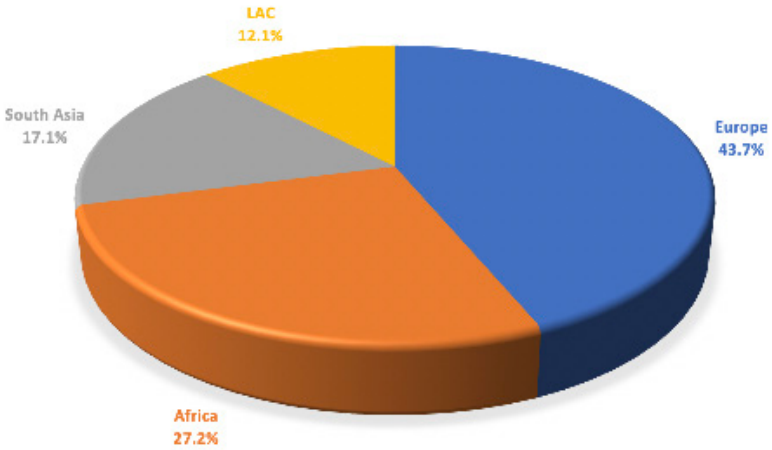
There are four ways to decipher the data. First, in terms of geographical distribution, the Chinese ODF for solar and wind projects from CDB and CHEXIM is scattered across seven countries in four regions. Figure 3 ranks these seven countries in a pecking order according to the amount of Chinese ODF they have received from 2010 to 2018. Grouped on a regional basis, the Chinese ODF for international solar and wind power is scattered across Europe, Africa, South Asia, and Latin America & Caribbean (LAC), with each accounting for 44%, 27%, 17% and 12% of the total respectively. Europe captured more Chinese ODF than other regions thanks to CDB's aggressive support for M&As by Chinese solar firms in Bulgaria, Italy, and Romania. Africa received more than one quarter of the total Chinese ODF largely because of CHEXIM's support for three wind farms in Ethiopia and one soar project in Kenya. Second, in terms of the source of financing, CDB has lent more than CHEXIM. From 2010 to 2018, CDB has contributed 56% of the total Chinese ODF for foreign solar and wind power while CHEXIM has provided the remaining 44%. This pattern is consistent with what we have found about the twin policy banks' share in China's global ODF for all forms of energy (Kong and Gallagher 2017). Thirdly, in terms of installed power generating capacity, CDB and CHEXIM have financed more solar power than wind power projects overseas. This is true in terms of both the amount of financing and the total installed capacity for which the twin policy banks are responsible. Coincidently, this is consistent with the basic reality back in China—while its wind industry is geared toward domestic absorption, its solar industry has been highly dependent upon markets overseas (Lacal-Arántegui 2019). Finally, when plotted on a chronological basis, China's ODF for international solar and wind power, as shown in Figure 6, registers a downward trajectory punctuated by fluctuations. In addition, CDB and CHEXIM do not provide financing for solar and wind power every year. Instead, Figure 6 suggests that they appear to finance solar and wind power projects on an ad-hoc basis.

Figure 3: Solar and wind projects financed by CDB and CHEXIM worldwide measured by loan amount ($ million)



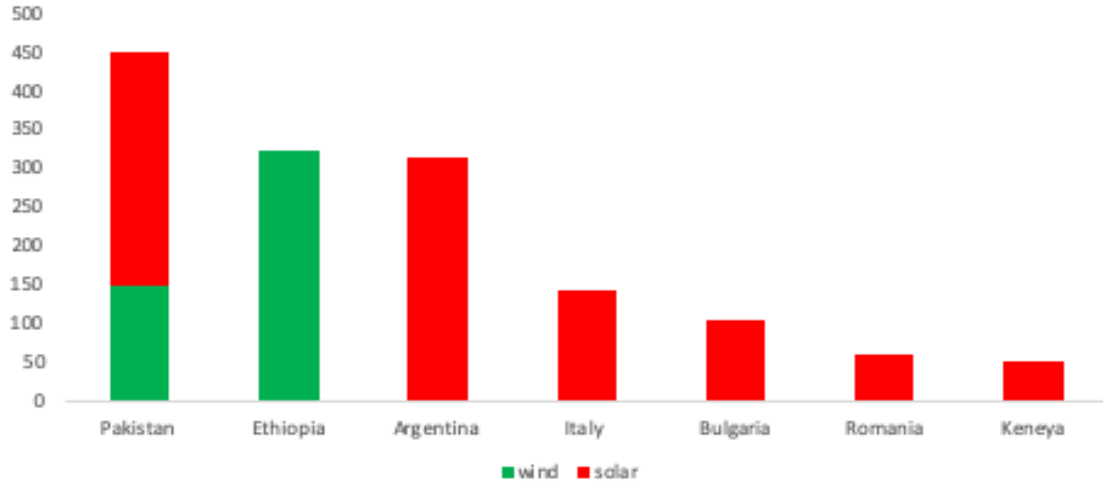
Source: Authors' compilation

Figure 4: Distribution of Chinese ODF for solar and wind projects by region (2010-2018)



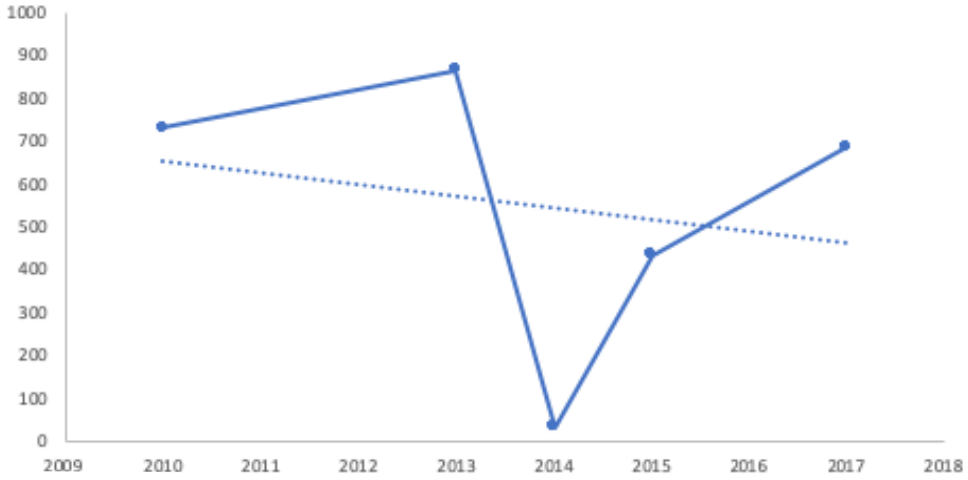
Source: Authors' compilation

Figure 5: Distribution of solar and wind power generating capacity installed through Chinese ODF (2000-2017)



Source: Authors' compilation

Figure 6: A chronological look at China's ODF for solar and wind projects overseas



Source: Authors' compilation

Drivers for CDB and CHEXIM to finance solar and wind power overseas

The downward trajectory and sporadic profile of China's ODF for international solar and wind projects is surprising because CDB and CHEXIM are actually the main reason behind the renewable energy boom in China. According to CDB, its lending for renewable power at home registered a four-fold increase between 2011 and 2015, with its cumulative lending for renewable power exceeding 300 billion yuan (about $46 billion[1]) and the outstanding balance of its lending for renewable power surpassing 200 billion yuan (about $31 billion) at the end of 2015 (China Development Bank 2016). When measured in terms of installed capacity, it is beyond doubt that CDB constitutes the secret behind the renewable power expansion in China. As of the end of the third quarter of 2015, CDB has financed the installation of 38.58 gigawatts (GW) of wind power and 9.28 GW of solar power, accounting for 35% and 29% of the grid-connected solar and wind power across the country respectively (China Development Bank 2016). Although at a much smaller scale, according to Ban Yongzhi, Deputy Director responsible for energy lending at CHEXIM, the bank has issued a total of 46.4 billion (about $7 billion) yuan and 14.6 billion yuan (more than $2 billion) worth of loans for solar and wind energy respectively by the end of 2017 (Ban 2018). To put these numbers in perspective, CHEXIM's lending for renewable power is roughly somewhere between one fifth and one third of that of CDB. For the lack of official data from CHEXIM, we can only infer on the basis of the CDB numbers to estimate the amount of renewable power generation capacity for which CHEXIM's loans were responsible. Using this indirect inference, we estimate that by the end of 2017, CHEXIM has probably financed about 6-9% of the total renewable power generation capacity in China. Taken together, CDB and CHEXIM are therefore responsible for about 40% of installed solar and wind power in China.

Further, there are at least three sets of drivers in China that push CDB and CHEXIM to engage in renewable power financing abroad. First, as arms of the Chinese state, their mission to fulfill its strategic priorities regarding the "going out" strategy launched in 2001 requires the two policy banks to finance renewable power overseas. Specifically, both banks have pledged financial targeting in support of the following four types of international expansion by Chinese firms: to develop resource projects that can improve the country's resource security, to participate in productive and infrastructure projects that can promote the country's export, to acquire strategic capital, such as technical know-how, managerial know-what, and professional talents, that can enhance the country's technological prowess, and to engage in merges and

1 Authors' calculation based on the yearly average exchange rates for converting foreign currencies into U.S. dollars published by the U.S. Internal Revenue Services.

acquisitions (M&As) that can improve Chinese companies' global competitiveness and accelerate their exploration of international markets (Kong and Gallagher 2017). Considering that the resource security concerns in China are largely focused on the country's growing dependence on imported agricultural and food commodities, minerals and metals, and especially oil and gas commodities (Farooki and Kaplinsky 2013; Preston et al. 2016), it is natural that renewable projects overseas are rarely linked to China's resource security considerations. However, the other three forms of international expansion to be supported by CDB and CHEXIM are all pertinent to the renewable industry. For instance, a Chinese firm's participation in building a renewable power project abroad that entails the export of Chinese renewable technologies, equipment, labor, and services fits in with the second form of international expansion described above. This participation can take the form of OFDI or overseas contracting. Further, so far as CHEXIM is concerned, promotion of Chinese export under the "going out" strategy is also consistent with its mission. Indeed, since its inception in 1994, CHEXIM has always been tasked to promote Chinese export, especially in areas that feature high-tech, high value-added, and home-born intellectual property rights (Li Ruogu 2008). Finally, a Chinese renewable energy firm's acquisition of a foreign entity that could shorten its technological learning curve or enhance its global competitiveness by virtue of gaining direct access to its end market abroad also dovetails with the third and fourth form of aforementioned activity CDB and CHEXIM pledge to back. In short, the "going out" strategy constitutes a major policy driver that pushes CDB and CHEXIM to finance renewable power overseas as part of their effort to assist with the OFDI, overseas contracting, and export of the Chinese firms engaged in renewable energy technology production and project development.

Second, the deterioration of the renewable energy industry outlook at home and abroad in 2011-2012 added urgency to the global expansion of the Chinese renewable energy industry under the auspices of the two policy banks. Domestically, after years of exuberant expansion, the solar and wind industry started to feel the pinch and came under the pressure of consolidation in the face of enormous excess capacity. While signs of excess capacity in the solar and wind sector emerged as early as 2009 (State Council of People's Republic of China 2009), the solar PV production capacity in China exceeded the entire global demand by 33% by 2012 while its wind power equipment manufacturing capacity surpassed two times of the country's domestic demand for the same period (KPMG Global China Practice 2014). Externally, the 2008 global financial crisis compelled the fiscally-strapped European countries to roll back subsides for renewable energy consumption, which not only depressed their demand for made-in-China renewable equipment and but also increased competition for their shrinking demand, thereby giving rise to impulses of trade protection against growing Chinese export (Curran et al. 2017; Liu and Goldstein 2013). Similarly, fears about the threat of Chinese export backed by state subsidies to local industries also gave rise to protectionism in other countries, such as the United States and India, and led to tariffs against renewable energy export from China. The combination of the growing excess capacity at home and decreasing demand from abroad converged in 2011-2012 to plunge China's solar and wind power sector into recession, with the country's solar PV export dropping by 35% in 2012 (KPMG Global China Practice 2014). With external demand collapsed and excess capacity piling up, some of the country's prominent industry leaders that pursued reckless expansion oblivious of the aforementioned domestic and external challenges had little alternative but to declare bankruptcy. The spectacular downfall of two China's biggest solar firms listed on the New Stock Exchange, i.e., Suntech Power[2] and JK Solar,[3] are a reminder of the scale of challenges confronting the renewable industry in China in 2011-2012. Against this backdrop, it comes as little surprise that Liang Zhipeng, Deputy Director General of the New Energy Department of China's National Energy Administration (NEA), publicly urged the country's state-owned financial institutions to assist with the going out of its renewable energy firms that takes the form of exporting products, investing overseas, and the globalization of the entire value chain of China's renewable energy industry (Duan Wenjuan 2015).

- 2 Rise and fall of Suntech, the largest producer of solar panels, https://www.reuters.com/article/us-suntech-shi-special-report/special-report-the-rise-and-fall-of-chinas-sun-king-idUSBRE94I00220130520
- 3 Downfall of JK Solar, the world's largest in produce solar wafer. , http://finance.ce.cn/rolling/201805/08/t20180508_29058584.shtml,

Finally, launched in 2013 against the backdrop of declining external demand from the West following the 2008 global financial crisis, growing excess capacity plaguing China's industrial economy, and a self-imposed investment slowdown aimed at fending off a debt crisis across the country, the Belt and Road Initiative (BRI) introduces another policy driver that pushes CBD and CHEXIM to finance renewable projects overseas. For instance, Article 11 of the **Guiding Opinions of the State Council on Promotion of International Production Capacity and Equipment Manufacturing Cooperation** urges Chinese companies to actively participate in investment and construction of wind power and solar photovoltaic projects abroad so as to propel international cooperation in the production capacity of wind power and photovoltaic electric power generation and in manufacturing of equipment thereof" (State Council of the People's Republic of China 2015). As arms of the Chinese state, CDB and CHEXIM are expected to play the role of a kingpin in financing the BRI overseas.

Reluctancy of CDB and CHEXIM

Do the above-mentioned drivers provide CDB and CHEXIM with enough push to finance solar and wind power overseas? If they do, we would have seen plenty of solar and wind projects overseas financed by CDB and CHEXIM as the Chinese government has pursued the going out strategy since 2001 and the BRI since 2013. Obviously, the underwhelming scale Chinese public finance reported in Table 1 suggests that this push has not been sufficient. To understand when and why CDB and CHEXIM decide to finance solar and wind projects overseas, one of the co-authors conducted some semi-structured dialogues with a few mid- and senior-level managers of CDB and CHEXIM and seasoned analysts with two environmental NGOs that follow the global expansion of the two banks in Beijing in the week of November 20, 2019. In this section, we will report two main findings that have some bearing on the puzzle we are wrestling with.

First, our dialogues point to the external demand for solar or wind power financing as a primary factor behind why the two policy banks have not financed much renewable power overseas. When presented with the author's data about the lack of Chinese public finance for solar and wind power overseas, a mid-level CHEXIM official provides the following response: "as a supplier of financing, we are simply on the receiving end of loan applications. We have no influence whatsoever over how our sovereign or corporate clients select their projects and what they request financing for. Instead, we evaluate the loan applications on the basis of their profitability, risks, and compatibility with local development."[4] A mid-level CDB manager went one step further, saying that: "Not every government turns to us for financing. When they do, many of them are governments of Asian, African, and LAC countries. When they approach us for loans, they invariably prioritize financing for the development of their industrial economy and their endeavor to improve access to public housing, public health, and clean water. In contrast, requests for loans to develop renewable power often occupy a very low priority in these countries' loan applications."[5] These insider accounts suggest that CDB and CHEXIM have financed renewable power projects from time to time simply because these projects have met their selection threshold. While demonstrating respect for local autonomy when working with their sovereign clients, CDB and CHEXIM have also revealed their indifference to renewable power projects overseas.

Second, our dialogues highlight a number of inherent reservations CDB and CHEXIM have about the bankability of solar and wind power projects overseas. A senior manager at a Beijing-based NGO observed that China, as the world's largest electric power market, can literally help other countries build whatever form of electric power capacity they want to develop; the reason behind the underwhelming scale of Chinese public finance for solar and wind power projects overseas is that many of these projects are simply not

- 4 Bo Kong, dialogue with a mid-level official in charge of lending for renewable power projects at CHEXIM, Beijing, November 23, 2019.
- 5 Bo Kong, dialogue with a mid-level official in charge of corporate clients at CDB, Beijing, November 23, 2019.

profitable and therefore shunned by Chinese companies, especially in places that have plenty of coal or natural gas[6]. The above-mentioned CHEXIM official attributed the bank's limited financing for solar and wind power abroad to the following three inhibiting factors: first, its sovereign clients, especially those in Asia, Africa, and LAC, often lack the necessary fiscal largesse to subsidize the development of renewable power; second, in absence of these subsides, the renewable electricity generated is not as competitive as that is generated from coal or natural gas; third, many of these countries are in need of base-load power, but without affordable and reliable storage technologies solar and wind power are unable to provide base-load electricity.[7] Similarly, CDB also exercises a lot of caution when approached for loans to renewable power projects abroad. According to the above-mentioned CDB official, the bank bases its decision of a loan application for a solar or wind project overseas on both key financial indicators pertinent to the project, including profitability, future cash flows, and debt-paying ability, and technical indicators, such as grid connectivity and electricity transmission capacity; a failure to meet these financial and technical thresholds will lead to CDB's rejection of the loan application.[8]

Two factors may account for the high level of reluctancy CDB and CHEXIM harbor about solar and wind projects overseas. On the one hand, the two banks' heavy emphasis on the issue of bankability has a lot do with how they raise their funds. As we have discussed elsewhere, both of the policy banks raise the overwhelming majority of their funds through the financial bonds they sell at home (Kong and Gallagher 2017; Kong 2019) against the backdrop of the growing interest rate liberalization (Feyzioğlu et al. 2009). What this means is that their primary fundraising is marketized and the cost of this fundraising has been on the rise over the time. Thus, it thus comes as little surprise that CDB and CHEXIM closely scrutinize the financial viability of the renewable projects when evaluating the corresponding loan applications. Indeed, the interlocutors we spoke to in Beijing kept referring to the importance of "bankability" when discussing whether to finance renewable power projects overseas. To make sure they are able to recover their loans, the two policy banks frequently condition their loans on the presence of reliable revenue streams, credible collaterals, government guarantees, or mortgage them on a client country's future commodities export and resource exploration (Bräutigam 2014). Coincidently, both of the policy banks, especially CDB, had adopted a similar practice at home (Sanderson and Forsythe 2013) before engaging in ODF for energy worldwide.

On the other hand, the two policy banks' experience in promoting renewable power at home may very well have contributed to their reservations about getting involved in renewable projects overseas. When asked to explain this reluctancy, a seasoned NGO-based analyst characterized it as an implicit bias that is derived from the two policy banks' sharpened sensitivity toward the typical problems, including intermittency, grid connectivity, as well as high dependence on subsidies for grid parity that have plagued their promotion of solar and wind power expansion in China.[9] We hear an echo of this implicit bias when the above-mentioned CHEXIM official drew a parallel between China and other developing countries that strive to expand renewable power, saying: "considering the amount of problems the renewable power expansion has experienced in China, it is natural these developing countries will have more problems in light of their stage of development. Because of these problems, renewable power for the moment will only remain at a demonstration stage in these countries."[10]

- 6 Bo Kong, dialogue with a senior program manager at an NGO that closely interacts with CDB and CHEXIM, Beijing, November 22, 2019.
- 7 Bo Kong, dialogue with a mid-level official in charge of lending for renewable power projects at CHEXIM, Beijing, November 23, 2019.
- 8 Bo Kong, dialogue with a mid-level official in charge of corporate clients at CDB, Beijing, November 23, 2019.
- 9 Bo Kong, dialogue with a mid-level official in charge of lending to corporate clients for renewable power projects at CHEXIM, Beijing, November 24, 2019.
- 10 Bo Kong, dialogue with a mid-level official in charge of lending for renewable power projects at CHEXIM, Beijing, November 23, 2019.

Reality check from the recipient countries of Chinese public finance

How does the reluctancy we detect about CDB and CHEXIM regarding solar and wind power overseas square with the empirical reality? Ideally, we would like to analyze the time series data on all of the loan applications CDB and CHEXIM have received or rejected for solar and wind power overseas. That would allow us to assess if the lack of demand for Chinese ODF from abroad is the reason why CDB and CHEXIM have not financed much renewable power abroad. However, our dialogues in Beijing suggest that such data might not exist; even if they do, the challenge we have encountered in obtaining more access to the two policy banks indicates their inaccessibility. This means we have to alter the way we try to answer the counterfactual puzzle of why CDB and CHEXIM have not financed more renewable energy projects worldwide. Instead of providing a direct treatment under the ideal circumstance, we can turn to the cases where CDB and CHEXIM have actually financed solar and wind power projects and see if the underlying reality is consistent with the perspectives from the two policy banks.

A compelling turn to renewable power in the seven countries

A careful examination of the seven countries that have received Chinese ODF for renewable power expansion reveals three commonalities: first, all countries are rich in renewable energy resources and have such a compelling reason to turn to solar or wind power that fossil fuels cannot replace; second, to promote solar or wind power, all countries have rolled out support measures that have enhanced the bankability of their renewable power projects; and, third, all countries enjoy good relations with China. Considering how the implementation of such a turn to renewable power is inseparable from renewable equipment manufacturing, capital investment, and project development, the push for solar and wind power in these seven countries has undoubtedly created opportunities for China, which has been leading the world in renewable investment, manufacturing, and deployment.

To begin, this compelling turn to renewable power has two manifestations in the seven countries. Based on what motivates them to promote renewable power, the seven countries fall into two categories. Category I countries, including Bulgaria, Italy, and Romania, promoted renewable power primarily for environmental considerations. While energy supply security and socioeconomic considerations are not irrelevant, the three members of the European Union (EU) have promoted renewable energy primarily as part of their obligation to comply with the Renewable Energy Directive 2009/28/EC, an EU directive and subsequently part of EU 2020 Energy Strategy. Fossil fuels cannot offer a solution to the challenge these three countries attempt to solve because they are the very integral to the very problems that are being tackled. This directive mandates that 20% of the bloc's final energy consumption should be produced from renewable energy sources by 2020 as part of EU's drive to cut carbon dioxide emissions (European Parliament and The Council 2009). As the target is pooled among the member states, all three countries are legally bound to do their part to transition toward low-carbon electricity. Specifically, Bulgaria is obligated to increase its share of energy from renewable sources in the country's gross final consumption of energy from 9.4% in 2005 to 16% in 2020, Italy from 5.2% to 17%, and Romania from 17.8% to 24% respectively for the same period (European Comission 2019).

Table 2: Push for renewable power in Ethiopia, Kenya, Pakistan, and Argentina

	Ethiopia	Kenya	Pakistan	Argentina
Average annual growth rate for the past 10 years	9.8%	5.6%	4.1%	1%
Power demand growth rate	30%	18.90%	13.4% in 2010-2015	6-8% in 1991-2015
Population without access to electricity	55%	25%	23%	less than 5%
Dependence on fossil fuels for power generation	Zero dependence	Zero dependence on coal but a low-level dependence on imported oil	Minimal dependence on coal but the level of dependence on imported oil and gas is high	Minimal dependence on coal, moderate dependence on imported oil, high dependence on imported gas
Government program	Growth and Transformation Plan (GTP) I & II	Least Cost Power Development Plan, Vision 2030	Policy for Development of Renewable Energy for Power Generation	Renewable Energy Auction (RenovAr) 1, 1.5, and 3
Growth rate of non-hydro renewable power	11-fold growth in 2011-2015	170% in 2007-2015	almost doubled in 2013-2015	43% in 2008-2015

Source: Author's compilation based on data drawn from the following sources: (IEA/IRENA 2019; International Energy Agency 2019b; Lucci and Garzón 2019; Mokveld and Eije 2018; U.S. Ennergy Information Agency 2019; United States of America Department of Commerce 2016; World Bank 2019)

Category II countries, consisting of Ethiopia, Kenya, Pakistan and Argentina, turned to renewable energy power as a solution to their growing power shortages. As illuminated in Table 2, Ethiopia, Kenya, and Pakistan are confronted with two parallel pressures on their power supplies—their economies have been growing a rapid rate and a large pocket of their population still does not have access to electricity. As a result, all three countries have been struggling to keep up with a growing demand, which is expected to grow at 30% per annum in Kenya (United States of America Department of Commerce 2016), rose by 18.9% per annum in Kenya (Mokveld and Eije 2018), and galloped at 13.4% in the period of 2010-2015 in Pakistan (IRENA 2018). With a sluggish growth rate and a higher national electrification rate, Argentina's power shortages were largely self-inflicted. It originated from the decision of President Kirchner to freeze public service tariffs at prices well below cost, which pushed its utilities to the brink of bankruptcy and turned the country into an energy importer in 2011 after more than 20 years of surplus and record exports (Lucci and Garzón 2019). As a result, when the demand for electricity bounced back to 6-7% per year following its economic crisis in 2001-2002, the country was caught off guard; by the time when President Macri took office, the situation was so precarious that he declared an "energy emergency" nationwide and established renewable energy as a state priority (Lucci and Garzón 2019).

Table 3: Electricity supply mix in Ethiopia, Kenya, Pakistan, and Argentina (2015)

	Ethiopia	Kenya	Pakistan	Argentina
Coal	0	0	0.14%	2%
Natural gas	0	0	25.7%	49.50%
Oil	0	12.50%	37.2%	15.40%
Nuclear	0	0.00%	5.5%	5.00%
Hydropower	92.70%	39.20%	30.7%	26.20%
Non-hydro renewables	7.30%	48.30%	0.76%	1.90%
Fossil fuels	0%	13%	63%	67%

Source: (World Bank 2019)

In all four cases, fossil fuels do not offer a credible alternative. As shown in Table 3, Ethiopia does not produce any electricity from fossil fuels at all. Similarly, coal and natural gas have no role whatsoever in Kenya's electricity supply mix. The role of coal in Pakistan's and Argentina's electricity supply mix is also minimal. While Pakistan and Argentina draw a large share of their electricity from natural gas and oil, they are net importers of both fuels. The same is true for Kenya with respect to oil, although at a lower level of dependence. As such, more dependence on imported oil and/or gas for power generation will not only lead to a drain on their national wealth but also create energy security challenges. In contrast, the cost of renewable energy production has been declining worldwide, with the global weighted levelized costs of electricity (LCOE) of solar photovoltaics (PV) and onshore wind registering a 35% and 46% decline respectively between 2000-2018 (IRENA 2019). Thus, both the developmental and energy security challenges facing the four Category II countries require them to expand renewable power. Indeed, that is exactly how the four countries responded. As shown in Table 2, all four countries have rolled out dedicate programs to expand renewable power.

Table 4: Policy support for solar and wind energy in the seven countries receiving Chinese ODF (2010-2018)

	Ethiopia	Kenya	Pakistan	Argentina	Bulgaria	Italy	Romania
Competitive bidding	Y	Y	N	Y	N	Y	N
Renewable energy targets	Y	Y	Y	Y	Y	Y	Y
RPS	N	N	N	N	N	Y	N
FITs	N	Y	N	N	Y	Y	N
Capital subsidies	N	N	N	Y	N	Y	Y
Tax incentives	Y	Y	Y	Y	Y	Y	Y

Source: (IEA/IRENA 2019) and authors' compilation based on open source data

Table 5: electricity production from non-hydro renewable sources (% of total)

	Argentina	Bulgaria	Romania	Ethiopia	Italy	Kenya	Pakistan[11]
2008	1.33	0.31	0.04	0.37	5.28	19.83	
2009	1.15	0.59	0.03	0.60	6.98	23.26	
2010	1.77	1.59	0.69	0.36	8.65	22.72	
2011	1.66	2.04	2.56	0.58	12.35	22.37	
2012	2.03	4.51	4.87	2.53	16.94	22.14	
2013	2.12	6.61	8.87	4.09	20.58	24.84	0.38
2014	1.97	5.93	12.76	5.24	22.34	45.73	0.75
2015	1.90	6.37	14.52	7.27	22.51	48.27	0.76
Absolute growth in 2008-2015	43%	1959%	32413%	1862%	327%	143%	99%
Annual average growth rate in 2009-2015	7%	65%	352%	78%	24%	16%	49%

Source: (World Bank 2019)

Next, to promote renewable power expansion, all of the seven countries have mobilized various forms of policy support. Drawing on the renewable energy Policies and Measures database jointly maintained by the International Energy Agency (IEA) and the International Renewable Energy Agency (IRENA) and the Legal Sources on Renewable Energy database (RES LEGAL Europe 2019), which is an initiative of the European Commission, we have assembled in Table 4 the incentives these countries have put in place to expand their renewable energy. While all countries provide tax incentives in support of solar and wind projects, Kenya is the only country in Category I that has adopted feed-in-tariffs (FITs). This echoes the remarks made by our interlocutors in Beijing that many developing countries that turn to China for help with renewable power development lack the fiscal largesse to subsidize their pursuit. In contrast, all three EU members in Category II provided more aggressive support than their Category I peers for renewable power expansion. However, it is worth noting that Italy, Bulgaria and Romania all cut back on their subsidies for renewable energy projects starting from 2014 (RES LEGAL Europe 2019). As to be discussed later, the subsidy rollback in these Category I countries has in turn created challenges for the two Chinese policy banks that financed renewable power projects in these countries. On the whole, with their dedicated support as illustrated in Table 4, all of the seven countries in Category I and Category II have seen incredible growth in the share of their electricity produced from non-hydro sources between 2008 and 2015 as illustrated in Table 5.

Finally, it is also important to note that all seven countries are well positioned to tap into China's manufacturing muscles and its deep pockets to accelerate their push for renewable power at home. In fact, six of the seven countries have signed onto the agreement with China to participate in the Beijing-initiated BRI. While Argentina has yet to become a BRI country reportedly as a result of pressure from the United States, it has substantially deepened cooperation with China in trade and investment since the 2000s (Lucci and Garzón 2019) to a level that matches what is between China and other BRI countries.

Meanwhile, the seven countries' pursuit of renewable power expansion provides an opportunity to Chinese firms engaged in renewable energy technology production and project development as well as to the two policy banks tasked to assist with the global expansion of the aforementioned Chinese firms. The opportunity arises because these national endeavors to expand renewable energy in the seven countries all hinge on the following three key ingredients—the manufacturing capacity to supply the necessary material and equipment inputs for their envisioned renewable expansion, the managerial and technical know-how required to build

• 11 Limited by data availability, the data on Pakistan only include the numbers for the year 2013, 2014, and 2015.

and operate these projects, and the ability to finance the capital-intensive renewable projects. However, except for Italy, none of the seven countries have developed much renewable energy manufacturing capacity or the technical-, managerial know-how to design, construct, and operate utility-scale solar and wind projects. The indigenous capacity of the seven countries to implement their envisioned renewable power expansion is even more limited when it comes to the financing required. The needs are especially great among the Category I countries described above. While the three Category II countries are in a better situation and enjoy access to funds in EU, their needs for financing also grew in the aftermaths of the 2008 Global Financial Crisis.

For China, the timing of this opportunity is almost like a godsend in light of the following three factors to which we have alluded earlier. First, its global leadership in investing, manufacturing, and installing renewable energy has already helped to foster some of the world's largest players in the renewable industry that are ready to expand overseas. Second, the renewable expansion in China has been increasingly accompanied by growing signs of excess capacity since 2009. Third, the precipitous decline in demand from Europe and the United States for Chinese renewable energy equipment and parts, coupled with growing excess capacity at home, has mounted pressure for the country's renewable energy industry, especially the solar industry, to explore alternate markets. This compelling turn to renewable power in the Category I and II countries has, therefore, presented a perfect opportunity for CBD and CHEXIM to promote the expansion and export of Chinese solar and energy firms.

Pull from Chinese firms engaged in OFDI

The story of Chinese ODF for solar and wind projects in Category I countries illustrates how the two policy banks of China are pulled into overseas renewable financing by its firms that seek overseas expansion. Whereas CDB provided financing in all three countries, CHEXIM did not have any presence. Drawing on their annual filings submitted to the U.S. SSEC and their annual reports, we will show in the following section how four leading Chinese solar manufacturers, i.e., Suntech Power Co., Ltd. (Suntech), Haeron Solar Technology Co., Ltd. (Haeron Solar), Shanghai Chaori Solar Energy & Science Technology Co., Ltd. (Chaori Solar), and Risen Energy Co., Ltd. (Risen Energy) pulled CDB into the three European markets while seeking to expand their operations from manufacturing at home into downstream project development and operations overseas, which presumably would also help them compete at home, and simultaneously increase their export through the platforms they acquired there.

Table 6: Haeron Solar in Bulgaria and Romania

Country	Time	Operator Name	Solar Project	Installed Capacity (MW)
Bulgaria	Jan-11	Helios	Pobeda	50.61
	Aug-11	Agro	Kolarovo	5.88
	Feb-12	Best Solar	Karlovo	4.89
	Mar-13	Cherganovo	Cherganovo	29.3
Romania	Nov-12	Firiza	n.a.	4.1
	Dec-12	S.C. Green Vision Seven S.R.L. (GV7)	n.a.	55
Total				149.78

Source: (Haeron Solar Technology Co. 2013)

A close scrutiny of CDB's involvement in these four firms' expansion in the three Category I countries reveals the following similarities. First, all three manufacturing-based solar firms developed and operated a significant amount of solar power generating capacity through cross-border mergers and acquisitions (M&As). They did

so via the subsidiaries they created through a complicated shareholding structure that at times gets highly convoluted and murky. For instance, Suntech set up the Global Solar Fund SCA SICAR (GSF), over which it had an overwhelming majority control, and then used it to acquire seven investee companies in Italy that designed, built and operated solar PV stations. According to its annual 20-F filings to the U.S. SSEC in 2012, GSF had completed 145 MW of solar power plants, of which approximately 143 MW had been connected to the grid, as of December 31, 2011 (Suntech Power Holdings Corporation LTD. 2012). Similarly, Haeron Solar established Haeron H1 through its wholly-controlled Haeron ALPS and used it to acquire seven entities, including four wholly-controlled subsidiaries in Bulgaria and two partially-controlled subsidiaries in Romania, to engage in solar PV project development and operation. According to Haeron Solar's annual report, as shown in Table 6, these seven subsidiaries are responsible for a total of 150 MW of installed solar PV power plants in Bulgaria and Romania collectively (Haeron Solar Technology Co. 2013). Finally, both Chaori Solar and Risen Energy teamed up with their shared affiliate Sky Solar Holding LTD. (Sky Solar) in creating two majority-controlled subsidiaries—ChaoriSky Solar Energy S.a.r.l. (ChaoriSky Solar) and RisenSky Solar Energy S.a.r.l. (RisenSky Solar)—to build and operate renewable power projects in Bulgaria. According to its annual 20-F filing to the U.S. SSEC, RisenSky Solar had completed 12.3 MW of solar parks in Bulgaria as of December 31, 2014 while ChaoriSky Solar had a plan to build seven solar parks with an aggregate capacity of 30.7 MW in the country (Sky Solar Holdings Limited 2014).

Second, in addition to expanding the scope of their operations overseas, the above-mentioned Chinese solar firms also used their cross-border acquisitions in Bulgaria, Italy, and Romania as platforms to increase their export to these markets directly. Table 7, for instance, shows the instrumental role GSF played in accelerating Suntech's export to Italy, with its sales to GSF investee companies accounting for 58% and 42% of the company's total sales to the country in 2009 and 2010 respectively. Similarly, while building the Uce de Sus solar park in Romania, Haerson Solar also supplied to the project its 226,000 ultra-modern polycrystalline photovoltaic modules (TÜV SÜD 2014). Meanwhile, Sky Solar sold permits and rendered engineering, procurement, and construction (EPC) services to ChaoriSky Solar in 2011-2013 and recorded a total of $119 million in revenues for the same period in Bulgaria (Sky Solar Holdings Limited 2014).

Table 7: Suntech's exports to Italy through GSF

	revenues of sales to GSF in Italy ($ million)	% of total net revenues	net sales in Italy	% of total sales in Italy
2008	n.a.	6.1	117.1	n.a.
2009	115.8	6.9	200.1	58%
2010	197.4	6.8	473.9	42%
2011	33.6	1.1	n.a.	n.a.

Source: (Suntech Power Holdings Co. 2011; Suntech Power Holdings Corporation LTD. 2012)

Third, to carry out their expansion in Bulgaria, Italy, and Romania and grow their export in these markets, all four firms turned to CDB for support. CDB provided substantial loans to the overseas subsidiaries of the four solar firms. As shown in Table 8, CDB lent Suntech, Haeron Solar, Chaori Solar, and Risen Energy, which were primarily concentrated on manufacturing, a total of 932.5 million Euros between 2010 and 2013 for them to expand into solar project development and solar power operation in Italy, Bulgaria, and Romania and simultaneously boost export there. To be sure, CDB's readiness to support the international expansion of these four firms is consistent with its obligation under the "going out" strategy and the BRI to facilitate Chinese firms' OFDI and export. However, it is worth noting that all four firms had already established deep

connections to CDB prior to their entry into these three European markets. Further, when approaching CDB for financing, all four companies adopted a similar strategy, that is they mortgaged their loans on their fixed assets, such as solar PV stations or corporate bonds, future revenues, such as those to be collected from their tariff revenues from their solar and wind power sales or subsidies to be collected from local governments for their promotion of renewable power, or their operational rights in Bulgaria, Italy, and Romania. This is quite similarly to their practice at home when turning to CDB for credit, except for one key difference: at home, these firms often received backing from their local governments and counted on them as their guarantors for their loans from CDB; however, when expanding overseas they cannot rely on anyone but themselves as guarantors for loans to their subsidiaries. As innovative as it might look from a financing point of view, this arrangement would pose a serious risk to CDB if these firms' operations in the three European markets fail to deliver the cash revenues or the financial bottom line of these firms back in China became questionable, both of which, as to be discussed below, actually came to pass.

Table 8: CDB loans to Suntech, Risen Energy, Chaori Sola, and Haeron Solar for expansion in Bulgaria, Italy, and Romania

Date	Borrower	Location of borrower	Guarantor	CDB loans (€ million)
May, 2010	GSF	Italy	Suntech	554.2
September, 2011	RisenSky Solar	Bulgaria	Risen Energy	26.2
March, 2012	ChaoriSky Solar	Bulgaria	Chaori Solar	43.1
March, 2012	Helios	Bulgaria	Haeron Solar	95
December, 2012	Cherganovo	Bulgaria	Haeron Solar	48
October, 2013	S.C. Green Vision Seven S.R.L. (GV7)	Romania	Haeron Solar	83
October, 2013	S.C. Green Vision Seven S.R.L. (GV7)	Romania	Haeron Solar	83
	Total			932.5

Source: (Haeron Solar Technology Co. 2017; Sky Solar Holdings Limited 2014; Suntech Power Holdings Corporation LTD. 2012)

Finally, almost all of the above-mentioned OFDI transactions financed by CDB ran into problems. Suntech was implicated in a financial fraud when it guaranteed the CDB loans to GSF on the basis of its subsidiary's non-existent investment into German government bonds. Similarly, in 2013, the 21st Century Business Herald, a leading business newspaper in China, uncovered the conspiracy Chaori Solar and Sky Solar forged in obtaining fraudulent loans from CDB (Qiao Jiawei 2013). Indeed, after Chaori Solar guaranteed the CDB loan for its subsidiary in Bulgaria to build seven parks with a total 30.7 MW installed capacity, we are unable to locate any information about the seven solar parks when perusing the company's annual reports in the subsequent years. In May 2016, the China Securities Regulatory Commission announced a ban on the President, Vice President, and Chief Financial Officer of Chaori Solar prohibiting them from accessing the Chines stock markets for the rest of their lifetime because of their engagement in irregularities and subreption of information disclosures, some of which concern the firm's OFDI in Bulgaria and Romania (China Securities Regulatory Commisssion 2015). Meanwhile, highly dependent on the subsidies to be collected from the Green Certificates issued by the Bulgarian government, Haeron Solar's operations started to incur losses after the Bulgaria government changed rules about the Green Certificates in 2017. According to its 2017 Annual Report, Haeron Solar incurred a total loss of about 534 million yuan (about $75 million) in 2017 (Haeron

Solar Technology Co. 2017). Coincidently, the reported problems in connection with the OFDI of the three leading Chinese soar firms are merely a tip of the iceberg. Indeed, Suntech, Chaori Solar, and Hairun Solar went bankrupt in March 2013, 2015, 2016 consecutively. As these companies guaranteed loans from CDB for their subsidiaries to expand in Italy, Bulgaria and Romania, which already experienced various problems because of the three governments' rollback of their renewable subsidies, it is hard for us not to conclude that CDB may have gotten burned in all three cases. In this regard, the way CDB financed solar projects in Bulgaria, Italy, and Romania planted the seed of its destruction from the very outset, thus calling into question of how much of the reluctancy and reservation CDB officials discussed with us in our dialogues in Beijing has actually been observed in real life. While it is beyond the scope of the study to appraise the impact of these problems on CDB's loans, we do observe one clear pattern—CDB has not financed any M&As of Chinese solar and wind firms since then. Instead, since 2013, it has joined CHEXIM and focused primarily on financing more straight-forward cases of export promotion.

Pull from foreign governments seeking to expand renewable power

Table 9: Solar and wind projects financed by CDB and CHEXIM in Category II countries

Year	Country	Project	Chinese stakeholder	Chinese involvement	Lender
2013	Ethiopia	Adama Wind Farm	Hydro China and CGCOC	EPC, WTG supply	CHEXIM
2013	Ethiopia	Adama Wind Farm II	Hydro China and CGCOC	EPC, WTG supply	CHEXIM
2014	Pakistan	Three Gorges Second & Third Wind Power	China Three Gorges, Goldwind	EPC, WTG supply	CDB
2015	Pakistan	Quaid-e-Azam Solar Park Phase II	Zonergy, China Metallurgical Group Corporation (MCC)	EPC, WTG supply, O&M	CDB, CHEXIM, Bank of Jiangsu, and China Bohai Bank
2015	Pakistan	UEP Wind Power Plant in (Jhimpir, Thatta)	China Gezhouba Group, Goldwind	EPC, WTG supply, O&M,	CDB
2017	Kenya	Garissa solar	China Jiangxi International Economic and Technical Corporation, JinkoSolar	EPC, PV supply	CHEXIM
2017	Argentina	Cauchari Solar I, II and III	Shanghai Electric Power Construction, Suzhou Talesun	EPC, PV supply, O&M	CHEXIM
2017	Ethiopia	Aysha I wind farm	Dongfang Electric Corporation	EPC	CHEXIM

Source: Authors' compilation

The story of Chinese ODF for solar and wind power in Category II countries is largely one of the four governments pursuing renewable power expansion turning to CDB and CHEXIM for help, the provision

of which is conditioned on import from China. As a testimony to this explicit focus on export promotion associated with the Chinese ODF, Table 9 demonstrates that all of the solar and wind projects CDB and CHEXIM have financed in 2013-2018 entail Chinese firms performing the engineering, procurement, and construction (EPC) services, supplying material inputs into the corresponding projects, such as wind turbine generators (WTG) or solar PV panels and parts, and sometimes responsible for project operation and maintenance (O&M) after the renewable power projects are connected to the grid.

An in-depth examination of the two Chinese policy banks' financing for solar and wind projects in the four Category II countries highlights the following three revelations. To begin, CDB has a much smaller footprint than its peer both graphically and in terms of the scale of its financing in Category II countries. Whereas CDB financed two wind projects independently and one solar project as part of a syndicate, which also includes CHEXIM, in Pakistan, CHEXIM extended financing to both solar and wind projects across all of the four countries in Category II. In terms of the scale of their loans, as Table 8 reveals, CDB has thus far channeled $341 million to Pakistan; by contrast, CHEXIM has issued more than $1.2 billion worth of loans to solar and wind projects in Pakistan, Ethiopia, Kenya, and Argentina from 2013 to 2017. This means that CHEXIM eclipses CDB by more than three times with respect to its financing for solar and wind projects in Category II countries. Further, while CDB financed solar and wind projects primarily via project financing, CHEXIM has relied on a wider range of loan facilities as to be discussed below, one of which overlaps with the modality of CDB's financing. Thus, the story of Chinese ODF for solar and wind projects in Ethiopia, Kenya, Argentina, and Pakistan is largely captured by CHEXIM's involvement in these four markets.

Table 10: CHEXIM's financing for solar and wind project in Category II countries by loan type

	Country	$ million	% total
Preferential export seller's credit	Ethiopia	611.75	50.6%
	Argentina	332	27.5%
Concessional loan	Kenya	135.7	11.2%
Project financing	Pakistan	127.9	10.6%
Total		1206.75	100%

Source: Authors' compilation

Next, the structure of CHEXIM's loans for solar and wind projects in the four Category II countries illuminates how export promotion motivates the bank's financing. As shown in Table 8, Ethiopia and Argentina received preferential export seller's credit, Kenya obtained concessional loan, while Pakistan attracted project financing from CHEXIM for their solar and wind projects. Preferential export seller's credit and concessional loan are often known as the two preferential loan facilities CHEXIM issues to foreign governments on behalf of the Chinese government out of political needs and to promote bilateral economic and trade cooperation (Li Zheng 2013). As foreign governments are the borrowers of these loans from CDB and CHEXIM, where they are used speaks to the priorities and needs of these sovereign governments. Thus, when the government of Ethiopia, Argentina, and Kenya approached CHEXIM for these two loan facilities for the development of solar or wind projects that would entail their absorption of China content, this clearly represents an opportunity for the policy bank to promote Chinese export. CHEXIM's high frequent use of these loan facilities shows unambiguously that it has taken advantage of the opportunity. Indeed, taken together, as seen Table in 10, these loan facilities account for 89% of CHEXIM's financing for solar and wind projects in 2013-2017.

Finally, the design of CHEXIM's two preferential loan facilities speaks to their distinct tilt toward export promotion. First, both loans require foreign governments to be the loan applicants and are issued on the

basis of close coordination of both Chinese governments and foreign governments. The concessional loan covers 100% of the total cost of the project to be funded and is denominated in Chinese currency, whereas the preferential export seller's credit covers 85% of the total cost of the project funded and is denominated U.S. dollars. Second, both loans come with a low interest rate of 2-3%, a repayment cycle of 15-20 years, and some grace period (Li Zheng 2013). For instance, CHEXIM's loan to the Cauchari Solar Park I, II, and III in Argentina features an interest rate of 3%, plus 0.75% of the management fee and 0.75% of the commitment fee, a repayment period of 180 months, and a grace period of 60 months (Lucci and Garzón 2019). Third, the provision of both loans is conditional upon the recipient government's contracting of Chinese firms to carry out the essential services, which often take the form of the EPC contracts and sometimes also include O&M contracts. According to Ban Yongzhi of CHEXIM, the proportion of content to be sourced from China is 55% or higher (Ban Yongzhi 2018). For instance, as part of CHEXIM's financing package, the Adama wind power project in Ethiopia, sourced almost everything, including capital, technologies, standards, equipment, design, construction, consulting, and O&M service from China (China Export and Import Bank 2016), with Hydro China playing the role as the project's general contractor and the CGCOC Co., Ltd., a leading state-owned construction company ranked No. 86 out of the Engineering News Record Top 250 International Contractors in 2015, contracted to perform the EPC services. Similarly, in return for financing from CHEXIM, the Argentine government contracted the Shanghai Electric Power Construction Co., Ltd. to perform the EPC services while hiring the Suzhou Talesun Technologies Co., Ltd. to supply the inputs for the Cauchari I, II, and III solar parks. To complete the construction of the 315 MW solar parks, according to the PV Magazine, the Chinese contractors sourced over 2750 cargo containers of components, including solar panels, inverters, racks and trackers, substation and combiners, over the course of 14 months from China, which is located more than 12,000 miles away (Anoymous 2019).

Conclusion

The story of China's provision of ODF for solar and wind projects through CDB and CHEXIM in the seven countries in 2010-2018 is one of two tales. These two tales have taken place in two distinct categories of countries. Category I includes Bulgaria, Italy and Romania while Category II consists of Ethiopia, Kenya, Argentina, and Pakistan. What Category I countries have witnessed is one tale of CDB being pulled into these markets by three leading Chinese solar firms, i.e., Suntech Power, Haeron Solar, and Chaori Solar, which had already established deep connections with the policy bank at home prior to their overseas expansion. For these solar firms, the generous subsidies Category I countries put in place to pursue renewable power expansion represented a great opportunity for the three Chinese solar PV manufacturers to expand their operations into solar project development and increase their export through the platforms they acquired through their M&As. For CDB, all three solar firms rose to national prominence within a short span of time with aggressive support from their respective local governments, which subsequently lobbied and sometimes even served as guarantor for their loans from CDB. Considering the massive credit lines CDB provided to these firms, it is not an exaggeration to say that CDB was the secret behind the miraculous rise of all three solar firms in China before the country's solar boom went to bust in 2011-2012. Thus, teaming up with these known names that embarked on in international expansion seems to be a logical extension of their domestic collaboration. Next, offering financial support for the expansion of these three firms in Bulgaria, Italy, and Romania is also consistent with what the policy bank is obligated to do under both the going out strategy and the BRI. Furthermore, all three firms obtained loans from CDB using seemingly credible collaterals in the form of future tariff revenues from their soar power plants or the subsidies they were supposed to receive from the governments of their investee countries; meanwhile, all three firms played the role as guarantors for CDB loans to their subsidiaries in the Category I countries. However, the fortunes for the Chinese investors turned sour when the governments of Bulgaria, Italy, and Romania began to scrap preferential prices, roll back subsides, and impose fees on grid connection. Domestically all three became victims of their reckless expansion. Thus, it is almost inevitable that CDB got burned in its financing of solar energy in these Category

I countries. While it is beyond the scope of this study to assess the impact of this experience on CDB's thinking about financing solar power overseas, it is clear that the policy bank has not mobilized ODF to support Chinese OFDI in solar or wind energy overseas since then.

On the other hand, the story in Category II countries is one of organized rationality and ends with unambiguous wins for the two policy banks. The provision of Chinese ODF for all of the solar and wind power in the four countries took place under a government-to-government framework. In the case of CHEXIM's preferential export seller's credit to wind power in Ethiopia and solar power in Argentina as well as its concessional loan to solar power in Kenya, the three governments were actually the borrowers. Although the Chinese ODF for the wind and solar power projects in Pakistan took the form of project financing, both loans were provided under the framework of the China-Pakistan Economic Corridor Program, which is part of the broader BRI. Thus, on all four occasions, governments of these four countries approached CHEXIM and CDB for renewable financing. In all cases, CHEXIM and CDB agreed to finance the projects in question because they would facilitate Chinese export as stipulated in the design of the loan agreement. Considering the amount of government-to-government interactions that led to the two policy banks' provision of ODF to these four Category II countries, it is almost impossible to separate Beijing's geopolitical considerations from the two banks' financial decisions. Further, thanks to the sovereign guarantees and the reliance on Chinese ODF to conduct the EPC and sometimes O&M of the completed solar and wind power projects, all of the projects financed by the two policy banks appeared to have been completed without any major hiccups. As a result, export promotion seems to have become the primary focus for CDB and CHEXIM when evaluating whether to finance solar and wind power projects overseas. However, as revealed from our in-country investigation, this is primarily done under a government-to-government framework, thus subjecting decision-making on Chinese ODF to a wide range of considerations specific to the policy banks, the Chinese government, and foreign governments. To put it bluntly, what this means is that the type of Chinese ODF for solar and wind projects in Category II countries is unlikely to scaled up at a rapid pace, thus further limiting the magnitude of Chinese ODF for solar and wind energy worldwide.

These two tales correspond to the data we report in this study that point to the underwhelming provision of Chinese ODF for solar and wind power in comparison with that for fossil fuels projects around the world. In the case of CDB's financing of solar energy in Europe, the policy bank encountered some setback and has since moved away from providing ODF to support Chinese OFDI in solar. In the case of the two policy banks' promotion of Chinese export through ODF, the record shows wins-wins for all stakeholders involved but it is likely to be scaled up. For countries that want to turn to China for help with their solar and/or wind power expansion, this means that they will have a better shot if their governments step up the plate and play a more proactive role in engaging the two Chinese policy banks and working out an arrangement in their favor. However, if this study provides any indication of what is to come, it is clear that one should not take it for granted that China will fill the near $800 renewable energy investment potential awaiting to be tapped worldwide.

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