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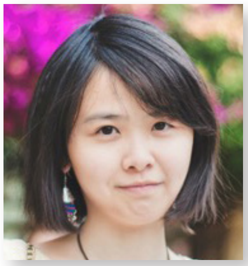


__Yangsiyu Lu__ is a Postdoctoral Research Fellow at the Paris School of Economics and a former Global China Research Fellow with the Boston University Global Development Policy Center. Her research focuses on energy infrastructure and cleantech innovation.

Cofinancing and Infrastructure Project Outcomes in Chinese Lending and Overseas Development Finance

YANGSIYU LU[1], CECILIA SPRINGER[2], BJARNE STEFFEN[3]

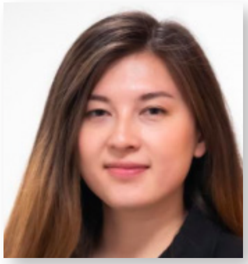
ABSTRACT

Cofinancing from government agencies, development banks and private actors is acknowledged as an important tool to bridge the finance gap in developing countries, but relatively little is known about outcomes for cofinanced projects. To fill this void, we explore the role of cofinancing in shaping Chinese lending and overseas development finance infrastructure projects in terms of implementation outcomes and environmental performance. Our study shows that cofinancing correlates with higher infrastructure project completion rates, as cofinanced projects are 3.3-7.0 percentage points less likely to be cancelled or suspended than non-cofinanced ones. We also find that cofinancing with certain partners suggests specific benefits. Cofinancing with partners from the recipient country is associated with more localized implementation, whereas cofinancing with international partners has demonstrated improved environmental performance, with a 2.7 percent lower carbon dioxide emissions

[1] Paris School of Economics, yangsiyu.lu@psemail.eu
[2] Global Development Policy Center, Boston University, chspring@bu.edu
[3] Climate Finance and Policy Group, ETH Zurich, bjarne.steffen@gess.ethz.ch

intensity and a 0.42 standard deviation decrease in biodiversity risks. The results suggest that cofinancing can be an effective tool to enhance infrastructure project success and achieve greater sustainable performance in Chinese lending and overseas development finance , highlighting the importance of a collaborative approach to developing infrastructure projects in the Global South.

Keywords: cofinancing, development finance, China's Belt and Road Initiative, project finance, infrastructure project implementation, environmental impacts



***Cecilia Springer** is the Assistant Director of the Global China Initiative at the Boston University Global Development Policy Center. Her interdisciplinary research focuses on the environmental impacts of China's overseas investment, policymaking processes within China and industrial decarbonization.*

***Bjarne Steffen** is Assistant Professor of Climate Finance and Policy at ETH Zurich, Switzerland and a Research Affiliate at the MIT Center for Energy and Environmental Policy Research. His research addresses policies related to energy innovation and the role of finance in the low-carbon energy transition.*

INTRODUCTION

Cofinancing has recently become a policy priority in international development finance. The primary motivation to syndicate multiple financiers in development projects is to increase the resources available from multiple sources (e.g. public and private) to achieve project and development goals. Over the years, many development institutions have emphasized the role of cofinancing for its potential in facilitating knowledge spillovers, project effectiveness, stakeholder coordination, more inclusive policy dialogue and risk mitigation (World Bank, 1997; Asian Development Bank, 2005; Inter-American Development Bank, 2005; Global Environment Facility, 2011). Achieving a higher cofinancing ratio has served as a way to measure the impact of development projects for many development finance institutions (Kotchen and Negi, 2019).

The emphasis on cofinancing is increasingly pronounced in Chinese development finance. As a newcomer and fast-growing player in international development, China has been actively mobilizing financial resources through collaboration with different partners. China's approach to cofinancing involves partnering with multilateral, bilateral and local parties to jointly finance and develop projects (Amighini, Rabellotti and Sanfilippo, 2013; Humphrey and Chen, 2021; Morris, Rockafellow and Rose, 2021; Sauer et al., 2022). Evidence suggests that China increasingly engages in trilateral aid cooperation programs with conventional Western development donors (Zhang, 2020).

Over recent years, Chinese development finance has attracted considerable attention due to its large scale and significant environmental and social impacts (Brazys, Elkink and Kelly, 2017; Kong and Gallagher, 2017; Chen, Gallagher and Mauzerall, 2020; Dreher, Fuchs, Parks, et al., 2021; Iacoella et al., 2021; Yang et al., 2021), but limited attention has been paid to the effects of cofinancing. Existing literature drawn from other development programs shows that cofinancing can impact project outcomes (Chatterjee, Sakoulis and Turnovsky, 2003; Kotchen and Negi, 2019) and previous conceptual work highlights the existence of various types of cofinancing arrangements in Chinese development finance (Lin and Wang, 2017; Chin and Gallagher, 2019; Humphrey and Chen, 2021; Sauer et al., 2022). This motivates us to investigate the variations in Chinese development cofinancing arrangements and how they may affect project outcomes differently.

In this paper, we investigate the project outcomes of a sample of Chinese lending and overseas development finance infrastructure projects committed from 2000-2017, including the energy, transport/storage and industry/mining/construction sectors. We first explore the differences between cofinanced and non-cofinanced projects and then assess variation across different types of cofinancing. Cofinancing refers to all financial resources – which can be private or public – from the recipient country, China, or any third-party country that flows into a project alongside the development financing provided by the primary Chinese funding institution. We focus particularly on cofinancing with international and recipient partners, as they may bring resources or apply standards that can lead to different project outcomes.

We examine two types of project outcomes: project implementation and environmental impacts. Implementation is the key to achieving project and development goals of infrastructure projects. We focus on two outcomes that are central to implementation: completion and localization. Development projects, especially large-scale and complex infrastructure projects, are characterized by long implementation duration and uncertainty (Granoff, Hogarth and Miller, 2016). Project cancellations and withdrawals frequently occur (Alova, Trotter and Money, 2021; Lu, Zhou and Simmons, 2021). Previous literature suggests that cofinancing can mitigate risks and ensure project success (Miller and Yu, 2012; Kotchen and Negi, 2019). Therefore, we investigate whether cofinancing can enhance the completion of Chinese lending and overseas development finance projects. Meanwhile, localized implementation is encouraged in development projects to foster benefits such as local employment opportunities, capacity building and knowledge spillovers, and to ensure that necessary on-the-ground know-how is taken into account (Auffray and Fu, 2015; Steffen et al., 2018; Chen, 2021). Empirical evidence reveals that Chinese overseas economic engagement has become more localized than in the past (Kernen and Lam, 2014; Van der Kley, 2020; Chen, 2021) and we aim to understand whether cofinancing with recipient country partners promotes such localization.

We also investigate the environmental performance of Chinese overseas development projects. Environmental impacts, especially with respect to climate change and biodiversity, have been identified as major risks facing Chinese overseas infrastructure projects (Ascensão et al., 2018; Narain et al., 2020; Springer, Evans and Teng, 2021; Yang et al., 2021). International financial institutions, in response to local community pressure and global environmental challenges, have established environmental safeguards to mitigate these risks. We hypothesize that cofinancing with international institutions could be an effective way for Chinese development institutions to foster best practice sharing and apply standardized norms. In this paper, we investigate whether cofinancing with international institutions improves Chinese-financed infrastructure projects' environmental performance, namely carbon dioxide emissions intensity and biodiversity risk.

Our empirical results suggest that cofinancing correlates with better project outcomes, though effects vary depending on the examined outcome and type of cofinancing. Specifically, cofinanced projects are 3.3-7.0 percentage points less likely to be cancelled or suspended compared to non-cofinanced projects. When projects involve recipient cofinancing, there is a 20.4 percentage points increase in the probability of having local implementors and an average of 0.11 increase in the number of local implementors than non-cofinanced projects. We also find that projects that are cofinanced with international institutions have a 2.7 percent lower carbon dioxide emissions intensity (within a sample of fossil fuel based electric power projects) and a 0.42 standard deviation decrease in biodiversity risks compared to non-cofinanced projects.

This paper makes three contributions to the literature. First and foremost, it contributes to filling the knowledge gap on cofinancing. Cofinancing is acknowledged by many development finance institutions as an essential tool to bridge development finance gaps in developing countries (World Bank, 1997; Asian Development Bank, 2005; Global Environment Facility, 2011), yet there is very limited empirical research on the topic. This paper enriches our understanding by providing novel project-level evidence from Chinese lending and overseas development finance.

Second, the empirical geography of financiers studied is also important in its own right. To the best of our knowledge, this is the first paper to investigate the role of cofinancing in Chinese lending and overseas development finance projects. Although project-level analysis is well established in Chinese development finance literature (Brazys, Elkink and Kelly, 2017; Dreher, Fuchs, Parks, et al., 2021; Iacoella et al., 2021; Yang et al., 2021), we are unaware of any research that is focused on cofinancing. Given China's increasing role in development finance and its stated emphasis on cooperation (Gallagher et al., 2022), it is critical to understand how cofinancing with multiple partners may influence project outcomes.

Lastly, this paper is timely and essential from a policy perspective. There has been strong advocacy from the international development community for more cofinancing and, more broadly, collaboration among different actors in development finance. In addition to the core benefit of mobilizing more financial resources, advocates usually point to numerous other benefits of cofinancing, such as risk mitigation and increased accountability, but there is a lack of empirical evidence supporting these benefits. This paper establishes a link between specific cofinancing arrangements and improved project implementation outcomes and environmental performance and it can inform the international development community on the importance of a collaborative approach to addressing the infrastructure finance gap in the Global South.

CONCEPTUAL BACKGROUND AND HYPOTHESES

Literature on Development Cofinancing

Despite heated policy conversations on cofinancing in development, the topic has attracted limited attention in academic literature, whether theoretical or empirical analysis. Early theoretical work focuses on the macroeconomic impacts of cofinancing sourced from the recipient country's domestic entities. Using a general equilibrium model, Chatterjee, Sakoulis and Turnovsky (2003) find that domestic cofinancing can offset the positive economic growth effects of a foreign capital transfer, especially when the recipient economy has a relatively high level of public capital. Similarly, in Kalaitzidakis and Kalyvitis (2008)'s endogenous growth model, the increase of the domestic cofinancing ratio can decrease recipient countries' growth-maximizing absorption rate of foreign aid.

Previous empirical research exploring the role of cofinancing in development finance mainly focuses on the determinants of cofinancing and is mostly drawn from Global Environmental Facility (GEF) projects. Miller and Yu (2012) find that the size of the project, whether the cofinancing is foreign or domestic and which providing agencies are involved can determine the cofinancing ratio of GEF projects. In another study, Cui et al. (2020) reveal that developing economies such as the BRICS countries can leverage more GEF cofinancing than low-income countries. Kotchen and Negi (2019) provide some of the first empirical evidence on whether cofinancing can influence ex-post evaluations of GEF projects and they find a larger amount of cofinancing results in a higher satisfaction rating and a greater likelihood of sustainable impacts.

In addition to the knowledge gained from GEF projects, Dite et al. (2019) investigate International Fund for Agricultural Development projects from 1995-2014 and find country-specific conditions such as income level, budget limitations and governance are significant determinants in attracting cofinancing. Wezel (2004) examines German foreign direct investment projects between 1998-2001 and finds that cofinancing with multilateral development banks such as the International Finance Corporation (IFC) or European Bank for Reconstruction and Development can enhance the willingness of the German banking sector to increase foreign direct investment in risky emerging economies. However, this research largely leaves out the effects of cofinancing, especially environmental impacts.

Cofinancing in Chinese Development Finance

Chinese development finance has increased significantly in recent years and it has become a major source of infrastructure projects in many developing countries. From 2008-2021 two major Chinese development finance institutions, the China Development Bank and the Export-Import Bank of China, lent $498 billion, roughly 83 percent of the World Bank's sovereign lending over the same period (Ray, 2023). By examining issues such as the motivations behind China's lending (Dreher, Fuchs, Hodler, et al., 2021; Kong and Gallagher, 2021), the impact of Chinese finance on recipient countries (Bluhm et al., 2021; Dreher, Fuchs, Parks, et al., 2021; Iacoella et al., 2021) and the governance and implementation of infrastructure projects (Hale, Liu and Urpelainen, 2020; Lu, Zhou and Simmons, 2021; Narain et al., 2022), scholars aim to understand both the potential benefits and risks of Chinese development finance. While some scholars argue that Chinese finance can help fill the infrastructure gap in developing countries, others raise concerns about its potential impact on recipient country's debt sustainability and environmental and social impacts (Ascensão et al., 2018; Gallagher et al., 2018; Gelpern et al., 2021; Yang et al., 2021).

In the Chinese development finance context, there is a dearth of papers that explicitly analyze the effect of cofinancing on the outcomes of development projects. Nevertheless, we notice a few studies that have advanced our understanding in various aspects. Following similar definitions by other institutions (Dite et al., 2019), we define cofinancing in this paper as investments made by entities other than the primary Chinese funder in any China-initiated project or Chinese investments in projects initiated by other entities. Depending on the origin of the cofinancing partners, cofinancing can be categorized into international, recipient and Chinese cofinancing.

International cofinancing is received from entities situated in a third country rather than China or the recipient. International cofinanciers typically include multilateral development banks (MDBs), development funds, international commercial banks and non-governmental organizations. Among all types of international cofinanciers, MDBs have received the most attention. Creating cofinancing funds at major MDBs is one of China's approaches to engaging with MDBs (Humphrey and Chen, 2021; Morris, Rockafellow and Rose, 2021). These are typically multibillion-dollar funds, with notable examples including a $2 billion China Cofinancing Fund for Latin America and the Caribbean with the Inter-American Development Bank, a $3 billion cofinancing fund with the IFC and a $2 billion cofinancing fund with the African Development Bank. Furthermore, China has played a critical role in establishing two new MDBs, the Asian Infrastructure Investment Bank (AIIB) and the New Development Bank (NDB), and they have undertaken cofinancing projects with other western-backed MDBs (Asian Development Bank, 2019).

There is some information on international cofinancing in the electric power sector specifically. Sauer et al. (2022) match financial transactions made by leading Chinese development institutions and traditional MDBs to power plants worldwide between 1999-2020 and find that about 13 percent of the China-funded electricity capacity is jointly invested with MDBs. The percentage of joint investment varies by institution, with China-backed MDBs (namely the AIIB and NDB) having substantially larger percentages of joint investment than Chinese bilateral policy banks and development funds. Sauer et al. (2022) also find there is an increase in the joint investment percentage from power plants already operating to the capacity being developed, pointing to a growing trend in joint investments in the near future.

Recipient cofinancing is provided by government agencies, state-owned entities, or the private sector in the recipient country. It can be obtained either through government budgets or other partnerships with local institutions. China-recipient cofinancing, one form of so-called South-South cooperation, has been increasingly acknowledged in the literature to complement North-South cooperation and promote structural transformation in the Global South (Lin and Wang, 2017). Particularly, when a project is cofinanced by Chinese, international and recipient institutions, it can be referred to as triangular or trilateral cooperation. Zhang (2020) argues that the increase in trilateral aid cooperation projects, such as the China-UNDP-Cambodia Cassava agriculture project and the China-UNIDO-Africa small hydrostations project, demonstrate China's willingness to work cooperatively with other actors in development to address global issues.

Chinese cofinancing is a cooperation between different actors all from China. According to the "coordinated credit space" theory developed by Chin and Gallagher (2019) to explain the globalization strategy of Chinese development finance, China-China cofinancing is one of the factors driving Chinese development finance to achieve such a large scale in a short period of time. Through government-led coordination, Chinese policy banks often take the lead in collaborating with commercial banks, state-owned enterprises, private firms and investment insurers in China to provide finance for individual projects. In this paper, we only focus on cofinancing, but it is worth noting that other forms of China-China cooperation, such as EPC contracts, insurance, guarantees and equipment purchasing are prevalent in the globalization of Chinese lending and overseas development finance.

The composition of cofinancing between public and private sources has also received considerable attention. Although most Chinese development financing is derived from public sources, such as bilateral loans from policy banks and investments backed by state-owned agencies and funds (Moses and Zhu, 2022), the private sector is also involved. Within the push for a higher cofinancing ratio, there is an increasing emphasis on leveraging private capital, especially for infrastructure projects focused on global issues such as climate change and energy transition (Venugopal and Srivastava, 2012). The private sector is broadly defined as entities with a profit-driven focus, such as commercial banks and non-state-owned firms. In Chinese development finance projects, a Chinese public institution such as a policy bank or government agency usually provides the primary financing. Private actors frequently serve as cofinanciers to provide additional funding and resources for the project. The private cofinancier can be of international origin, from the recipient country or from China.

Hypotheses: Cofinancing and Project Outcomes

The primary goal of cofinancing is to raise more funds than could be provided by a single financier. Aside from that, cofinancing can provide a slew of other benefits. The most compelling argument is that cofinancing can improve project accountability and eventually enhance chances of success. Literature suggests that cofinancing can lower transaction costs, guarantee stakeholder coordination and improve project transparency (Nelson, 2001; Chin and Gallagher, 2019). There is less chance of corruption for cofinanced projects since cofinanciers can act as monitors for one another (Shin, Kim and Sohn, 2017).

Evidence indicates that cofinancing with different partners can mobilize more resources into a given project (Miller and Yu, 2012). International organizations have a long history of developing cross-border development initiatives and collaborating with them allows Chinese institutions to learn from international partners' experience in project design, evaluation and implementation. Cofinancing with recipient institutions can help to fill the local knowledge gap and decrease sovereign and political risks. Bundling with other Chinese institutions to cofinance a specific project enables several institutions with disparate skills to complement one another's advantages. In addition, cofinancing with the private sector can incorporate the private sector's professional efficiency in project completion and ease of technology transfer.

The involvement of multiple players in project funding can boost project ownership, which is especially important for infrastructure projects. Infrastructure constructions are frequently complex, large-scale, uncertain projects with lengthy implementation periods. Successful delivery of infrastructure projects necessitates experience in international development, access to local regulatory and market information and specialized technical skills. Enhanced ownership allows engagement

with more stakeholders and therefore mobilizes more expertise into a project. This can decrease the possibility of project cancellations and withdrawals. Therefore, we hypothesize the following:

> ***Hypothesis 1. Cofinanced projects are less likely to be cancelled or suspended than non-cofinanced projects***

The impact of cofinancing on project outcomes may vary depending on the type of cofinancier. Cofinancing with recipient institutions can be beneficial, particularly in increasing local authorities' ownership of the project and raising the sense of engagement (Miller and Yu, 2012). With local entities involved in infrastructure finance, development projects tend to focus more on the interests of host countries (Shin, Kim and Sohn, 2017). Recipient country's societal and governmental demands encourage Chinese overseas development projects to be more localized and to strengthen relations with the local economy (Kernen and Lam, 2014).

One form of localization is to have local actors involved in the implementation of a project. Localized implementation can provide numerous social and economic benefits. When Chinese and recipient implementors collaborate, knowledge transfer can occur through the demonstration effect, labor mobility and apprenticeship training of local personnel. Local implementor involvement is more likely to ensure local employment and supply chain sourcing, and assist in overcoming language and cultural hurdles (Auffray and Fu, 2015; Chen, 2021). Participation of the recipient country during implementation can also facilitate the incorporation of input from the local community (Harrison and Mulley, 2007). Public opinions can be heard and local legislation is taken into account. According to a survey and fieldwork study executed by Chen (2021), more localized Chinese institutions are better prepared to weather potential obstacles such as political instability and economic slumps when conducting projects abroad.

Previous literature suggest that the source of funding can influence the localization level of Chinese institutions' development projects overseas (Van der Kley, 2020). In our context, when a project receives recipient cofinancing, its implementation is more likely to be localized. Based on the above discussions, we hypothesize:

> ***Hypothesis 2. Projects that are cofinanced with recipient partners have more localized implementation***

Cofinancing partners may apply specific standards that can shape project outcomes. International institutions have a long track record of funding development projects and have developed robust and comprehensive oversight systems. Over the last several decades, international institutions have made mitigating environmental impacts a critical component of project development in response to campaigns by locally affected populations, climate policy and biodiversity threats. Both public and private international financial institutions have adopted a series of environmental management practices. Some of these measures are initiated by institutional safeguards (e.g. the World Bank's Environmental and Social Standards, BNP Paribas's biodiversity frameworks), others are guided by sectoral associations (e.g. the Task Force on Climate-Related Financial Disclosures, Equator Principles, Principles for Responsible Investment). These protocols are especially essential for many projects in developing countries, where environmental legislation and enforcement tend to be relatively lax.

When international institutions provide funding, the sponsored project typically adheres to common standards. For example, multilateral development banks like the World Bank requires all cofinanced projects to be developed, appraised and implemented in accordance with the Bank's standard policies and procedures (World Bank, 2013; Steffen and Schmidt, 2020). International institutions are attentive to environmental concerns and can quickly take action to de-risk the project to be compatible with globally standardized norms. If an infrastructure project involves financing from international partners, it is likely to be governed by higher-level international environmental standards.

Cofinancing with international institutions can be an effective way for Chinese institutions to build on their growing experience and enhance the environmental governance of their overseas activities. The Belt and Road Initiative International Green Development Coalition (2021) has called for Chinese development finance institutions to increase cofinancing with international institutions adhering to common standards to mitigate social and environmental risks. As newcomers in providing infrastructure finance in the Global South, Chinese financial institutions can expand on the environmental management frameworks of international institutions and innovate to suit relevant circumstances. Coordination among financial institutions can also enable cofinanced projects to benefit from international institutions' better environmental management and strive for the most advanced environmental practices (Ray and Gallagher, 2018). Therefore, we hypothesize:

> ***Hypothesis 3. Projects that are cofinanced with international partners have a better environmental performance***

DATA SOURCES AND VARIABLES

We employ Chinese development finance projects committed between 2000-2017 to investigate the effects of cofinancing arrangements on implementation outcomes and combine them with project-level data from other sources to assess environmental impacts. Table S1 lists the variables used in our analysis and their definitions.

Cofinancing Variables

Our primary source of project-level data comes from AidData's Global Chinese Development Finance Dataset, Version 2.0 (Custer et al., 2021). This is one of the most comprehensive datasets compiling overseas development projects supported by Chinese government institutions and state-owned agencies. It has been widely used in the literature to investigate the effect of Chinese development finance on issues such as political participation (Iacoella et al., 2021), corruption (Isaksson and Kotsadam, 2018), political stability (Gehring, Kaplan and Wong, 2022) and economic growth (Dreher, Fuchs, Parks, et al., 2021). AidData 2.0 compiles 13,427 Chinese development finance projects across 165 countries that were committed from 2000-2017. We consider infrastructure projects in the following three sectors: 1) energy, 2) transport and storage and 3) industry, mining and construction. We compiled a data sample of 2,997 projects: 1,063 in the energy sector, 1,244 in the transport and storage sector and 690 in the industry, mining and construction sector.

The information on project-level cofinancing obtained from AidData is critical to our analysis. For each project, AidData records the main Chinese funding institution and its cofinanciers (if applicable). The main institution is frequently a Chinese government agency or state-owned enterprise that issued the official financial commitment. For cofinanced projects, the database also contains information on cofinancing partner origin and type. Cofinancing partner origin indicates whether the cofinancier is from China, the recipient country, or another country. The cofinancing partner type is classified by AidData into detailed types of public sectors (e.g. state-owned bank, state-owned company, government agency) and private sector.

We begin our analysis by examining the differences between cofinanced and non-cofinanced projects using a dummy indicator, $\textit{Cofinanced}_i$. Then we further examine the effect of specific cofinancing arrangements based on the origin and source of the cofinancing partner. There can be more than one cofinancing partner. In order to create mutually exclusive and exhaustive dummy variables to represent different types of cofinancing arrangements, we code cofinanced projects according to the origin of cofinanciers as follows:

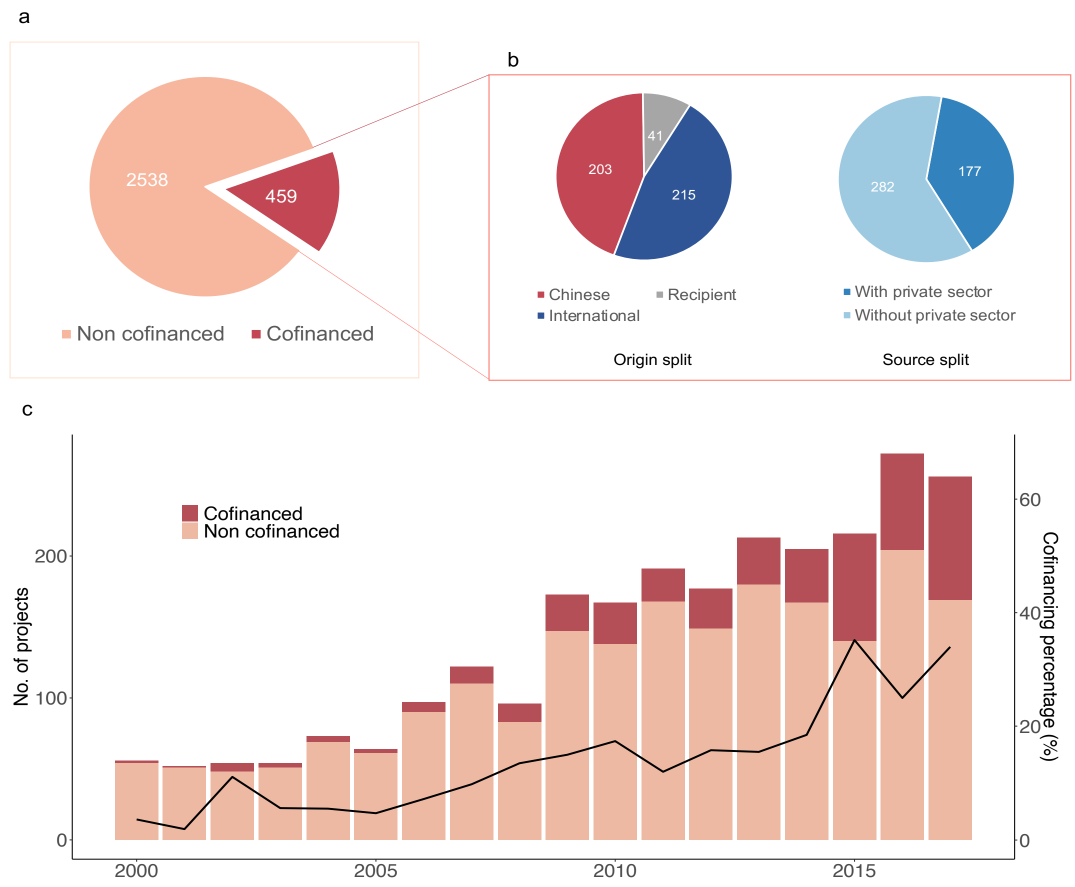
- *Cofinanced with international partner*: at least one cofinancier is from countries other than China or the recipient country;
- *Cofinanced with recipient partner*: no international cofinancier, but at least one cofinancier is from the recipient country;
- *Cofinanced with Chinese partner*: all cofinanciers are from China.

Similarly, when investigating the participation of the private sector in Chinese development finance projects, we code cofinancing types as follows:

- *Cofinanced with private sector*: when at least one cofinancier is from the private sector;
- *Cofinanced without private sector*: when none of the cofinanciers is from the private sector.

Figure 1 presents the cofinancing characteristics of infrastructure projects supported by Chinese lending and overseas development finance. 459 (15 percent) of the 2,997 infrastructure projects are cofinanced, including 215 with international partners, 41 with recipient partners and 203 with Chinese partners. When broken down by financing source, 282 projects are entirely funded by the

Figure 1: Cofinancing Characteristics of Infrastructure Projects Supported by Chinese Lending and Overseas Development Finance



Source: Authors' computation from AiDData 2.0.

public sector, while 177 have the private sector involved as cofinanciers. Looking at annual patterns, the share of cofinanced projects has grown over time, with more cofinanced projects in recent years. This trend is consistent with Sauer et al. (2022)'s observation that there is a favorable trend in joint investments in the near future of Chinese lending and overseas development finance when they examine the electricity sector.

Project Outcomes

PROJECT IMPLEMENTATION We focus on two types of project implementation outcomes: completion and localization. AidData 2.0 collects Chinese lending and overseas development finance projects committed between 2000-2017 and identifies the latest status of projects as of August 2021. The project status is classified into six categories: Pipeline: Pledge; Pipeline: Commitment; Implementation; Completed; Suspended; and Cancelled. We construct a binary dependent variable to indicate whether the project has been cancelled or suspended. Summary statistics in Table 1 show that approximately three percent of the 2,997 infrastructure projects in our sample are cancelled or suspended, including 20 energy projects, 17 industry, mining and construction projects and 49 transport and storage projects.

AidData 2.0 also compiles the name and origin of institutions responsible for implementing the project. Project implementors are categorized by their origin: China, the recipient country and other countries. We construct two dependent variables to measure recipient implementor involvement. The first variable is a dummy variable at the extensive margin, indicating whether there is at least one implementor from the recipient country. The second variable is at the intensive margin, i.e. the number of implementors from the recipient country. More than half of the infrastructure projects with known implementation information are implemented with the recipient actors involved and the maximum number of recipient implementors in a given project is seven (Table 1).

ENVIRONMENTAL IMPACTS To examine environmental impacts, we combine the AidData 2.0 dataset with data from other sources to construct environmental outcomes. Environmental impact evaluation of infrastructure projects is highly variable and depends on the individual nature of each project. To make the analysis feasible, we investigate two types of measurable and comparable impacts that are central to international institutions' environmental safeguards and China's push to green the Belt Road Initiative (China Council for International Cooperation on Environment and Development, 2021): CO_2 emissions intensity of power generation units and biodiversity risks of infrastructure projects with precise geographical boundaries. We employ established methods used in the literature to construct these impact variables.

To evaluate the effect of cofinancing on CO_2 emissions intensity, we limit our sample to fossil fuel electric power generation units contained in the "Energy" sector defined by AidData. Based on the project description in AidData, we identify projects that finance fossil fuel electricity plants and match them to power units in the World Electric Power Plants (WEPP) database. WEPP (S&P Global Market Intelligence, 2020) is a global database that compiles power generation facilities at the unit level and contains information such as the name of the power unit, generator capacity, operational year, location and technical parameters. Therefore, we build our sample of power generation units based on financing information provided in AidData and technical information contained in WEPP. Our sample constitutes 296 fossil fuel power generation units, among which 213 units are coal-fired, 70 are gas-fired and 13 are oil-fired.

We follow the approach developed in electricity emissions literature (Pfeiffer et al., 2018; Springer, Evans and Teng, 2021; Xiahou, Springer and Mendelsohn, 2022) to construct our dependent variable, i.e. CO_2 emissions intensity of fossil fuel power generation units. CO_2 emissions intensity (tons of CO_2/MWh) is the product of the heat rate (million Btu/MWh) and emission factor (tons CO_2/ million Btu). The heat rate measures the technical efficiency of a power generator and it equals the amount of energy consumed by a power generator to produce one unit of electricity. The lower the heat rate, the higher the efficiency of the power generator. The emission factor represents the carbon content of the fuel used. The higher the emission factor, the dirtier the fuel.

$$Carbon\ emissions\ intensity = Heat\ Rate\ \times\ Emission\ factor \tag{1}$$

We extract heat rates and emission factors from the US Energy Information Agency (EIA, 2016, 2017) and assign values to power generators based on their technical attributes. In our estimates, the heat rate of oil and gas power units is determined by fuel class and turbine type (e.g., steam turbine, gas turbine, internal combustion and combined cycle). For coal power units, the approach for estimating heat rate is more granular (Pfeiffer et al., 2018), which is decided by generator capacity, fuel type (e.g. bituminous, sub-bituminous, lignite) and steam conditions (e.g., subcritical, supercritical and ultra-supercritical). The WEPP database provides greater detail on fuel type and turbine technologies than EIA. We group detailed types into distinct categories that can be matched to references in EIA following the classification approach developed by Pfeiffer et al. (2018). Table S2 lists our estimates of emission factors and heat rates for power generation units. As shown in the summary statistics in Table 1, the CO_2 emissions intensity of fossil fuel generation units ranges from 0.45 to 1.15 with an average of around 0.85 tons CO_2/MWh.

To study biodiversity risk, we restrict our sample to infrastructure projects with precise geolocated information. AidData 2.0 provides information on the geographical locations of infrastructure projects, however, the database does not specify the precision level of each project. Certain projects' geolocation represents the facility's precise geographical boundaries, whereas others are defined by the administrative division (Ray et al., 2021). Evaluating the georeferenced biodiversity risk will be problematic without knowing the precision level of geolocation.

To address this issue, we leverage alternative geolocation data from Ray et al. (2021). Ray et al. (2021) compile 862 development finance commitments from Chinese policy banks between 2008 and 2019 and trace the most precise footprint of every project. Locations have been plotted and validated on the ground as points, lines, or polygons for projects with available geographic information. The dataset classifies geolocation into six precision levels: 1) exact project footprint; 2) project location within 25km; 3) second-order administrative division; 4) first-order administrative division; 5) spanning multiple first-order administrative divisions; 6) country. We only consider projects with precision levels 1 and 2 in our sample for assessing biodiversity risks. We match cofinancing information from AidData to projects included in Ray et al. (2021), yielding a sample of 298 infrastructure projects with high-precision spatial information.

Our dependent variable for assessing biodiversity risk is an integrated index ranging from 0 (lowest risk) to 1 (greatest risk). We apply the method developed by Yang et al. (2021) to estimate risks to biodiversity imposed by Chinese development finance projects. The risk score is constructed by overlapping geocoded projects with three types of biodiversity sensitive areas: critical habitats (CH), protected areas (PA) and threatened species richness (SR):

$$Biodiversity\ Risk\ Index_i = \frac{CH_i + PA_i + SR_i}{3} \tag{2}$$

Cell $\boldsymbol{i}$ represents a given geographical zone at 1km² resolution level. CH_i is the cell $\boldsymbol{i}$'s risk score for critical habitats. Cells labeled as "likely" critical habitat receive a high risk value (CH = 1), while cells designated as "potential" critical habitat receive a moderate risk value (CH = 0.5). PA_i is a binary indicator of protected areas, with PA_i = 1 indicating that cell i is in protected areas. SR_i is a continuous

0–1 scale that reflects the relative global patterns of species richness, adjusted by human modification of the landscape. The $\textit{Biodiversity Risk Index}_i$ is generated by averaging the three risk scores and has a value between 0 (lowest risk) and 1 (highest risk). This approach ensures that our biodiversity risk assessment takes into account multiple sensitive ecological features and presents the risk at a relative scale suitable for a regression model.

The risk scores are first generated at 1km^2 cell level and then assigned to projects based on their geographical characteristics. For projects displayed as points, integrated risks are allocated based on the 1km^2 cell with which they intersected. For projects represented as lines, integrated risks indicate the average risk across all cells created at 1 km intervals along the linear path. For projects represented as polygons, integrated risks are calculated as the average risk across all cells at the 1km^2 resolution. More details on constructing the biodiversity risk index can be found in Yang et al. (2021). The median biodiversity risk index in our sample is 0.17, with the lowest value being 0 and the greatest value reaching 0.85.

Control Variables

We account for various factors that may affect the project's outcomes besides our explanatory variables.

Project size: We control for project size since larger projects require more financial resources and are thus more likely to be cofinanced (Miller and Yu, 2012; Kotchen and Negi, 2019). For the infrastructure project sample, project size is measured by the monetary value of the financial commitment from the main Chinese funding institution (constant 2017 USD in log form). The size of infrastructure projects varies from 12 thousand to $32 billion, with the average at $411 million (Table 1).

Sector, country and year dummies: We add sector dummies to control for unobserved heterogeneity among sectors that can affect project outcomes. The three infrastructure sectors in our sample are 1) energy, 2) transport and storage, and 3) industry, mining and construction. We also include dummy variables of recipient countries to allow coefficients to be identified of variation in projects within countries. To account for common yearly shocks, we include dummies for the year when the project was officially committed.

In our alternative specification without country dummies, we include a few country-level characteristics, including GDP per capita and the Worldwide Governance Indicators (WGI). WGI indicators are rated on a scale of -2.5 to 2.5, with higher values indicating better governance. Both sets of data are from the World Bank.

When investigating carbon dioxide emissions intensity, we replace the project size, commitment year and sector dummies with variables corresponding to power generation as follows:

Power unit capacity: We use the capacity of the power generator (megawatts in log form) to represent the size of the power unit. In our sample, the generator capacity ranges from 2 to 1050 MW, with a mean value of about 327 MW (Table 1).

Operational year of power units: We include the year when power units start to operate in our specification to account for common trends such as advances in technology over time.

Fuel dummies: Gas-fired and oil-fired power units are typically less carbon-intensive than coal-fired units. We include fuel dummies to account for the differences among the three power generating technologies, namely coal-, gas- and oil-fired, so our estimates can be read as within-fuel effects.

Table 1: Summary Statistics of Variables Used in Main Specifications

	Means	Std.Dev.	Min.	Max.	Obs.
1) All infrastructure projects					
Project cancelled or suspended	0.03	0.17	0	1	2,997
Recipient implementor involved	0.60	0.49	0	1	2,347
Number of recipient implementors	0.74	0.75	0	7	2,347
Project size (constant 2017 million USD)	410.58	1419.84	0.012	32064.84	2,401
2) Infrastructure projects being fossil fuel power units					
CO_2 emissions intensity (tons CO_2/MWh)	0.85	0.12	0.45	1.15	282
Power unit capacity (MW)	327.20	252.00	2	1050	282
3) Infrastructure projects with accurate geolocation					
Biodiversity risk index	0.17	0.20	0.00	0.85	298

Source: Authors' computation.

EMPIRICAL DESIGN

To investigate the effect of cofinancing arrangements on project outcomes, we estimate the following linear regression in the cross-section of project-level data specified as:

$$Y_{isct} = \beta_1 Cofinanced_i + Controls_i + \sigma_s + \gamma_c + \delta_t + \epsilon_i \qquad (3)$$

Where Y_{isct} is the outcome of project i of sector s located in recipient country c and committed in the year t. Project outcomes include project cancelled or suspended, recipient implementor involved, the number of implementors from the recipient country, carbon dioxide emissions intensity and biodiversity risk index. $Controls_i$ are characteristics presumed to affect the outcome variable, such as project size. σ_s and γ_c are sector and country dummies respectively, controlling for time-invariant differences among sectors and recipient countries that can affect project outcomes. δ_t are year dummies, accounting for common time effects.

In addition to this main specification, we also replace country dummies with region dummies, such as Africa, America, Asia, Europe and the Middle East, in order to allow coefficients to be estimated within regions. This alternative specification is less restrictive and does not control for unobserved heterogeneity among countries that may affect project outcomes. To address this concern, we include GDP per capita and five WGI indicators - control of corruption, government effectiveness, political stability, regulatory quality and voice and accountability[4] - into the alternative specification to account for country-level characteristics.

$Cofinanced_i$ is our variable of interest. Its coefficient β_1 captures differences in outcomes of cofinanced projects relative to non-cofinanced projects. Besides, to test whether the outcomes vary under different cofinancing arrangements, we split the dummy variable $Cofinanced_i$ into a set of dummy variables according to the cofinancing partner's origin (cofinanced with international partner,

[4] To avoid multicollinearity, we do not include all the six WGI indicators. We eliminate "rule of law" from our model after computing the variance inflation factor (VIF).

recipient partner and Chinese partner) and source (cofinanced with private sector, without private sector), specified as:

$$Y_{isct} = \beta_2 Cofinanced\_International_i + \beta_3 Cofinanced\_Recipient_i + \beta_4 Cofinanced\_China_i + Controls_i + \sigma_s + \gamma_c + \delta_t + \epsilon_i \quad (4)$$

$$Y_{isct} = \beta_5 Cofinanced\_withPrivate_i + \beta_6 Cofinanced\_withoutPrivate_i + Controls_i + \sigma_s + \gamma_c + \delta_t + \epsilon_i \quad (5)$$

In all specifications, the reference group remains non-cofinanced projects. Coefficients β_2 to β_6 quantify the differences in outcomes of projects under a specific type of cofinancing arrangement relative to non-cofinanced projects.

Our empirical strategy has some limitations that should be noted. First, we study correlational patterns and causality may not be established from our analysis. Nevertheless, our analysis aims to enhance our understanding of cofinancing and the patterns we draw from observational data provide preliminary quantitative evidence supporting our hypotheses about the link between cofinancing and project outcomes. Additionally, our empirical design makes it difficult to disentangle the mechanisms underlying these outcomes. We cannot determine whether cofinanciers select projects that are likely to have better outcomes from the beginning, or whether projects are implemented differently once cofinanciers are on board. However, our hypotheses account for both channels, reinforcing the idea that cofinancing is linked with better project outcomes. Finally, although we have carefully chosen control variables, there may still be omitted variables that could affect our results. For example, there may be subsector differences that could lead to different project outcomes and they are not captured by our sector dummies. To address this issue, we have conducted specific analyses for subsectors such as fossil fuel power plants and the results are in line with the overall patterns.

RESULTS

Project Implementation

We start our analysis with the impact of cofinancing on project completion (Table 2), assessing the overall impact of cofinancing before delving into specific cofinancing arrangements. We find that the probability of cancellation and suspension for cofinanced projects is 3.3 percentage points lower than that of non-cofinanced ones (Column 1). In Columns 2 and 3, we examine whether the effect is driven by specific types of cofinancing arrangements. In all specifications, non-cofinanced projects remain as the reference group. When we separate cofinanced projects by cofinanciers' origin (Column 2), we find that projects cofinanced with recipient and Chinese partners are around 4 percentage points less likely to be cancelled or suspended than non-cofinanced ones. The coefficient of cofinancing with international partners is not statistically significant. When diving into the source of cofinancing, the attenuation effect is mainly driven by the private sector's participation in cofinancing, which reduces the likelihood of project setbacks by about 4.9 percentage points (Column 3).

In Columns 4 to 6, we further limit our sample to eliminate projects that have been completed or terminated. This specification addresses the uncertainty that some projects are still in the planning and implementation stages and may be cancelled or suspended at a later date. When dropping ongoing projects, the effect becomes stronger. The probability of cofinanced projects being cancelled or suspended is 7 percentage points lower than non-cofinanced projects (Column 4). This effect is statistically significant across all cofinancing arrangements (at 10 percent level only for projects cofinanced with international partner). The effect is greatest for projects cofinanced with Chinese partners (9.7 percentage points lower) and smallest for projects cofinanced with international partners (5 percentage points lower).

Overall, our results suggest that cofinancing, regardless of the type of arrangement, is associated with a lower likelihood of project cancellations and suspensions. These patterns are in line with our first hypothesis motivated by the idea that cofinancing can enhance project accountability and hence the chances of completion.

Table 2: Effect of Cofinancing Arrangements on Project Completion

Outcome variable	Project cancelled or suspended					
	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample			Drop ongoing projects		
Cofinanced	-0.033**			-0.070***		
	(0.014)			(0.024)		
Cofinanced with international partner		-0.024			-0.050*	
		(0.016)			(0.025)	
Cofinanced with recipient partner		-0.041***			-0.070***	
		(0.016)			(0.019)	
Cofinanced with Chinese partner		-0.040**			-0.097***	
		(0.018)			(0.034)	
Cofinanced with private partner			-0.049***			-0.079***
			(0.016)			(0.023)
Cofinanced without private partner			-0.0220			-0.063**
			(0.017)			(0.028)
Project size (constant 2017 USD in log)	0.008***	0.008***	0.008***	0.016***	0.016***	0.016***
	(0.002)	(0.002)	(0.002)	(0.004)	(0.005)	(0.004)
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,390	2,390	2,390	1,446	1,446	1,446

Source: Authors' computation.

Note: Columns 1-3 include projects of all statuses, whereas Columns 4-6 exclude projects in "Pipeline: Pledge", "Pipeline: Commitment", "Implementation" statuses. Standard errors are clustered at recipient country level and indicated in parenthesis. Asterisks denote *p <0.10, **p <0.05, ***p <0.01.

Table 3 presents results for local implementation involvement. To quantify recipient implementation engagement in both extensive and intensive margins, we use two dependent variables: a dummy variable that indicates whether at least one recipient institution participated in project implementation (Columns 1-3) and a count variable that records the number of implementors from the recipient country (Columns 4-6).

At the extensive margin, there is no statistically significant difference between cofinanced and non-cofinanced projects (Column 1). The difference becomes statistically significant when investigating the effect of specific cofinancing arrangements. Cofinancing with recipient partners increases the probability of local implementation by 20.4 percentage points, while cofinancing with only Chinese partners decreases the likelihood by 17.7 percentage points (Column 2). We also find that having the private sector as cofinancier does not contribute to involving local implementors. On the contrary, when the project's financiers are all from the public sector, the odds of having a recipient implementor decrease by 11.1 percentage points compared to non-cofinanced projects (Column 3).

Table 3: Effect of Cofinancing Arrangements on Localized Implementation

Outcome variable	Recipient implementor involved			Number of recipient implementors		
	(1)	(2)	(3)	(4)	(5)	(6)
Cofinanced	-0.07			-0.136*		
	(0.044)			(0.073)		
Cofinanced with international partner		-0.022			-0.062	
		(0.057)			(0.079)	
Cofinanced with recipient partner		0.204**			0.110*	
		(0.092)			(0.065)	
Cofinanced with Chinese partner		-0.177***			-0.260**	
		(0.063)			(0.117)	
Cofinanced with private sector			-0.002			-0.062
			(0.057)			(0.077)
Cofinanced without private sector			-0.111**			-0.181**
			(0.050)			(0.086)
Project size (constant 2017 USD in log)	-0.013	-0.01	-0.012	0.005	0.008	0.005
	(0.008)	(0.007)	(0.008)	(0.010)	(0.010)	(0.010)
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,921	1,921	1,921	1,921	1,921	1,921

Source: Authors' computation.

Note: Columns 1-3 present the effects on the dummy dependent variable indicating whether recipient implementor was involved, Columns 4-6 present the effects on the number of recipient implementors. Standard errors are clustered at recipient country level and indicated in parenthesis. Asterisks denote *p <0.10, **p <0.05, ***p <0.01.

Results are similar at the intensive margin (Columns 4-6). In Column 4, we do find that cofinanced projects tend to have fewer recipient implementors involved relative to non-cofinanced projects, albeit the effect is only statistically significant at the 10 percent level. We also find that projects cofinanced with recipient partners tend to involve more recipient implementors compared to non-cofinanced projects, whereas projects cofinanced with only Chinese partners tend to involve fewer (Column 5). When examining cofinancing with the private sector (Column 6), the pattern is consistent with our findings in the extensive margin.

Taken together, it appears that cofinancing with recipient partners can increase the likelihood of involving local implementors and the number of local implementors. This supports our second hypothesis that gaining cofinancing from recipient partners involves more localized implementation. We also find that projects backed by multiple Chinese financiers tend to be less likely to engage with implementors from the recipient country than projects funded by a single Chinese public financier (non-cofinanced ones). This implies that increased Chinese funder presence may restrain the localization level of the project's implementation. We also find that when there are only public financiers for a project, the project is less likely to be implemented by local institutions.

Environmental Impacts

We investigate the effect of cofinancing on projects' environmental impacts using relevant subsamples, as discussed in earlier section. Table 4 shows the results of assessing the CO_2 emissions intensity of fossil fuel power generation units. Considering all types of cofinancing together, we do not find a significant difference between cofinanced and non-cofinanced fossil fuel power generation units within fuel types (Column 1). Cofinancing with international partners specifically, however, lowers power generators' emissions intensity by 2.7 percent and this effect is significant at the 5 percent level. This finding is in line with our hypothesis that projects financed with international partners show a better environmental performance. We do not find significant effects of other forms of cofinancing arrangements.

We further explore the mechanism that drives down emissions intensity when projects are cofinanced with international partners. Emissions intensity is determined by the emission factor and heat rate, as in Equation 1. The emission factor measures the carbon content of the fuel used, indicating the quality of the fuel, whereas heat rate captures the technology level of the turbine, i.e. how efficient the combustion is. Therefore, we re-run the regressions with emission factor and heat rate as dependent variables.

Results are presented in Columns (4) and (5). We find that the lower emissions intensity is mainly driven by the use of cleaner fuel options within a single type of fuel (i.e., oil, gas or coal), as cofinancing with international partners can decrease the emission factor by 2.6 percent (Column 4). Cofinancing has no discernible influence on power generators' efficiency (Column 5), implying that there is no significant difference in technology level between cofinanced and non-cofinanced units. This differs from a prior study in which the authors discover that foreign-invested coal plants have lower CO_2 emissions intensity, driven by more efficient technologies (Xiahou, Springer and Mendelsohn, 2022). Our results suggest that cofinancing with international partners can reduce the emissions intensity of Chinese development-financed fossil fuel units through the adoption of cleaner fuel sources.

Table 4: Effect of Cofinancing Arrangements on CO_2 Emissions Intensity

Outcome variable	CO_2 emissions intensity (log)		Emission factor (log)		Heat rate (log)
	(1)	(2)	(3)	(4)	(5)
Cofinanced	-0.014				
	(0.010)				
Cofinanced with international partner		-0.027**		-0.026***	0.0004
		(0.012)		(0.007)	(0.010)
Cofinanced with recipient partner		0.007		0.006	0.002
		(0.016)		(0.010)	(0.009)
Cofinanced with Chinese partner		-0.013		-0.008	-0.005
		(0.023)		(0.017)	(0.009)
Cofinanced with private sector			-0.020		
			(0.012)		
Cofinanced without private sector			-0.009		
			(0.011)		
Project size (MW in log)	-0.013**	-0.012**	-0.012**	0.005	-0.018***
	(0.005)	(0.006)	(0.005)	(0.004)	(0.005)
Fuel dummies	Yes	Yes	Yes	Yes	Yes
Operational year dummies	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes
Number of observations	272	272	272	272	272

Source: Authors' computation.

Note: Standard errors are clustered at recipient country level and indicated in parenthesis. Asterisks denote $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Concerning biodiversity impact, we find international cofinancing is related to significantly better performance. Table 5 presents our findings regarding the impact of cofinancing on project biodiversity risk. Compared to non-cofinanced projects, cofinancing with international partners is associated with a 0.083 decrease in biodiversity risk (a 49 percent decrease relative to the biodiversity risk mean, or 42 percent of the standard deviations). No statistically significant differences exist in the biodiversity risk index for projects under other cofinancing arrangements.

Taking the results on CO_2 emissions intensity and biodiversity risk together, we find a significant effect of cofinancing with international partners on project environmental performance. We do not find statistically significant effects of other forms of cofinancing arrangements. One possible explanation is that compared to international institutions that have the most established environmental governance system, Chinese and recipient financial institutions are still catching up. These results imply that cofinancing can be an effective tool for emerging development institutions to collaborate with international partners and strengthen their environmental governance.

Table 5: Effect of Cofinancing Arrangements on Biodiversity Risk Index

Outcome variable: biodiversity risk index	(1)	(2)	(3)
Cofinanced	-0.012		
	(0.028)		
Cofinanced with international partner		-0.083**	
		(0.037)	
Cofinanced with recipient partner		0.073	
		(0.093)	
Cofinanced with Chinese partner		0.016	
		(0.026)	
Cofinanced with private sector			-0.066
			(0.048)
Cofinanced without private sector			0.015
			(0.047)
Project size (constant 2017 USD in log)	0.009	0.007	0.011
	(0.009)	(0.010)	(0.009)
Sector dummies	Yes	Yes	Yes
Recipient country dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Number of observations	276	276	276

Source: Authors' computation.

Note: Standard errors are clustered at recipient country level and indicated in parenthesis. Asterisks denote *p <0.10, **p <0.05, ***p <0.01.

Robustness Checks

To check the robustness of our results, we perform a few tests. In our main specifications, standard errors are clustered at the recipient country level. In robustness checks, we first cluster standard errors at the country-by-sector level to account for possible correlation in the dependent variable. Then we use alternative specifications by replacing country dummies with region dummies to allow coefficients to be identified within regions and we include country-level characteristics. Table S3 summarizes the results of robustness checks to test our hypothesis. We find the signs and statistical significance of the coefficients remain consistent. The magnitude of the effect slightly differs when model specifications change, but none of them violate our main findings.

In addition to linear probability models, we use Logit and Probit models to analyze binary project outcomes (i.e. project cancelled or suspended, recipient implementor involved). The findings show a similar trend as the linear probability models (Table S4): cofinanced projects are less likely to be cancelled or suspended than non-cofinanced ones and projects with recipient cofinancing have a higher chance of involving recipient implementors. Similarly, non-linear model results show that projects funded by multiple Chinese partners are less likely to involve recipient implementors than those funded by a single Chinese institution.

DISCUSSIONS AND CONCLUSIONS

Over recent years, there has been a strong emphasis on promoting cofinancing in the policy discussion on development finance. As a major player in development finance, Chinese institutions are actively seeking cooperation with other partners. This paper contributes to the currently limited cofinancing literature with a focus on the effects of cofinancing on project-level outcomes of Chinese lending and overseas development finance in the energy, transport and industrial sectors.

Overall, our results suggest a positive link between cofinancing and project outcomes in Chinese development finance, although the effects vary. Cofinanced projects, in general, are less likely to be cancelled or suspended than non-cofinanced ones. We also find that cofinancing with the recipient and international partners can bring specific benefits. Projects with recipient cofinancing are implemented in a more localized manner on both the intensive and extensive margins, whereas projects with international cofinancing have better environmental performance, including lower CO_2 emissions intensity of power generation units and lower biodiversity risk. Our findings are comparable with the results of Kotchen and Negi (2019), the only study we know that explores how cofinancing influences ex-post project outcomes (though not studying Chinese finance specifically). They find cofinancing results in better satisfaction ratings and sustained impacts of Global Environmental Facility projects.

The findings imply that cofinancing can be an effective tool to improve outcomes of Chinese lending and overseas development finance projects. As mitigating social and environmental risks has been a stated policy priority for China's Belt and Road Initiative, our results show that strengthening collaboration with the recipient and international partners, such as through cofinancing, might be a way forward to enhance project success and achieve greater sustainable performance in Chinese lending and overseas development finance. To increase the share of cofinanced projects, Chinese institutions could for instance further facilitate stakeholder dialogue between Chinese and non-Chinese actors, such as MDBs, recipient governments and the private sector, to foster cofinancing partnerships. Further, it might help in that regard to develop specialized financial instruments to address some of the concerns that potential cofinanciers may have with regard to large-scale infrastructure projects.

The evidence drawn from Chinese overseas development projects has broader implications for the international community. Many development finance institutions see cofinancing as a key strategy for unlocking greater financial resources in order to achieve carbon-neutral transition and sustainable development goals in the developing world (UNCTAD, 2014; Songwe, Stern and Bhattacharya, 2022). Our findings suggest that cofinancing, in addition to filling the financing gap, can increase the likelihood of project success and improve environmental performance. These findings underscore the importance of a collaborative approach to developing infrastructure projects in the Global South. By leveraging the resources and expertise of multiple partners, cofinancing can help to build more inclusive and sustainable infrastructure that leads to economic growth and development.

Our findings raise important questions for further research. While our results show that cofinancing with recipient partners can promote more localized implementation, we also find evidence that cofinancing with multiple Chinese institutions and exclusively the public sector has the opposite effect on localization. This raises questions about how to design and structure cofinancing arrangements to engage with local communities and stakeholders. Besides, we find that the private sector's cofinancing in Chinese development finance is linked with a lower risk of project cancellation or suspension, but there is no significant link with other outcomes. This pattern highlights the need for further research to understand the specific contribution that the private sector can bring into development finance, given the recent push to channel more private capital into development and climate finance.

REFERENCES

Alova, G., Trotter, P. A. and Money, A. (2021) 'A machine-learning approach to predicting Africa's electricity mix based on planned power plants and their chances of success', Nature Energy. Springer US, 6(February). doi: 10.1038/s41560-020-00755-9.

Amighini, A. A., Rabellotti, R. and Sanfilippo, M. (2013) 'Do Chinese state-owned and private enterprises differ in their internationalization strategies?', China Economic Review. Elsevier Inc., 27, pp. 312–325. doi: 10.1016/j.chieco.2013.02.003.

Ascensão, F. et al. (2018) 'Environmental challenges for the Belt and Road Initiative', Nature Sustainability. Springer US, 1(5), pp. 206–209. doi: 10.1038/s41893-018-0059-3.

Asian Development Bank (2005) Cofinancing: A Guide to ADB's Official and Commercial Cofinancing Operations.

Asian Development Bank (2019) Partnership Report 2019, Asian Development Bank. Available at: https://www.adb.org/multimedia/partnership-report2019/partners/multilateral/asian-infrastructure-investment-bank/ (Accessed: 22 February 2023).

Auffray, C. and Fu, X. (2015) 'Chinese MNEs and managerial knowledge transfer in Africa: the case of the construction sector in Ghana', Journal of Chinese Economic and Business Studies, 13(4), pp. 285–310. doi: 10.1080/14765284.2015.1092415.

Belt Road Initiative International Green Development Coalition (2021) Green Development Guidance for BRI Projects Phase II Task 1: Application Guide for Enterprises and Financial Institutions.

Bluhm, R. et al. (2021) Chinese Infrastructure Projects and the Diffusion of Economic Activity in Developing Countries.

Brazys, S., Elkink, J. A. and Kelly, G. (2017) 'Bad neighbors? How co-located Chinese and World Bank development projects impact local corruption in Tanzania', Review of International Organizations. The Review of International Organizations, 12(2), pp. 227–253. doi: 10.1007/s11558-017-9273-4.

Chatterjee, S., Sakoulis, G. and Turnovsky, S. J. (2003) 'Unilateral capital transfers, public investment, and economic growth', European Economic Review, 47(6), pp. 1077–1103. doi: 10.1016/S0014-2921(02)00235-0.

Chen, X., Gallagher, K. P. and Mauzerall, D. L. (2020) 'Chinese Overseas Development Financing of Electric Power Generation: A Comparative Analysis', One Earth. Elsevier Inc., 3(4), pp. 491–503. doi: 10.1016/j.oneear.2020.09.015.

Chen, Y. (2021) '"Africa's China": Chinese manufacturing investment in Nigeria and channels for technology transfer', Journal of Chinese Economic and Business Studies. Routledge, 19(4), pp. 335–358. doi: 10.1080/14765284.2021.1943184.

Chin, G. T. and Gallagher, K. P. (2019) 'Coordinated Credit Spaces: The Globalization of Chinese Development Finance', Development and Change, 50(1), pp. 245–274. doi: 10.1111/dech.12470.

China Council for International Cooperation on Environment and Development (2021) Green BRI and 2030 Agenda for Sustainable Development.

Cui, L. et al. (2020) 'Co-financing in the green climate fund: lessons from the global environment facility', Climate Policy. Taylor & Francis, 20(1), pp. 95–108. doi: 10.1080/14693062.2019.1690968.

Custer, S. et al. (2021) 'Tracking Chinese Development Finance: An Application of AidData's TUFF 2.0 Methodology', Williamsburg, VA: AidData at William & Mary.

Dite, M. et al. (2019) Determinants of cofinancing in IFAD-funded projects: A call to rethink development interventions.

Dreher, A., Fuchs, A., Parks, B., et al. (2021) 'Aid, China, and Growth: Evidence from a New Global Development Finance Dataset', American Economic Journal: Economic Policy, 13(2), pp. 135–174. doi: 10.1257/pol.20180631.

Dreher, A., Fuchs, A., Hodler, R., et al. (2021) 'Is Favoritism a Threat to Chinese Aid Effectiveness? A Subnational Analysis of Chinese Development Projects', World Development. Elsevier Ltd, 139, p. 105291. doi: 10.1016/j.worlddev.2020.105291.

EIA (2016) Carbon Dioxide Emissions Coefficients (US Energy Information Administration).

EIA (2017) Approximate Heat Rates for Electricity, and Heat Content of Electricity (US Energy Information Administration). Available at: www.eia.gov/totalenergy/data/annual/showtext.php?t=ptb1206.

Gallagher, K. P. et al. (2018) 'Energizing development finance? The benefits and risks of China's development finance in the global energy sector', Energy Policy. Elsevier Ltd, 122 (April), pp. 313–321. doi: 10.1016/j.enpol.2018.06.009.

Gallagher, K. P. et al. (2022) Experts React: China's National Development and Reform Commission Issues New Guidance on Greening the BRI, Global Development Policy Center,Boston University.

Gehring, K., Kaplan, L. C. and Wong, M. H. L. (2022) 'China and the World Bank—How contrasting development approaches affect the stability of African states', Journal of Development Economics, 158, p. 102902. doi: 10.1016/j.jdeveco.2022.102902.

Gelpern, A. et al. (2021) How China Lends: A Rare Look into 100 Debt Contracts with Foreign Governments.

Global Environment Facility (2011) Guidelines for Project Financing.

Granoff, I., Hogarth, J. R. and Miller, A. (2016) 'Nested barriers to low-carbon infrastructure investment', Nature Climate Change, 6(12), pp. 1065–1071. doi: 10.1038/nclimate3142.

Hale, T., Liu, C. and Urpelainen, J. (2020) Belt and road decision-making in China and recipient countries: how and to what extent does sustainability matter?

Harrison, G. and Mulley, S. (2007) Tanzania: a genuine case of recipient leadership in the aid system? GEG Working Paper.

Humphrey, C. and Chen, Y. (2021) China in the multilateral development banks Evolving strategies of a new power.

Iacoella, F. et al. (2021) 'Chinese official finance and political participation in Africa', European Economic Review. Elsevier B.V., 136(January 2013), p. 103741. doi: 10.1016/j.euroecorev.2021.103741.

Inter-American Development Bank (2005) Annual Report 2004. Washington, DC, United States.

Isaksson, A.-S. and Kotsadam, A. (2018) 'Chinese aid and local corruption', Journal of Public Economics, 159, pp. 146–159. doi: 10.1016/j.jpubeco.2018.01.002.

Kalaitzidakis, P. and Kalyvitis, S. (2008) ‘On the Growth Implications of Foreign Aid for Public Investment Co-Financing’, Review of Development Economics, 12(2), pp. 354–371. doi: 10.1111/j.1467-9361.2007.00385.x.

Kernen, A. and Lam, K. N. (2014) ‘Workforce Localization among Chinese State-Owned Enterprises (SOEs) in Ghana’, Journal of Contemporary China, 23(90), pp. 1053–1072. doi: 10.1080/10670564.2014.898894.

Van der Kley, D. (2020) ‘Chinese Companies’ Localization in Kyrgyzstan and Tajikistan’, Problems of Post-Communism. Routledge, 67(3), pp. 241–250. doi: 10.1080/10758216.2020.1755314.

Kong, B. and Gallagher, K. P. (2017) ‘Globalizing Chinese energy finance: The role of policy banks’, Journal of Contemporary China. Routledge, 26(108), pp. 834–851. doi: 10.1080/10670564.2017.1337307.

Kong, B. and Gallagher, K. P. (2021) ‘The new coal champion of the world: The political economy of Chinese overseas development finance for coal-fired power plants’, Energy Policy. Elsevier Ltd, 155(September 2020), p. 112334. doi: 10.1016/j.enpol.2021.112334.

Kotchen, M. J. and Negi, N. K. (2019) ‘Cofinancing in Environment and Development: Evidence from the Global Environment Facility’, World Bank Economic Review, 33(1), pp. 41–62. doi: 10.1093/wber/lhw048.

Lin, J. Y. and Wang, Y. (2017) Going beyond aid: Development cooperation for structural transformation. Cambridge University Press.

Lu, Y., Zhou, X. and Simmons, B. A. (2021) Environmental risks and power plant suspensions. Available at: https://doi.org/10.21203/rs.3.rs-1129680/v1.

Miller, S. and Yu, B.-K. (2012) Mobilizing Resources for Supporting Environmental Activities in Developing Countries: The Case of the GEF Trust Fund. doi: 10.2139/ssrn.2149063.

Morris, S., Rockafellow, R. and Rose, S. (2021) Mapping China’s Multilateralism: A Data Survey of China’s Participation in Multilateral Development Institutions and Funds.

Moses, O. and Zhu, K. (2022) The Belt and Road Initiative and the Partnership for Global Infrastructure and Investment: Global Infrastructure Initiatives in Comparison.

Narain, D. et al. (2020) ‘Best-practice biodiversity safeguards for Belt and Road Initiative’s financiers’, Nature Sustainability. Springer US, 3(8), pp. 650–657. doi: 10.1038/s41893-020-0528-3.

Narain, D. et al. (2022) ‘Biodiversity risks and safeguards of China’s hydropower financing in Belt and Road Initiative (BRI) countries’, One Earth, 5(9), pp. 1019–1029. doi: 10.1016/j.oneear.2022.08.012.

Nelson, P. J. (2001) ‘Transparency Mechanisms at the Multilateral Development Banks’, World Development, 29(11), pp. 1835–1847. doi: 10.1016/S0305-750X(01)00073-0.

Pfeiffer, A. et al. (2018) ‘Committed emissions from existing and planned power plants and asset stranding required to meet the Paris Agreement’, Environmental Research Letters, 13(5), pp. 054–019. doi: 10.1088/1748-9326/aabc5f.

Ray, R. et al. (2021) ‘Geolocated dataset of Chinese overseas development finance’, Scientific Data, 8(1), p. 241. doi: 10.1038/s41597-021-01021-7.

Ray, R. (2023) “ Small is Beautiful ” A New Era in China ’ s Overseas Development Finance ? Available at: https://www.bu.edu/gdp/files/2023/01/GCI_PB_017_CODF_EN_FIN.pdf.

Ray, R. and Gallagher, K. P. (2018) Standardizing Sustainable Development ? Development Banks in the Andean Amazon.

S&P Global Market Intelligence (2020) World Electric Power Plants Database. Available at: https://www.spglobal.com/platts/zh/products-services/electric-power/world-electric-power-plants-database (Accessed: 31 March 2020).

Sauer, J. M. T. et al. (2022) 'Chinese and multilateral development finance in the power sector', Global Environmental Change, 75(March 2021), p. 102553. doi: 10.1016/j.gloenvcha.2022.102553.

Shin, W., Kim, Y. and Sohn, H. S. (2017) 'Do Different Implementing Partnerships Lead to Different Project Outcomes? Evidence from the World Bank Project-Level Evaluation Data', World Development. Elsevier Ltd, 95, pp. 268–284. doi: 10.1016/j.worlddev.2017.02.033.

Songwe, V., Stern, N. and Bhattacharya, A. (2022) Finance for climate action: scaling up investment for climate and development. Report of the Independent High-Level Expert Group on Climate Finance. London.

Springer, C. H., Evans, S. and Teng, F. (2021) 'An empirical analysis of the environmental performance of China's overseas coal plants', Environmental Research Letters, 16(5). doi: 10.1088/1748-9326/abf287.

Steffen, B. et al. (2018) 'Opening new markets for clean energy: The role of project developers in the global diffusion of renewable energy technologies', Business and Politics. Cambridge University Press, 20(4), pp. 553–587.

Steffen, B. and Schmidt, T. S. (2020) '14 Renewable Energy Finance by Multilateral Development Banks', in Green Banking. De Gruyter Oldenbourg, pp. 359–366.

UNCTAD (2014) World Investment Report 2014: Investing in the SDGs: An Action Plan, UNCTAD.

Venugopal, S. and Srivastava, A. (2012) Moving the fulcrum: a primer on public climate financing instruments used to leverage private capital, WRI Working Paper.

Wezel, T. (2004) Does Co-Financing by Multilateral Development Banks Increase 'Risky' Direct Investment in Emerging Markets?, Deutsche Bundesbank Working Paper. doi: 10.2139/ssrn.2785047.

World Bank (1997) Cofinancing Opportunities with the World Bank.

World Bank (2013) OP 14.20:Cofinancing, Operational Manual. Available at: http://web.worldbank.org/archive/website01541/WEB/0__CO-83.HTM#fn3.

Xiahou, Q., Springer, C. H. and Mendelsohn, R. (2022) 'The effect of foreign investment on Asian coal power plants', Energy Economics. Elsevier B.V., 105(May 2021), p. 105752. doi: 10.1016/j.eneco.2021.105752.

Yang, H. et al. (2021) 'Risks to global biodiversity and Indigenous lands from China's overseas development finance', Nature Ecology & Evolution. Springer US. doi: 10.1038/s41559-021-01541-w.

Zhang, D. (2020) A Cautious New Approach: China's Growing Trilateral Aid Cooperation. ANU Press. doi: 10.22459/CNA.2020.

SUPPLEMENTARY INFORMATION

Table S1: Definition of Variables Used in Main Specifications

Variables	Definition
1) Project outcomes	
Project cancelled or suspended	A dummy variable that equals one if the project status is cancelled or suspended, and zero otherwise.
Recipient implementor involved	A dummy variable that equals one if recipient country's institutions were involved in project implementation and zero otherwise.
Number of recipient implementors	Number of implementors from recipient country.
CO_2 emissions intensity	Estimated carbon dioxide emissions intensity of the power unit (tons CO_2/MWh). Estimated based on technology parameters (heat rate and emission factor).
Biodiversity risk index	An integrated risk index ranging from 0 (lowest risk) to 1 (greatest risk). Constructed based on methods described in Yang et al. (2021), i.e. overlapping infrastructure projects with biodiversity sensitive areas.
2) Cofinancing variables	
Cofinanced	A dummy variable that equals one if the project is cofinanced and zero otherwise.
Cofinanced with international partner	A dummy variable that equals one if the project is cofinanced and at least one cofinancier is from countries other than China or the recipient country and zero otherwise.
Cofinanced with recipient partner	A dummy variable that equals one if the project is cofinanced and at least one cofinancier is from recipient country (no international cofinancier) and zero otherwise.
Cofinanced with Chinese partner	A dummy variable that equals one if the project is cofinanced and all cofinanciers are from China and zero otherwise.
Cofinanced with private sector	A dummy variable that equals one if the project is cofinanced and at least one cofinancier is from the private sector and zero otherwise.
Cofinanced without private sector	A dummy variable that equals one if the project is cofinanced and none of the cofinanciers is from the private sector and zero otherwise.
3) Control variables	
Project size	The monetary value of the official commitment issued by the main Chinese funding institution in constant 2017 USD.
Power unit capacity	The capacity of the power generation unit in megawatt (MW).

Source: Authors' elaboration.

Table S2: (A) Assigned Heat Rates and Emission Factors for Coal-Fired Power Units

1) Heat Rate

Capacity range (MW)	Fuel type	Steam conditions	Heat rate (million Btu/MWh)
0-400	Bituminous	Subcritical	9.394
401-500	Bituminous	Subcritical	9.370
501-700	Bituminous	Subcritical	9.347
701-900	Bituminous	Subcritical	9.341
901-10000	Bituminous	Subcritical	9.336
0-400	Bituminous	Supercritical	9.102
401-500	Bituminous	Supercritical	9.081
501-700	Bituminous	Supercritical	9.060
701-900	Bituminous	Supercritical	9.047
901-10000	Bituminous	Supercritical	9.033
0-400	Bituminous	Ultra-supercritical	8.967
401-500	Bituminous	Ultra-supercritical	8.942
501-700	Bituminous	Ultra-supercritical	8.917
701-900	Bituminous	Ultra-supercritical	8.907
901-10000	Bituminous	Ultra-supercritical	8.898
0-400	Subbituminous	Subcritical	9.468
401-500	Subbituminous	Subcritical	9.441
501-700	Subbituminous	Subcritical	9.414
701-900	Subbituminous	Subcritical	9.410
901-10000	Subbituminous	Subcritical	9.405
0-400	Subbituminous	Supercritical	9.172
401-500	Subbituminous	Supercritical	9.148
501-700	Subbituminous	Supercritical	9.124
701-900	Subbituminous	Supercritical	9.112
901-10000	Subbituminous	Supercritical	9.101
0-400	Subbituminous	Ultra-supercritical	9.036
401-500	Subbituminous	Ultra-supercritical	9.008
501-700	Subbituminous	Ultra-supercritical	8.980
701-900	Subbituminous	Ultra-supercritical	8.972
901-10000	Subbituminous	Ultra-supercritical	8.964
0-400	Lignite	Subcritical	10.011
401-500	Lignite	Subcritical	9.985

Capacity range (MW)	Fuel type	Steam conditions	Heat rate (million Btu/MWh)
501-700	Lignite	Subcritical	9.960
701-900	Lignite	Subcritical	9.954
901-10000	Lignite	Subcritical	9.949
0-400	Lignite	Supercritical	9.693
401-500	Lignite	Supercritical	9.671
501-700	Lignite	Supercritical	9.649
701-900	Lignite	Supercritical	9.636
901-10000	Lignite	Supercritical	9.622
0-400	Lignite	Ultra-supercritical	9.548
401-500	Lignite	Ultra-supercritical	9.521
501-700	Lignite	Ultra-supercritical	9.495
701-900	Lignite	Ultra-supercritical	9.485
901-10000	Lignite	Ultra-supercritical	9.475

2) Emission Factor

Detailed fuel type	Classified fuel type	Emission factor (tons CO_2/million Btu)
Anthracite	Lignite	0.104
Anthracite/culm	Lignite	0.104
Lignite	Lignite	0.098
Bituminous	Bituminous	0.093
Subbituminous	Subbituminous	0.097
Bituminous/Subbituminous	Bituminous	0.095

Source: Authors' compilation from Pfeiffer et al. (2018).

Table S2: (B) Assigned Heat Rates and Emission Factors For Gas- And Oil-Fired Power Units

1) Heat Rate

Fuel class	Turbine type	Heat rate (million Btu/MWh)
Gas	Steam turbine	10.372
Gas	Gas turbine	11.302
Gas	Internal combustion	9.322
Gas	Combined cycle	7.655
Oil	Steam turbine	10.197
Oil	Gas turbine	13.55
Oil	Internal combustion	10.379
Oil	Combined cycle	9.676

2) Emission Factor

Detailed fuel type	Fuel class	Emission factor (tons CO_2/million Btu)
Gas	Gas	0.059
Liquified natural gas	Gas	0.053
Liquified petroleum gas	Gas	0.067
Oil	Oil	0.082
Oil shale	Oil	0.113
Diesel oil	Oil	0.073
Heavy fuel oil	Oil	0.079

Source: Authors' compilation from Pfeiffer et al. (2018).

Table S3: Robustness Checks Using Alternative Specifications

Outcome variable	Project cancelled or suspended		Recipient implementor involved		CO_2 emissions intensity (log)		Biodiversity risk index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	All infrastructure projects				Fossil fuel power units		Infrastructure projects with accurate geolocation	
Cofinanced	-0.033**	-0.023*						
	(0.014)	(0.013)						
Cofinanced with international partner			-0.022	0.036	-0.027*	-0.018*	-0.083*	-0.091**
			(0.056)	(0.045)	(0.014)	(0.010)	(0.044)	(0.040)
Cofinanced with recipient partner			0.204**	0.210***	0.007	0.022***	0.073	0.074
			(0.087)	(0.056)	(0.015)	(0.006)	(0.090)	(0.101)
Cofinanced with Chinese partner			-0.177***	-0.164**	-0.013	0.012	0.016	-0.023
			(0.059)	(0.075)	(0.025)	(0.030)	(0.029)	(0.034)
Project size (USD/MW in log)	0.008***	0.009***	-0.01	-0.014*	-0.012*	-0.013**	0.007	0.013*
	(0.002)	(0.002)	(0.008)	(0.008)	(0.006)	(0.006)	(0.013)	(0.007)
GDP per capita (USD in log)		0.003		-0.031		-0.023**		0.018
		(0.006)		(0.034)		(0.010)		(0.021)
Control of corruption		0.013		-0.116*		-0.040*		-0.064*
		(0.016)		(0.066)		(0.019)		(0.033)
Government effectiveness		-0.036		0.231***		0.044*		0.106
		(0.035)		(0.056)		(0.021)		(0.061)
Political stability		0.002		-0.064*		0.009**		0.032***
		(0.006)		(0.034)		(0.004)		(0.007)
Regulatory quality		-0.001		-0.07		0.029		-0.086
		(0.015)		(0.073)		(0.032)		(0.050)
Voice and accountability		0.027**		-0.02		-0.027***		0.019
		(0.011)		(0.034)		(0.006)		(0.033)
Sector/Fuel dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	No	Yes	No	Yes	No	Yes	No
Region dummies	No	Yes	No	Yes	No	Yes	No	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standard error cluster	Country by sector	Region by sector	Country by sector	Region by sector	Country by fuel	Region by fuel	Country by sector	Region by sector
Observations	2,390	2,327	1,921	1,903	272	281	276	297

Source: Authors' computation.
Note: Standard errors are indicated in parenthesis. Asterisks denote *p <0.10, **p <0.05, ***p <0.01.

Boston University
53 Bay State Road
Boston, MA 02215

gdp@bu.edu
@GDP_Center
bu.edu/gdp

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Table S4: Robustness Checks Using Logit and Probit Models

Outcome variable	Project cancelled or suspended		Recipient implementor involved	
Model	Logit	Probit	Logit	Probit
	(1)	(2)	(3)	(4)
Cofinanced	-1.213**	-0.629**		
	(0.547)	(0.268)		
Cofinanced with international partner			-0.137	-0.08
			(0.332)	(0.189)
Cofinanced with recipient partner			1.408*	0.799*
			(0.804)	(0.444)
Cofinanced with Chinese partner			-0.934***	-0.553***
			(0.318)	(0.186)
Project size (USD in log)	0.284**	0.150**	-0.058	-0.034
	(0.124)	(0.060)	(0.044)	(0.026)
Sector dummies	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	968	968	1,764	1,764

Source: Authors' computation.
Note: All infrastructure projects. Standard errors are clustered at recipient country level and indicated in parenthesis. Asterisks denote *p <0.10, **p <0.05, ***p <0.01.