Examining The Role of Natural Resources in the Allocation of Chinese Foreign Aid

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I. Introduction

On September 7th, 2013, students and faculty of Nazarbayev University in Astana, Kazakhstan gathered to listen to Xi Jinping deliver a speech that would mark one of the most formidable challenges to the Western-dominated geopolitical landscape since the fall of the Soviet Union. In this speech, Xi announced the goal of creating an "economic belt along the Silk Road" through Chinese and Eurasian collaboration (Xi 2013). In Indonesia that same year, Jinping's announced China's intention to build a "maritime Silk Road," bringing South Asian and Oceanic countries into the Belt and Road Initiative (BRI) as well (Jinping 2013). The plan would eventually expand to include over 25 African countries by 2018 and 19 Latin American countries by 2019 (Sacks 2021). Today, a total of 139 countries are participating in this ambitious initiative. According to the Chinese government, the BRI is a transcontinental long-term policy and investment program with aims to "achieve policy, infrastructure, trade, financial, and people-to-people connectivity […] for international cooperation to create new drivers of shared development" (Xi 2017, 61). Using rhetoric such as "shared," "bilateral," and "friendship," Xi has attempted to make it clear that the BRI is not only about China's self-interest; instead, the BRI is a program of "mutually beneficial cooperation" for all countries involved (xI 2017, 61; 2013).

Of course, not everyone accepts this rosy vision. The West has accused China of using the BRI as a strategic tool to ensnare developing nations in an unsurmountable debt trap through which China can exploit natural resources (Areddy 2021). Others argue China is trying to buy political favors, project military/naval power, and challenge the Western-dominated global order (Ratner 2018). This criticism extends beyond the BRI; instead, it is applied to China's loan-

heavy foreign aid strategy, which does not conform to the typical OECD definition of ODA. Yet are these claims by the West warranted?

This paper attempts to address the accusation that China is using foreign aid as a tool for geopolitically motivated resource diplomacy, as it is one of the prevailing arguments levied against China's ambitions abroad and arguably the most consequential to world order if true. More specifically, are there any significant relationships between China's foreign aid allocation and a recipient country's natural resources (e.g., rare earths, oil, etc.)? Furthermore, what can these individual relationships (or the lack thereof) tell us about the true aims of China's foreign aid and general resource diplomacy strategy?

There are a few potential scenarios. First, China's foreign aid strategy may be aimed at accessing valuable resources in which China is already resource-rich but which are scarce in Western countries. One of the biggest concerns among Western nations is that China is trying to monopolize over rare earths and other materials for lithium-ion batteries, which are required in everything from semiconductors to electric motors to lighting, making them indispensable to Western economies (Kalantzakos 2018 1-2). Thus, with a chokehold on the world's global battery supply chain, China could use the threat to turn off the tap on the exports of rare earths against the West to extract political, economic, or military-related concessions (Biedermann 2014, 276). Second, China may instead be using foreign aid to gain access to materials in which China is resource-poor such as oil, that would make China's behavior more defensive rather than hostile (yet still not purely altruistic). China's foreign aid allocations may not be not correlated at all with the amount or type of natural resources a country has. If so, more would be needed to identify other potential intentions such as military/naval power projection or efforts to reinforce its international power vis-à-vis the West. While it would be near impossible (and unlikely) to

rule out every non-altruistic motive, this study can at least help us assess whether the most clearly material of them is in fact true.

To answer this question, I perform a series of OLS regressions to test the relationship between Chinese aid allocation and countries' endowments of six commodities: rare earths, lithium, cobalt, oil, natural gas and iron ore. To do so, I use a dataset compiled by AidData that covers Chinese overseas development financing from 2001 to 2017 (Custer et al. 2021, 8) and several surveys conducted by the USGS and Bp that map known resource reserves all over the world (USGS 2021; BP 2021). Furthermore, I divide these commodities into "geostrategic" resources (rare earths, lithium, cobalt) and "scarce" resources (oil, natural gas, iron ore). I look for any significant differences in Chinese aid allocation between these two groups of resources while also looking for statistical differences at the individual resource level. Additionally, I look at differences in this relationship before and after the announcement of the BRI in 2013 to identify whether or not the adoption of this strategy has had an impact on the extent to which China uses its foreign aid for geopolitical reasons. Next, in order to compare China's foreign aid intentions relative to those of the West, I replicate the previous methodology using American bilateral aid instead of Chinese aid (as the US poses arguably the most significant threat to China out of all Western nations).

This paper is organized as follows: Section 2 provides a brief overview of China's foreign aid policy, including its history, structure, and comparison with foreign aid from OECD member countries. This section also reviews existing literature surrounding the debate over China's true strategic and economic aims in their overseas development. Section 3 describes in detail the datasets used, controls, and structure of regression models tested. Section 4 presents

the results and my analysis of these statistical tests. Finally, section 6 summarizes my conclusions about the broader implications my results suggest for global politics.

II. Literature Review

The Foundations of Chinese Aid

Chinese foreign aid traces its roots back to the early 1950s when China sent food and military assistance to Vietnam and North Korea during the Vietnam and Korean Wars. While such relief would not be classified as ODA by OECD standards, these actions represent the first use of external assistance by the incumbent Beijing regime (Lixia et al. 2019, 12). Today, China is still not a member of OECD and much of the country's external aid does not follow the traditional OECD definition of foreign aid. Instead, Beijing has developed its own system of foreign aid by providing concessional loans, interest-free loans, and grants to recipient countries (Brautigam 2011, 755; Information Office of the State Council The People's Republic of China 2011). By this definition of aid, China spent an estimated $843 billion on 13,427 ODA- and OOF-like projects from 2000 to 2017, outspending the United States 2-to-1 in average annual foreign aid (Malik et al. 2021, 1; Custer et al. 2021, 8-9).

While OECD countries such as the US and UK champion liberal keywords such as "justice," "democracy," "peace," and "inequality," among others in their aid strategy statements, one might wonder what motivates China's foreign aid strategy considering that China is not a democracy (Congressional Research Service 2022, 4; Foreign, Commonwealth & Development Office 2020; Inter-ministerial Committee for International Cooperation and Development 2018). According to China's most recent white paper on foreign aid, China's international development cooperation is driven by its cultural and philosophical origins based on universal harmony, repaying kindness with kindness, internationalism, and a sense of responsibility as a major

country. China states that it aims to alleviate poverty, improve individual well-being, promote independent development, and increase prosperity throughout the global South, which China is a member of itself. All with the guiding purpose of pursuing the greater good and shared interests, "with higher priority given to the former" (State Council 2021, I.1-I.3). Thus, China claims that its foreign aid strategy is first and foremost altruistic in nature.

Arguments Against the Altruistic Principle of Chinese Aid

Politicians and scholars in Western democracies have not bought into China's stated motivations for their rapidly expanding foreign assistance program. Many accusations have been levied against Chinese aid, including its potential use for buying UN General Assembly votes and for pursuing the 2017 meme of "debt-trap diplomacy" (authors). One of the most prevalent allegations is that China uses foreign aid as a tool for "resource diplomacy." First used by Australian politicians in the 1970s, resource diplomacy has been defined as having to do with the disposal and acquisition of resources in the management of international relations (Bergsten 1974, 88; Gutman 1975, 36).

As for the broader, geopolitical goals of China's resource diplomacy, scholars disagree over which game of strategy China is trying to play. Some scholars and politicians assert that China is playing the power game by using resources to maximize its international power (Gutman 1975, 46). Others argue that China is playing the security game by using resource diplomacy to ensure its own survival (Gutman 1975, 45). Of course, the two are not mutually exclusive; instead, the game that China is playing may vary on a case-by-case basis.

Those who claim China is playing the power game argue that China is using foreign aid to gain control of the recipient's natural resources and use their control as a political tool to influence and/or hurt other nations. China has previously used rare earth resources to extract

political concessions, as it did when it withheld rare earth imports from Japan during the 2012 Diaoyo/Senkaku Island dispute. For instance, even though China already domestically produces 97 percent of the world's rare earths, the country is also pursuing foreign rare earth mining projects in countries such as Greenland and Australia (Zeuthen 2017). China has also pursued these projects in countries that receive its foreign aid (Grim 2014; Sautman and Hairong 2008) . As such actions come at a time when the global demand for rare earths is rapidly rising, some argue that China is trying to gain control for power purposes rather than to fulfill an actual resource security need as it has with oil and natural gas. Moreover, many in the West have accused China of using its foreign aid program as a tool to carry out this form of power resource diplomacy (Shambaugh 2015). However, previous analyses of the relationship between Chinese aid allocation and natural resource rents have failed to find significant evidence for this claim (Dreher and Fuchs 2015; Guillon and Mathonnat 2020).

Unlike the prior studies that looked at natural resources in the context of Chinese aid, I focus on identified resources and reserves in a country rather than resource rents (Guillon and Mathonnat 2020). Such resource endowments differ from resource rents in the sense that resource rents only represent existing resource flows, while endowments capture potential resource flows. If China has geostrategic interests, they will be interested in controlling potential as well as existing flows for resources that China already has significant trading power over. Doing so will allow China to block other countries from exploiting these resources and from threatening China's hold on the global trade of that commodity.

Indeed, the relationship between resource reserves (oil specifically) and Chinese aid allocation has been previously studied (Dreher and Fuchs 2015). Furthermore, these authors concluded that oil reserves did not play a significant role in deciding where China sent its

external assistance (Dreher and Fuchs 2015). However, this study looked at Chinese aid projects only up until 2005 and mainly focused on exploring how China's "Going Out" policy, which began in 1999, affected its foreign aid program (Dreher and Fuchs 2015; Lixia, Jiewen and Xiaoyun 22013). Instead, I utilize new public datasets to look at a more recent time range from 2000 to 2017. As such, I am able to compare China's aid allocation before and after Xi Jinping's announcement of the Belt and Road Initiative, which arguably had a large effect on the structure and goals for China's foreign aid program (Lin 2019). Additionally, unlike Dreher and Fuchs, these new datasets saved me from having to research all of the aid projects per recipient myself, which would have made this study much more tedious and error-prone.

II. Methodology

Data

Along with not following traditional OECD standards, the Chinese government does not publish official numbers for any of their international development finance flows. However, in lieu of official data, I use the new AidData 2.0 dataset. AidData has produced an extensive dataset of 13,427 ODA- and OOF-like projects China has committed to from 2000 to 2017. The criteria AidData researchers used to distinguish these projects from other instances of Chinese international development financing was based on OECD criteria for ODA and OOF (Custer et al. 2021). Therefore, even though there is still missing information, this dataset provides a more defined picture of China's foreign aid program than what has previously been available in other studies (Malik et al 2021). Moreover, by using OECD criteria, more accurate comparisons can be drawn between Chinese and traditional foreign aid from DAC countries (Custer et al. 2021).

As a dependent variable, I estimate the total amount of Chinese aid that a recipient received in a given year by counting the total number of Chinese aid project commitments it

received that year. Unfortunately, the estimated dollar amount is not available or not certain for many of China's aid projects, especially grants (Custer et al. 2021), which is why I had to use the number of projects instead of the total dollar amount of aid allocated. Additionally, I chose commitments instead of actual disbursements as there is very limited data for the latter in the dataset. Even though most aid literature tends to focus on only ODA-like flows, my dependent variable includes the total number of both ODA-like and OOF-like aid projects rather than only ODA-like projects (Lixia, Jiewen and Xiaoyun 2013). I do so as OOF-like projects fit China's definition for foreign aid. Therefore, even though they may not fit into the OECD's gold ODA standard for foreign aid, these projects should be considered when analyzing Chinese aid allocation patterns.

To choose which natural resources to use to understand how they are related to China's allocation of aid, I selected three "geostrategic" commodities and three "scarce" commodities. The first of the geostrategic commodities are rare earth minerals. As previously mentioned, China controls 97 percent of the world's rare earth reserves and therefore does not have a critical need to obtain these minerals from other countries, despite still being the world's largest importer of rare earths (Dutta et al. 2016, 150). Rather, the scarcity problem is on the flip side: The US, Japan, South Korea, and other countries are partially or fully net import reliant on China for rare earth minerals (U.S. Department of the Interior 2017; Dutta et. Al 2016, 184). As such, if China is using foreign aid as a form of resource diplomacy to gain control of or access to the recipient's rare earth resources, this would be a clear indicator of geostrategic motives for Chinese aid. To measure a country's rare earth potential, I use data from the USGS to determine the number of rare earth deposits that a country has. I use the number of deposits rather than rare

earth reserves or resources because most rare earth deposits have not been extensively surveyed for total volume. As such, deposits serve as a proxy for the rare earth potential of a country.

The second geostrategic commodity I use is lithium. Like rare earths, the demand for lithium is rising as electric vehicles, which use lithium-ion batteries, are starting to replace gas-powered vehicles. Aside from batteries, lithium is also used in the production of glass, ceramics, medications, and more (Goonan 2012, 11, 4). In 2019, China was in control of over half of the world's lithium production. Such is a result of a rapid push in recent years by China to secure lithium supplies by buying mines in South America and Africa, drawing accusations in Western media that it was trying to monopolize the lithium supply trade (Schadlow and Herman 2021). As such, if China's aid flows were to correlate with the location of lithium resources, that might suggest that this geostrategic push to crowd out rivals in the "Battery Arms Race" has also seeped into its allocation decisions. To estimate countries' lithium resources, I use data from the USGS 2019 Mineral Survey. Estimating resources, which includes unexplored deposits, instead of reserves, which only counts identified, extractable deposits, provides a better picture for the lithium potential of a country, consistent with a forward-looking, geostrategic perspective.

The third geostrategic commodity I chose is cobalt. The primary use for cobalt today is in the production of lithium-ion batteries where it has no substitute, unlike in its other uses for jet engines and prosthetics. While China does not have large enough geological concentrations of cobalt to support mining, China is the world's largest producer of refined cobalt (Gully, McCullough and Shedd 2019, 317-318). Given that China's refined cobalt production in 2016 was thirty-four times larger than that in 2000, some argue that China is trying to take control of the cobalt supply chain and crowd out competing countries. This argument is supported by the fact that China reduced its net import reliance for raw cobalt from 97% to 47% through its

purchases of foreign cobalt mines over the past twenty years, which are located almost exclusively in the Democratic Republic of the Congo (Gully, McCullough and Shedd 2019, 321-322). Therefore, interpreting China's cobalt push as one to control the global battery supply chain rather than to secure crucial resources for critical infrastructure, a positive relationship between Chinese aid and cobalt reserves would suggest geostrategic motives in China's aid allocation. Unfortunately, the volume of the world's cobalt reserves has not been extensively surveyed at the country level; however, information from the USGS does indicate which countries have proven cobalt reserves. Therefore, I use a binary variable to indicate whether a country is endowed with extractable cobalt.

Moving on to the so-called "scarce" resources, the first of these commodities is oil. China is heavily import-reliant on oil. While some do posit that China's search for oil has geopolitical implications, as of now China is still far behind other major powers in oil production (Taylor 2006). Considering that China is the world's second-largest economy and has the largest population, its primary motivation is most likely one of security rather than pure geostrategy. As mentioned previously, studies have found that China's aid allocation is significantly correlated to oil rents for economic projects as well as across all projects in countries such as Sudan (Guillon and Mathonnat 2020; Large 2008). Moreover, studies have revealed that aid allocation for G7 countries is has a significant, positive relationship with a recipient's oil endowment (Couharde et al. 2020). Therefore, it is plausible that Chinese aid is also correlated to a country's oil reserves. To estimate each country's oil reserves, I use data from Bp's 2021 Statistical Review of the World Energy.

Along the same lines, the second "scare" commodity I use is natural gas. The relationship between natural gas and Chinese foreign aid has not been extensively studied using the most

recent data available. However, the same arguments for oil can also be applied to natural gas as to why it is primarily a matter of resource security rather than power to China. Thus, we would expect natural gas to follow the same patterns as oil with Chinese aid allocation. I also use data from bp's 2021 Statistical Review of the World Energy to estimate the natural gas reserves of each country.

The last "scarce" commodity chosen is iron ore. China has a high demand for iron ore given that it is necessary to produce steel, which is used in everything from buildings to machinery (Wu et al. 2016). However, while China has the world's fourth-largest iron ore reserves, China's iron ore is low grade and expensive to process. Instead, it is significantly cheaper for Chinese steelmakers to import foreign iron ore from countries such as Australia, Brazil, and India (Wilson 2012, 332). Therefore, to support the rapid expansion of its steel and iron intensive sectors, China's current policy is to maximize its overseas capacity for iron ore supply (Wu et al. 2016). Accordingly, in 2019 not only was China the world's largest consumer of iron ore, but the country also became the world's largest importer of iron ore. As such, a positive relationship between iron ore endowment and Chinese aid flow would clearly imply allocation motives for security, rather than geopolitical power. I use data from the 20109 USGS Iron Ore MCS to estimate the volume of a country's crude iron ore reserves.

Controls

In order to control for other factors that may be related to China's aid allocation, I have included several independent variables that deal with conditions in the recipient country as well as China's own self-interests. As a general measure of a recipient's "need" for economic assistance, I use GDP-per-capita (logged) in constant 2015 USD as well as the GNI-to-debt ratio

(Cahill and Isley 2011, 79; Guillon and Mathonnat 2020, 5). To further capture a recipient country's need for aid, I include logged population as a control (Dreher 2012, 15).

To account for political factors that are not resource related, I use ideal point estimates for UNGA voting alignment with China which have been shown to be positively correlated with the amount of Chinese aid received (Voeten, Strezhnev, and Bailey 2009, 430, 432-3; Drehrer 2012, 20). Additionally, countries that have relations with Taiwan receive less aid from China based on previous studies (Davies 2007; Rich 2009). As such, I also include a variable that represents the proportion of years from 2000-2017 in which a country recognized Taiwan (Davies 2007, Drehrer 2012, 20). Furthermore, I also consider institutional quality. As local corruption levels around Chinese aid projects have been shown to be higher than other areas in African countries, I include the WDI control of corruption indicator (Kaufmann, Kraay and Mastruzzi 2011; Isaksson and Kotsadam 2018, 146).

In terms of economic interests, I include controls for natural resource rents because both have been found to be positively correlated with Chinese ODA-like economic projects (Guillon and Mathonnat 2020). The reason for including natural resource rents as a control rather than as a dependent variable is because my primary focus is China's geostrategic interests rather than its economic interests in aid allocation. Therefore, my concern is the presence and volume of natural resources in a country, not a recipient's economic dependence on those resources. Furthermore, I also include the total amount of ODA received from DAC countries each year to account for the impact that aid from other countries might have on conditions in a recipient country.

Table 1. Dependent and Key Independent Variables with Sources Used

Number of Chinese projects received by a country in a single year	https://www.aiddata.org/data/aiddatas-global-chinese-development-finance-dataset-version-2-0
Rare Earth Deposits	https://catalog.data.gov/dataset/rare-earth-element-mines-deposits-and-occurrences/resource/1e49a516-5520-48a6-b76a-94896e25b790
Lithium Resources	https://pubs.usgs.gov/periodicals/mcs2021/mcs2021-lithium.pdf
Cobalt Resources	https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html
Oil Reserves	https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html
Natural Gas Reserves	https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html
Iron Ore Reserves	https://pubs.usgs.gov/periodicals/mcs2021/mcs2021-iron-ore.pdf
GDP per capita, Population, Natural Resource Rents, WDI Indicators (Control of Corruption, Rule of Law, Government Effectiveness)	https://data.worldbank.org/
UNGA Ideal Point Scores Distance	https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/LEJUQZ
Taiwan Recognition	https://www.icpsr.umich.edu/web/ICPSR/studies/30802
Total Commitments from OECD Donors	https://data.oecd.org/

Regression Model

Given the similarities with the structure of Guillon and Mathonnat's 2020 study of Chinese aid allocation, I follow the authors' approach and employ a maximum likelihood Possion regression model with robust variance errors (Guillon and Mathonnat 2020). The main reason for doing so is because there are many zeroes in the dataset for my dependent variable, the annual number of Chinese aid projects committed to individual countries. Additionally, many countries do not have any reserves for one or more of the six commodities I examine. Therefore, due to the overrepresentation of zeroes, using a OLS regression model will most likely misfit the data and lead to an overly flat regression line (McGillivray 2003). Moreover, given the unknown decision-making process for Chinese aid, I cannot use a 2SLS model which would be the typical

solution to the zero-overrepresentation problem (Grépin et al. 2014, 2; Guillon and Mathonnat 2020). Alternatively, the Poisson regression is robust to a high proportion of zeroes within dependent variable data (Silva and Tenreyro 2006, 651, 653). As such, the Poisson model has gained popularity in aid literature as well as Chinese FDI literature (Dollar and Levin 2006).

Guillion & Mathonnat also adjusted their models based on a few other considerations. First, they did not log transform their dependent variable. They did so because the transformation ln(aid+1) to ensure that the 0 values do not drop out is incompatible with an overrepresentation of zeroes in the dependent variable data. Secondly, they use pooled Poisson regressions with year fixed effects rather than use random-effects regressions, which assumed fixed effects are independently- and gamma-distributed (Silva and Tenreyro 2006, 653). Lastly, to account for reverse causality, the authors lag all independent variables other than the ODA amount from DAC countries and their English-speaking dummy variable (Guillion & Mathonnat 2020; Colin and Trivedi 2005, 670, 804). Because these issues also apply to the structure of the data that I am using, I also employ these three methods to account for the above considerations.

III. Results

I started my analysis by considering all ODA-like and OOF-like Chinese aid projects from the years 2001 to 2017 (omitting 2000 due to a lack of information from prior years for variables that were lagged). In terms of which countries I chose to include, I dropped all countries that were considered “developed” by UN standards and both non-member observer states, Vatican City and Palestine. Additionally, I dropped all countries which did not receive any aid from official OECD donors or any aid from China from 2001 to 2017. Lastly, I dropped any country where data was missing for over half of the independent variables I used. I filled in the remaining missing values for each variable by using the earliest non-zero observation

available for that country. After this process, the dataset contained 136 countries. Descriptive summary statistics for these countries and individual observations are listed in Tables 2 & 3.

Table 2. Resource Endowment Summary Statistics for Included Countries

Variable	Obs	Mean	Std. dev.	Min	Max
Rare Earth Deposits	136	2.066667	4.420604	0	25
Lithium Reserves	136	78.5	839.9126	0	9200
Cobalt Reserves	136	42.79167	336.0167	0	3600
Oil Reserves	136	2.270392	11.68463	0	115
Gas Reserves	136	0.3003388	1.374649	0	13.60125
Iron Ore Reserves	136	102.9167	735.0841	0	7250

Table 3. Summary Statistics for All Included Observations

Variable	Obs	Mean	Std. dev.	Min	Max
Total number of Chinese aid project commitments (Single year)	2,110	5.167299	5.837533	0	85
Total commitments from DAC Donors	2,110	503.7624	1047.178	0	23579.13
Population (Log)	2,109	14.9733	3.2446	0	21.01495
population~g	2,109	14.9733	3.2446	0	21.01495
GDP Per Capita (Log)	2,109	7.424458	1.829819	0	10.05659
UNGA Ideal Point Voting Distance from China	2,108	0.4455754	0.4699703	0	3.606769
Control of Corruption Index	2,108	-0.4812183	0.6682654	-1.868714	1.592268
Natural Resource Rents	2,108	9.212254	13.62547	0	87.45931
Government Effectiveness Index	2,110	-0.5309766	0.6491796	-2.446712	1.572235
Debt Service to GNI Ratio	2,100	3.279795	4.904193	0	59.67141

As a baseline, I first ran a regression on only the six reserve variables: rare earth reserves, lithium reserves, cobalt resources, oil reserves, natural gas reserves, and iron ore reserves. Rare earth reserves, cobalt resources, and iron ore reserves were all strongly statistically significant at the one percent level. It is interesting to note that the coefficient for iron ore reserves was negative rather than positive and would be for all regressions that I ran. Such would signify that having higher reserves of iron ore make a country less likely to receive aid projects from China. Furthermore, no significant relationship was found at any level with the number of Chinese aid projects a country received and its lithium resources, its oil reserves, or its natural gas reserves. However, the pseudo R2 score for this regression was only 0.0348, far from the ideal range of 0.2 to 0.4. Such implies that this model is not a good fit to explain the dependent variable, the number of Chinese aid projects committed to a country in a given year. Therefore, it is hard to draw any meaningful conclusions from the results of this regression as it is not a good fit to explain the dependent variable.

Next, I ran the same regression including all the independent variables I listed in the previous section (see Table 4 and 5). Unlike the first regression, only iron ore reserves were significantly related to the allocation of Chinese aid projects. Moreover, this time the result only held at the 5 percent significance level rather than at the 0.1 percent significance level. Out of the independent variables, the coefficient for lagged population was positive as expected and strongly significant at the 0.1 percent level. Surprisingly, none of the other independent variables were significantly related to the dependent variable at the 5 percent significance level. This result ran contrary to my predictions based on previous studies; however, I do use a stricter standard of significance (five percent) compared to the latter (ten percent). Additionally, the lack of significance may stem from the fact that the pseudo R2 value was 0.1084 which was still below

the 0.2-0.4 ideal range. However, it is hard to say how this model compares to previous uses in Chinese aid literature as the Pseudo R2 score is rarely reported. On the other hand, higher pseudo R2 scores have been achieved in studies focusing on foreign aid allocation from DAC donors; however, that is to be expected because the allocation decision-making processes and details of aid flows are significantly more transparent for DAC countries.

Reservations about the Pseudo R2 score aside, I was also interested in whether Chinese aid allocation patterns changed after the announcement of the BRI at the end of 2013. I repeated the first and second regressions for observations from 2001 to 2013 and again for observations from 2014 to 2017. While iron ore was the only significantly related resource endowment variable for pre-BRI years, after its announcement all three of the geostrategic resource endowments (rare earth deposits, lithium resources, and cobalt resources) were significant at the five percent significance level. Moreover, the Pseudo R2 score also increased. These results suggest that China's adoption of the Belt and Road Program is correlated with not only more resource diplomacy considerations in China's aid allocation, but also a more geostrategic approach. Therefore, Western critics may have merit in accusing China of using the Belt and Road Initiative as a disguise to pursue its own geopolitical interests rather than exclusively for mutual benefit and "the greater good" as China claims.

Table 4. Regression Results for Chinese Aid Allocation (# of Projects) on Resource Endowment, Political and Economic Factors (Pooled Maximum-Likelihood Poisson)

	(1)	(2)	(3)	(4)	(5)	(6)
Time Range	2001-2017	2001-2017	2001-2013	2000-2013	2014-2017	2014-2017
Number of Rare Earth Deposits	0.0379***	0.0216	0.0339**	0.0157	0.0473***	0.0347*
	(3.42)	(1.85)	(3.28)	(1.38)	(3.58)	(2.53)
Lithium Reserves	0.0000134	0.0000331	-0.0000313	0.00000142	0.0000305	0.000137*
	(0.40)	(0.63)	(-0.66)	(0.03)	(1.04)	(2.33)
Cobalt Reserves	0.000223***	0.0000687	0.000212***	0.0000399	0.000234***	0.000134*
	(5.43)	(1.40)	(6.00)	(0.82)	(4.46)	(2.35)
Oil Reserves	-0.00183	-0.00459	-0.00195	-0.00575	-0.00207	-0.00346
	(-0.90)	(-1.28)	(-0.78)	(-1.31)	(-1.18)	(-1.45)
Gas Reserves	-0.0129	-0.0320	-0.00353	-0.0268	-0.0372	-0.0637
	(-0.50)	(-0.70)	(-0.17)	(-0.63)	(-0.81)	(-0.99)
Iron Ore Resources	-0.0000723***	-0.0000456*	-0.0000809***	-0.0000484*	-0.0000579**	-0.0000461*
	(-3.82)	(-2.28)	(-3.98)	(-2.11)	(-2.76)	(-2.39)
Recognition of Taiwan		-0.435		-0.564*		-0.129
		(-1.67)		(-2.31)		(-0.38)
UNGA Ideal Point Distance from China		-0.124		-0.157		0.0756
		(-0.78)		(-0.81)		(0.53)
Control of Corruption Index		-0.204		-0.274		-0.154
		(-1.32)		(-1.67)		(-0.80)
Government Effectiveness Index		-0.0700		0.0156		-0.0194
		(-0.47)		(0.10)		(-0.10)
Population (log)		0.0790***		0.0722***		0.0861**
		(3.79)		(3.58)		(3.28)
GDP Per Capita (log)		-0.0424		-0.0840*		-0.00666
		(-1.31)		(-2.45)		(-0.16)
Natural Resource Rents (% of GDP)		0.000638		0.00469		0.000302
		(0.17)		(1.15)		(0.06)
Total Debt Service (% of GNI)		-0.00319		-0.00598		0.00222
		(-0.35)		(-0.52)		(0.19)
Total Commitments (OECD Official Donors)		0.0000418		0.0000321		0.0000647
		(1.20)		(0.88)		(1.05)
Constant	1.553***	0.607*	1.415***	0.896***	1.914***	0.488
	(20.88)	(2.08)	(17.82)	(3.39)	(25.14)	(1.14)
Observations	2110	2100	1627	1620	483	480
Pseudo R2	0.0348	0.1084	0.0280	0.1141	0.0648	0.1292

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Note: All regressions use robust standard errors clustered at the country level

Table 5. IRR Scores for Regression 2

number_of_projects	Coefficient	std. err.	z	P>z	[95% conf.	interval]
rare_earth_deposits	0.0215538	0.0116413	1.85	0.064	-0.0012627	0.0443704
lithium_reserves	0.0000331	0.0000523	0.63	0.527	-0.0000695	0.0001357
cobalt_reserves	0.0000687	0.000049	1.4	0.161	-0.0000273	0.0001647
oil_reserves	-0.0045904	0.0035731	-1.28	0.199	-0.0115935	0.0024127
gas_reserves	-0.0319983	0.0454285	-0.7	0.481	-0.1210365	0.0570399
ironore_reserves	-0.0000456	0.00002	-2.28	0.023	-0.0000849	-6.37E-06
taiwan_recognition	-0.4347579	0.2599756	-1.67	0.094	-0.9443006	0.0747849
total_commitments_OECD_donors	0.0000418	0.000035	1.2	0.231	-0.0000267	0.0001104
population_log	0.0790173	0.0208723	3.79	0	0.0381083	0.1199263
gdppercapita_log	-0.0424358	0.032497	-1.31	0.192	-0.1061288	0.0212572
UNGA_ipdistance_China	-0.1236596	0.1584378	-0.78	0.435	-0.434192	0.1868727
control_of_corruption	-0.2044287	0.1553678	-1.32	0.188	-0.508944	0.1000867
naturalresource_rents	0.0006379	0.0037542	0.17	0.865	-0.0067201	0.007996
govt_effectiveness	-0.0699761	0.1492028	-0.47	0.639	-0.3624082	0.2224559
debt_to_GNI	-0.0031945	0.0092333	-0.35	0.729	-0.0212913	0.0149024
_cons	0.6072341	0.2922523	2.08	0.038	0.0344302	1.180038

IV. Conclusion

This paper is unique in its focus on natural resource endowments rather than the natural resources rents in the process of Chinese aid allocation. Furthermore, while there is little evidence that natural resource rents play a significant role in which countries China decides to send aid to, these results do suggest that resource endowments significantly factor into aid allocation decisions.

Why is this distinction important? These previous studies mainly emphasize the economic value of these resources to the Chinese since rents only capture a country's current output of that resource. Moreover, resource rents are also dependent on the relative price of that resource during a specific time period. On the other hand, resource endowments, whether proven or unproven, represent the potential future output of that resource from a country. Thus, there is

more room for players to gain control of these resources as oftentimes there is no existing infrastructure or plan to extract them. That creates a geopolitical incentive for countries to secure these resources before other states do, even if the economic prospects for these resources are slim for the near future. Thus, if China is using its foreign aid program as a tool for resource diplomacy, it is doing so more for geopolitical reasons rather than economic reasons.

That there is only a significant relationship with Chinese allocation for rare earths, lithium, and cobalt endowments after the announcement of the Belt and Road Initiative reveals even more about China's international finance strategy. As previously established, these resources are not particularly scarce or indispensable in China's economy. Rather, new sustainable technologies are pushing up global demand as the resources are indispensable in the production of their batteries and motors. Therefore, if the relationship between Chinese aid allocation and recipients' endowments of these commodities is more than mere correlation, China's recent expansion of its foreign aid program and the general Belt and Road Initiative strategy may be motivated by a desire to monopolize the global battery supply chain. And if China achieves that goal, it can use its power to withhold or increase the prices for these crucial materials draw political and military concessions from its rivals.

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