Cui bono? Explaining the persistence of public finance for coal-fired power plants overseas

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Extended Abstract

Introduction

Over the past 40 years coal consumption has almost continuously increased (Steckel, Edenhofer, and Jakob 2015; Edenhofer et al. 2018), turning coal into the largest single source of greenhouse gas emissions (Peters et al. 2020). Phasing out coal is hence inevitable to achieve the international climate targets of the Paris Agreement (UNFCCC 2015; Luderer et al. 2018). Yet, in addition to the committed emissions of already existing coal plants (Tong et al. 2019; Edenhofer et al. 2018), about 500 GW of new coal-fired power plants are in the 'pipeline' (i.e. planned or already under construction), foremost in Asia (Global Energy Monitor 2020b).

Despite the Paris Agreement's call to make "finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development" (UNFCCC 2015), much coal finance is provided, to a large extent by foreign companies (Manych, Steckel, and Jakob in press). Steffen and Schmidt (2019) quantify the role of multilateral development banks in financing conventional and renewable energy. Chen et al. (2020) compare multilateral development banks to East Asian national development finance institutions. Chen and Schmidt (2017) show how G20 governments' public finance institutions invest in coal. Different dimensions of coal financing have also been investigated by several NGOs (urgewald e.V. 2019; Schücking 2017; BankTrack 2018).

Recent literature has discussed the particular role of Chinese public foreign direct investment for the development of coal and links the financing to Chinese exports of domestic technology (Li, Gallagher, and Mauzerall 2020; Shearer, Brown, and Buckley 2019; Kong and Gallagher 2019). Other studies show the tendency of Chinese developers to develop plants abroad (Peng, Chang, and Liwen 2017) or Japanese companies to export coal plants (Trencher et al. 2019). However, all of these papers look at a subset of financial transactions, e.g. from two specific Chinese banks only.

Our paper, to the best of our knowledge, is the first to i) provide a global analysis of coal finance on a plant level and ii) systematically assess the ties between financers, manufacturers, sponsors, construction companies and other involved companies in the development of coal plants. This paper aims to understand reasons why financial institutions still invest in international coal. We add to an increasing literature on the political economy of coal in countries building new coal-fired plants (Jakob et al. 2020). We hypothesize that overseas coal finance may benefit domestic exporting industries, especially in the light of declining domestic markets. Our analysis is based on a new and comprehensive dataset, which allows analysing capital flows of financial institutions and other involved companies on a plant level. We find that for many coal plants the involved companies are foreign and stem from the financer's country.

Data + Method

In this paper we build a new and comprehensive dataset by extending and merging existing data on international coal finance. For information on coal plants we use the Global Coal Plant Tracker for latest plant data (Global Energy Monitor 2020b) and the World Electric Power Plants Data Base for information on involved companies (S&P Global Platts 2017). For finance data the authors rely on data by the Natural Resources Defense Council, Global Energy Monitor and urgewald e.V. (Global Energy Monitor 2020a).

To obtain the novel plant level dataset we cleanse, match and extend the above mentioned datasets. Many transactions are linked to several units, thus some units appear more than once in the merged dataset. The facilitated generation capacity additions allocate the total capacity of each units to the respective financers regardless of their amount of financing provided following (X. Chen, Gallagher, and Mauzerall 2020). This capacity is therefore higher than the actual capacity of the unique units and entails some 'double counting'. To deal with the issue, we calculate the capacity weighted by funding share, which splits the capacity of a unit and allocates it to all the matched transactions by the funding share (if no financial volume is stated we assume equal shares). Both, the capacity addition and the weighted capacity is used in this paper. We additionally identify the host country of each company. This leaves us with a dataset with information on the financers and all other involved companies for each unit-transaction.[1]

The novel dataset allocates 346 transactions from 2013 onwards to 365 distinct units that belong to 161 distinct plants, resulting in 730 unit-transactions. It allows us to display the transaction amount per financer, country and year and link it to facilitated generation capacity additions. We afterwards analyse a broad set of companies involved in a particular coal unit's development by their origin. Finally, we link the financers and the other involved companies for each plant and e.g. examine if they are from the same country.

Results

Table 1 shows the number of unit-transactions, unique units, the transaction amount and the capacity of the units. We separate units that will likely be developed, including those under construction, operating, permitted or under pre-permit from those of all status (including those that are announced, shelved or cancelled). We thereby distinguish between results from the entire sample and a subset of units with a particularly high likelihood to be developed.

Table 1 Overview of the coal finance transactions linked to unique units. The first column includes information on all units, the second only on those that will most likely be developed. The underlying novel dataset builds upon (Global Energy Monitor 2020a) and (Global Energy Monitor 2020b).

	Units of all status	For construction, operating, permitted and pre-permit development (without announced, shelved and cancelled)
Unit-transactions	730	542
Unique units	365	233
Transaction amount (US$ billion)	91.2	81.5
Facilitated generation capacity addition (GW)	385	274
Capacity of unique units (GW)	174	100

[1] We check for representativeness and overage of the data regarding the total finance volume, financers' and site countries, financers' and site regions, transactions we are not able to match to units, the status of units, the availability of company information and other.

In total, the transactions amount to US$ 91 billion from 11 financing countries. Banks from China provided US$ 60 billion, those from Japan and South Korea US$ 20 billion and US$ 7 billion, respectively. The remaining US$ 4 billion stem from financial institution in India, Germany, Italy, Russia, South Africa, France, the United States and the Czech Republic. The facilitated generation capacity additions per country range from 284 GW for China to 500 MW for the United States. Japan and South Korea facilitated generation capacity additions of 49 GW and 35 GW, respectively.

The annual transactions from 2013 to 2020 differ widely. The absolute finance volume increased from US$ 4.8 billion in 2013 to US$ 18.4 billion in 2017 and decreased afterwards to reach US$ 3.4 billion in 2020. Transactions that are currently pending equal US$ 13.3 billion, transactions that were put on hold and those that got cancelled amount to US$ 2.9 billion and US$ 5.7 billion, respectively. From 2016 to 2020 the transactions can be fully allocated to China, Japan and South Korea (with India in 2017 being the only exception). The origin of finance that is currently pending, on hold or cancelled however shows a higher geographical diversity.

Looking at individual financing institutions, the three largest ones (China Development Bank, the Export Import Bank of China and the Industrial and Commercial Bank of China) all stem from China, reflecting its high share in overall finance. They are followed by two Japanese banks, the Japan Bank for International Cooperation and the Nippon Export and Investment Insurance. The financial institutions of the other countries providing most financing are the Export-Import Bank of Korea (South Korea), the Export-Import Bank of India (India), Euler Hermes (Germany), Servizi Assicurativi del Commercio Estero (Italy), Russian Development Bank (Russia), Development Bank of Southern Africa (South Africa), Compagnie Francaise d'Assurance pour le Commerce Exterieur (France), US Development Finance Corporation (the United States) and EGAP (the Czech Republic).

In Figure 1 we analyse a broad set of companies with business activities related to a particular coal unit's development by their origin. The share of capacity, for that the companies are known, varies greatly between the different companies. The analysis is limited to 174 GW of capacity of unique units for which we have collected information on financing and the respective financers, explaining the capacity share of known financers being 100%. For sponsors (developers/operators or primary owners of a unit) and parent companies (of the sponsors) we can still identify 95% of companies. The share is reduced for manufacturers of turbines (TURBMFR), generators (GENMFR) and steam supply systems (SSSMFR), as well as the primary architect/engineering firms (AE) and the construction companies, varying between 30-50%. The manufacturers of the particulate control device (PARTMFR), FGD scrubber system (FDGMFR) and NOX control system (NOXMFR) are mostly unknown. When we look only at the subset consisting of units that are under construction, operating, permitted or under pre-permit development, the share increases for each company by up to 20 percentage points.

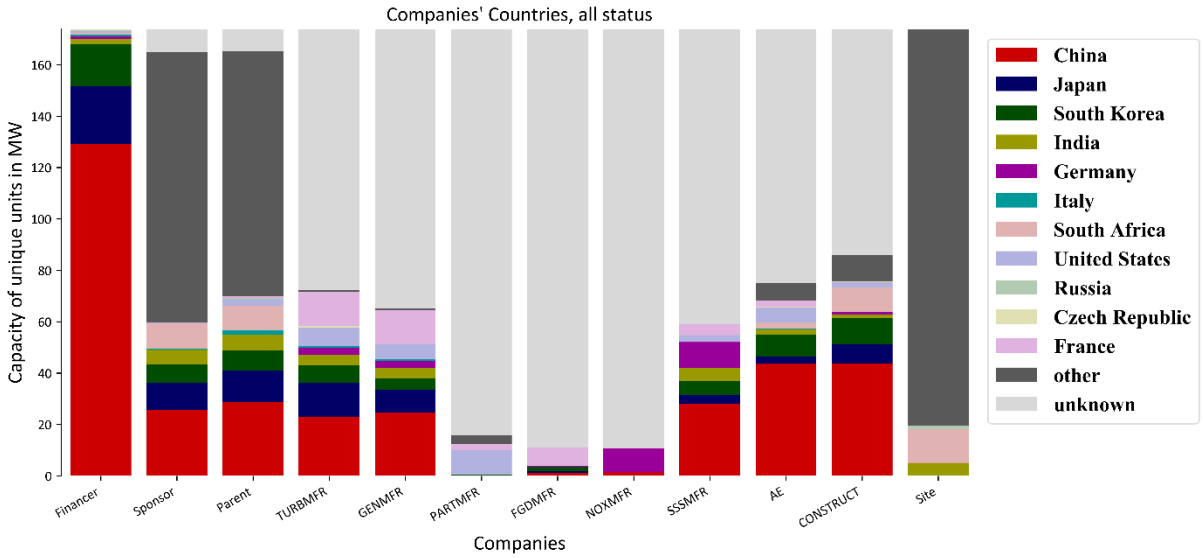

Figure 1 Companies' countries for each company in MW. For the financers and all other involved companies their countries are stated, as well as the site countries. Countries other than the 11 financing countries are grouped in 'other'. Finance data is taken from (Global Energy Monitor 2020a), data on coal units from (Global Energy Monitor 2020b; S&P Global Platts 2017).

Figure 1 further shows that the headquarters of almost all companies are located in one of the 11 financing countries. One exception are sponsor and parent companies: the majority stem from the site country, i.e. where the unit is located. Manufacturers, architect firms and construction companies from the financing countries constitute the vast majority of above 80% of the capacity. This applies to the subset of units with a particularly high likelihood to be developed as well.

The companies that are involved in the biggest generation capacity addition highlight the link to the financing countries. For sponsor and parent it is Eskom from South Africa. The biggest turbine manufacturers are Alstom (France) and Toshiba Manufacturing (Japan), for generator manufacturers it is Alstom (France) and Dongfang (China). The biggest particulate control device manufacturers are Balcke-Durr (United States) and Alstom (France), for FGD scrubber system manufacturers it is Alstom (France) and Doosan (South Korea) and for NOX control system manufacturers Hitachi Power Europe (Germany) and Babcock & Wilcox Beijing (China). The biggest steam supply system manufacturers are Dongfang (China) and Hitachi Power Europe (Germany). The two largest architect/engineering firms are also the largest construction companies: China National Machinery Import and Export Corp and Harbin Electric from China.

The companies providing equipment and those being involved in the construction do in most cases not stem from the country, where the unit is located. This becomes obvious when looking at the share of the 365 units that have foreign involvement for each company. Table 2 shows that the share of units that have solely foreign sponsors is 56%, while 16% of the units have domestic and foreign sponsors. For 3% of the units we do not have information on the sponsors. We find similar numbers for parent companies. For all other companies, the domestic share is below 8%. The foreign share on the other hand is multiple percentage points higher. For the 233 units that are under construction, operating, permitted and pre-permit development the share of unknown decreases for each company.

Table 2 Share of units with domestic/foreign companies. Each column splits the 365 units into the shares where the companies were only from the country in which the plant is constructed (domestic) or only from a different country (foreign). In some cases both, domestic and foreign companies were involved. The table builds on a newly constructed dataset comprising data from (Global Energy Monitor 2020a; 2020b; S&P Global Platts 2017).

	Sponsor	Parent	TURBMFR	GENMFR	PARTMFR	FGDMFR	NOXMFR	SSSMFR	AE	CONSTRUCT
Domestic only in %										
Foreign only in %										
Domestic and foreign in %										
Unknown in %										

We aim to understand if there is a systematic correlation regarding the origin of financing institutions and power plant equipment manufacturers. Figure 2 shows the capacity addition by financers' and generator manufacturers' origin. The size of the circles is proportional to the capacity additions. The diagonal line represents the capacity additions where the financer's country equals the manufacturer's country. The biggest circles per colour – per financing country – are predominantly on the diagonal line.

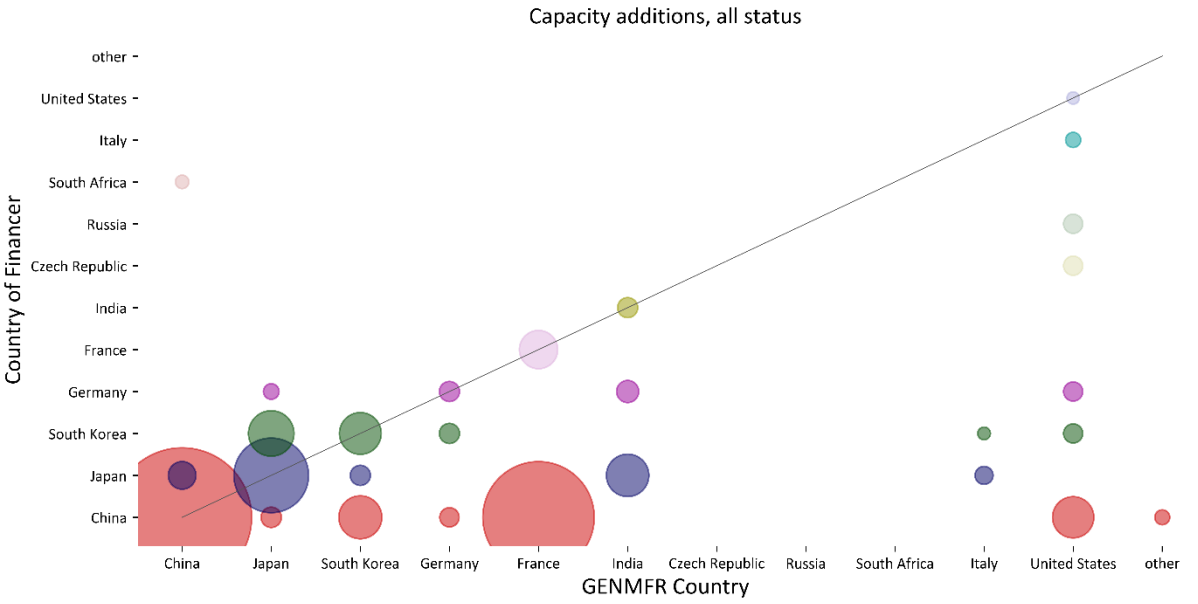

Figure 2 Capacity additions by country of financers and generator manufacturers. The total facilitated generation capacity of each financing country is split by the country of the generator manufacturer. The size of the circles is proportional to the capacity addition. For circles on the diagonal line the country of financer equals the country of generator manufacturer. To build the underlying dataset we used data from (Global Energy Monitor 2020a; 2020b; S&P Global Platts 2017).

Table 3, which covers 385 GW generation capacity including units of all states, also reveals a clear correlation between the origin of finance and equipment companies. Next to China and Japan, financing highly correlates with the origin of the turbine and generator manufacturer in India, France and the USA (i.e. showing levels higher 50%). For China, India and Italy, this is also true for construction and AE. Generally, if finance was granted by banks from France and India, we find a high likelihood that also equipment manufactures from those countries are involved.

Table 3 Share of capacity for that the company is from the same country as the financer. Each number represents the share of capacity where the respective company is from the same country as the financer out of the capacity financed by the respective country for that the respective company is known. We excluded PARTMFR, FGDMFR and NOXMFR. The data is from (Global Energy Monitor 2020a; 2020b; S&P Global Platts 2017).

	Sponsor	Parent	TURBMFR	GENMFR	SSSMFR	AE	CONSTRUCT
China	29.8	41.2	41.6	55.0	56.7	75.3	75.3
Japan	33.8	50.7	67.6	62.7	23.6	31.4	42.1
South Korea	34.0	37.9	41.3	36.7	66.4	46.4	49.5
Germany	0.0	0.0	26.8	26.8	35.5	0.0	16.3
France	0.0	0.0	100.0	100.0	0.0	0.0	0.0
India	93.6	93.6	100.0	100.0	100.0	100.0	100.0
Czech Republic	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Russia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Africa	50.0	0.0	0.0	0.0	0.0	0.0	0.0
Italy	0.0	0.0	0.0	0.0	0.0	100.0	100.0
United States	100.0	0.0	0.0	100.0	0.0	0.0	0.0

For 66% of the 730 unit-transactions, at least one other company is from the same country as the financer. For transactions from Chinese banks this number is around 64%. For Japan the share is 84%, for South Korea 73%, for South Africa 50% and for Germany 43%. When we consider only unit-transactions with units that are under construction, operating, permitted and pre-permit development the share increases for most countries.

Discussion

Building a unique dataset, we show that manufacturers, construction companies and other involved companies in the development of a coal plant are in many cases from the same country as the public banks that finance the projects abroad. This holds true for finance of all units and of those that will most likely be developed. This opens room for interpretation. One potential explanation is that manufacturers are more likely to engage in a project if it is financed by a public bank from their country. Another reason could be that development and export-import banks support the export of coal technology. If this was the case, the domestic bias of banks and companies might be linked to the situation in the home country. Potential drivers could be the electricity or more explicitly the coal overcapacity in a country ('overcapacity effect'). The export of technology could be a means to stabilize the manufacturing industry that is faced with decreasing sales in the home market, which again could be linked to domestic policies, e.g. recent carbon neutral pledges in banks' home countries (Kong and Gallagher 2019). In this case exporting coal technology can be seen as a new way of outsourcing emissions, i.e. 'Carbon Leakage 2.0'. Stakes of other companies might also play a role, e.g. coal suppliers that can export their coal to the newly developed plants. These political economy factors can be important drivers for the domestic bias.

To learn more about the drivers of the domestic bias we will develop this paper further by comparing finance by public banks to finance by commercial banks. We further aim to compare the situation of coal to that of renewable energy technologies, taking wind energy as an example. Finally, we will develop our descriptive statistical results further using robust econometric techniques.

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