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Has Chinese Aid Benefited Recipient Countries? Evidence from a Meta-Regression Analysis

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ABSTRACT: This paper employs a meta-regression analysis of 473 estimates from 15 studies to take stock of the empirical literature on Chinese aid effectiveness. After accommodating publication selection bias, we find that, on average, Beijing's foreign assistance has had a positive impact on economic and social outcomes in recipient countries but an opposite effect on governance, albeit negligible in size. We also show that (i) studies that fail to uncover statistically significant effects are less likely to be submitted to journals, or accepted for publication; and (ii) results are not driven by authors' institutional affiliation. Differences in study characteristics such as the type of development outcome considered, how the Chinese aid variable is measured, the geographic region under study, and publication outlet explain the heterogeneity among Chinese aid effectiveness estimates reported in the literature.

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Contents

I. INTRODUCTION

Since May 2020, the G20's Debt Service Suspension Initiative (DSSI) has been providing eligible low-income countries with a temporary moratorium on official bilateral debt repayments in a bid to free up resources for the COVID-19 pandemic response. In view of China's rise as a major international donor over the last decades, its participation in the DSSI is poised to give much needed breathing space to developing countries grappling with the fallout of the pandemic.[2] Formerly an aid[3] recipient itself, China has emerged as a key official creditor rivaling traditional Western donors, with more than US$350 billion in official finance committed to developing countries between 2000 and 2014 (Dreher et al., 2017). In Africa alone, Beijing is believed to have signed some 1,141 loan commitments worth US$153 billion over 2000-19.[4] While China is active in virtually all sectors of activity (Asmus et al., 2017), its engagement is most visible in connective infrastructure financing, including through its US$1 trillion Belt and Road Initiative (BRI) launched in 2013.

Despite China's growing role in the global development finance arena, much of the conventional wisdom about the effect of Chinese aid on recipient economies rests on anecdotal evidence owing to the lack of reliable and comprehensive data (Cooper, 2019). Unlike traditional donors organized in the OECD Development Assistance Committee (DAC), Beijing does not publish detailed country- and project-level information about its foreign aid activities (Strange et al., 2013, Horn et al., 2020).[5] However, a nascent body of research relying on rigorous empirical analysis has emerged with the release of AidData's Global Chinese Official Finance Dataset which captures more than 4,000 Chinese government-financed projects in 138 countries over 2000-14 (Dreher et al., 2017).[6] The dataset provides, inter alia, the sub-national location of each aid project, the amount and terms of financing, and the sector of activity. It was constructed using the Tracking Underreported Financial Flows (TUFF) methodology, which involves a systematic, transparent, and replicable process of triangulating information from various sources to minimize the impact of incomplete or inaccurate information.[7]

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[2] China's share of bilateral debt owed by the world's poorest countries to the G20 has risen from 45 per cent in 2015 to 63 percent in 2019. As of October 2020, China is the largest contributor to the DSSI, with over US$1.9 billion in repayments postponed, out of roughly US$5.3 billion suspended by G20 members for 44 debtor countries. https://www.ft.com/content/bd73a115-1988-43aa-8b2b-40a449da1235

[3] For ease of exposition, the term "aid" is used to refer broadly to any type of official finance. Thus, Chinese "official finance" and "foreign aid assistance" are used interchangeably.

[4] Estimates by the China-Africa Research Initiative (SAIS-CARI).

[5] China considers its aid "as a sensitive area [and] a state secret" (Bräutigam, 2009). For instance, China State Council's White Paper on development released in January 2021 revealed that Beijing's aid amounted to RMB 270.2 billion (US$ 41.6 billion) between 2013-18. While a breakdown by instrument, region and recipient income group is provided for the first time since the 2011 White Paper, granular data by individual country, year and sector are still not available.

[6] AidData is a development research and innovation lab that collects and publishes granular data on foreign development assistance projects worldwide.

[7] Information is collected from four types of sources: (i) English, Chinese, and local-language news reports; (ii) Chinese ministries, embassies, and economic and commercial counselor offices; (iii) the aid and debt information management systems of finance and planning ministries in counterpart countries; and (iv) case studies and field research undertaken by scholars and NGOs. See Dreher et al. (2017) for more detail.

Albeit nascent, the empirical evidence on the effectiveness of Chinese official finance is extremely ambiguous, with studies finding positive, negative, or even no impact of Beijing's aid on recipient countries. To date, the literature has investigated the effect of China's foreign assistance on a broad range of outcomes in recipient countries, including economic and social development, governance, conflict, and deforestation (Dreher 2016, 2017; Martorano et al., 2020; Isaksson and Kotsadam, 2018a; Gehring et al., 2019; Ben Yishay et al. 2016, to cite a few). Some researchers have explored whether Chinese aid inflows crowd out development finance from other bilateral or multilateral donors (e.g., Kilama, 2016; Humphrey and Michaelowa 2019; Zeitz, 2021), others have examined how they contribute to expanding Beijing's soft power, including through a change in citizens' attitude towards China in aid-recipient countries, and foreign policy alignment with Beijing at the United Nations' General Assembly (e.g., Xu et al., 2020; Struver, 2016).

To take stock of the controversial literature on the effectiveness of Chinese foreign assistance, this paper employs a meta-regression analysis (MRA) using 473 estimates taken from 15 studies and obtained from regressions accounting for endogeneity. MRA is a statistical method for systematically reviewing, summarizing, and evaluating the diverse findings from empirical studies conducted on a given topic using different methods and research designs (Stanley, 2001). Importantly, MRA can identify and accommodate publication selection bias, which arises when researchers, editors or reviewers choose to report or publish empirical estimates that are statistically significant or that conform to their expectations (Stanley and Doucouliagos, 2012). As a result, larger and more significant estimates tend to be overrepresented in the research record, thus distorting the "true" effect. In this paper, we leverage MRA to (i) examine the presence of publication selection bias in the widely debated literature on Chinese aid effectiveness, (ii) quantify the genuine effect of Beijing's official finance on developing countries, and (iii) shed light on the sources of heterogeneity across reported results.

Our results suggest the absence of publication selection bias and genuine empirical effect in the Chinese aid effectiveness literature when implementing MRA on the meta-dataset of 473 estimates. Sub-sample MRAs by outcome category reveal that Beijing's aid has had a positive impact on economic and social outcomes in recipient countries but an opposite effect on governance, albeit negligible in size. On average, we find no evidence that Beijing's official assistance affected socio-economic stability in recipient countries, the inflow of aid from other donors, or citizens' perceptions of China. Interestingly, publication selection bias is detected for the body of research published in peer-reviewed journals (as opposed to working papers), suggesting that studies that fail to uncover statistically significant effects are less likely to be submitted to journals, or accepted for publication. While MRA results are not driven by authors' institutional affiliation, differences in study characteristics such as the type of development outcome considered, how the Chinese aid variable is measured, the geographic region under study, and publication outlet explain the large variations among Chinese aid effectiveness estimates reported in the empirical literature. In particular, there is some evidence that Chinese aid is more effective when it is concessional and when its impact is assessed on economic outcomes. In contrast, studies that rely on a sample of African countries or use macro-level data report, on average, smaller aid effectiveness coefficients.

Our contribution is threefold. First, we conduct the first MRA of the empirical literature on Chinese aid effectiveness, building on a meta-dataset specifically compiled for this purpose. We provide a synthesis of the conflicting empirical evidence and aim to quantify the genuine effect of Chinese aid on developing countries after correcting for potential publication selection bias and using estimates obtained from studies that try to address identification problems. As such, our MRA furnishes insight into the development implications of Beijing's poorly understood foreign aid activities. Second, we shed light on the study characteristics that explain the large differences among the Chinese aid effectiveness estimates reported in the empirical literature. Third, we address a key research gap in the broader aid effectiveness literature that predominantly focuses on Western/traditional donors. In particular, we compare the effects of Chinese aid with that of traditional OECD DAC donors as documented in the existing literature. With China poised to remain a key provider of development finance in the foreseeable future, taking stock of its foreign aid policy and tracking its development outcomes is relevant.

The remainder of the paper is organized as follows: Section II provides a brief overview of the empirical literature on Chinese aid effectiveness. The data collection procedure underpinning MRA is explained in Section III. Section IV presents the MRA model, baseline results and robustness checks. Section V explores the study characteristics behind the heterogeneity in the empirical literature. Section VI concludes.

II. LITERATURE

The growing empirical literature on the effectiveness of Chinese foreign assistance presents mixed results about the impact of Beijing's aid on recipient countries' development outcomes. Combining nighttime light intensity with geocoded aid data, Dreher et al. (2016, 2017) and Xu et al. (2019) show that Chinese projects boost economic growth in Africa, a result confirmed by Dreher et al. (2017) using a large sample of developing countries. However, Busse et al. (2016) do not find a statistically significant and robust effect of Chinese aid on economic growth in Africa. Bluhm et al. (2020) show that Chinese infrastructure investments reduce within-region economic inequality in low- and middle-income countries, while Xu et al. (2019) find the opposite for Africa. Beyond its economic effect, Chinese foreign assistance is found to influence social outcomes in recipient economies. According to Martorano et al. (2020), households living in areas hosting Chinese aid projects enjoy better education and lower child mortality. Cruzatti et al. (2020) find mixed results, with aid decreasing infant mortality at the country level while increasing it at the sub-national level. At the macro level, countries benefiting from Chinese foreign assistance tend to score high on the human development index (Yuan, 2020). In the same vein, BRI transport projects have the potential to expand trade and lower poverty in participating countries according to World Bank (2019), although risks inherent to large infrastructure projects, including debt sustainability issues from excessive borrowing (Onjala, 2018; Hurley et al., 2018; Horn et al., 2020), remain a concern.[8]

[8] Critics accuse China of pursuing a "debt-trap diplomacy" that lures developing countries into taking on expensive loans to finance infrastructure projects, all with the end goal of Beijing eventually seizing these assets when borrowers struggle to service their debt, thereby extending its strategic or military reach. Several studies have debunked these claims (e.g., Acker et al., 2020; Jones and Hameiri, 2020).

The impact of Chinese development financing on governance outcomes in recipient economies has also been controversial. Chinese aid projects are found to fuel local corruption (Brazys et al., 2017; Isaksson and Kotsadam, 2018a; Cha, 2020), undermine democratic governance (Kersting and Kilby, 2014; Li, 2017), discourage trade union involvement (Isaksson and Kotsadam, 2018b), exacerbate ethnic identities (Isaksson, 2019), and disincentivize economic reforms (Brazys and Vadlamannati, 2020).[9] However, contrary to conventional wisdom, there is little evidence indicating that Beijing's foreign assistance contributes to maintaining autocratic regimes in power (Bader, 2015) or to eroding citizens' trust in government, perception of democracy, or tax compliance (Blair and Roessler, 2018).[10] Studies investigating the relationship between Chinese aid and conflict are not unanimous either. Sardoschau and Jarotschkin (2019) show that Chinese aid projects in Africa are associated with an increase in civilian riots at the district level. However, Gehring et al. (2019) do not find a conflict-fueling effect, although Chinese aid tends to correlate with more government repression and an increased acceptance of authoritarian norms. Strange et al. (2017) argue that Chinese aid allows recipient governments to avert armed conflict by substituting for sudden withdrawals of aid from traditional donors.

Similarly, the environmental implications of Chinese aid projects are subject to debate. Based on a comparative analysis, Chen et al. (2020) find that public lending by China's policy banks contributes to pollution despite boosting power-generation capacity since most of the plants financed by Beijing operate in the carbon-intensive coal sector. However, the few studies employing rigorous econometric approaches offer a more nuanced view. Marty et al. (2019) find that Chinese official finance reduced forest loss in Rwanda and Burundi. According to Ben Yishay et al. (2016), Chinese infrastructure projects in Cambodia and Tanzania led to deforestation only in areas with weak domestic enforcement of environmental laws and regulation. Additionally, there is no evidence that Chinese aid is linked to the increase in the production of illegal ivory through elephant poaching (Hsiang and Sekar, 2016).

Another strand of the empirical literature investigates how Chinese official assistance affects the volume and composition of aid received from other donors, with most studies evidencing increased flows to recipient countries as a result of competition between China and traditional donors.[11] Kilama (2016) shows that G7 countries tend to channel more development assistance to African countries receiving Chinese aid. They also shift their financing away from social sectors to compete for influence in infrastructure projects where China is more active. Similarly, Zeitz (2021) finds that the World Bank allocates a greater share of its development projects in infrastructure when recipient countries receive more Chinese aid. It also extends loans with fewer conditions to African countries with large influx of Chinese aid (Hernandez, 2017). In the same vein, countries participating in the BRI are more likely to receive US support for loans from multilateral development banks (Vadlamannati et al., 2019). But

[9] Additionally, Isaksson (2017) provides evidence that World Bank projects increase citizen engagement in Africa while Chinese projects do not.

[10] Blair and Roessler (2018)'s survey experiments in Liberia even suggest that citizens exposed to Chinese aid exhibit more favorable perceptions of their government.

[11] There is also evidence that recipients of Chinese aid are more likely to benefit from Chinese foreign direct investment (FDI) (Dong and Fan, 2017; Morgan and Zheng, 2019).

Humphrey and Michaelowa (2019) find that the volume of aid from multilateral development banks and bilateral donors has little changed over time in response to Chinese aid inflows.

Studies exploring how Chinese official assistance influences Beijing's soft power in recipient economies have not reached consensus either. Countries that receive Chinese official finance tend to vote similarly to China at the United Nations' General Assembly (Struver, 2016; Raess et al., 2017). Chinese foreign aid also affects attitudes towards China, with African citizens living close to projects financed by Beijing having better perceptions of China (Blair and Roessler, 2018), especially for infrastructure and social projects (Xu et al., 2020).[12] However, Sardoschau and Jaortschikin (2019) do not find a statistically significant effect of China's aid on its image in Africa, while Eichenauer et al. (2018) show that Beijing's aid leads to more polarized opinions on China in Latin America.

To evaluate the conflicting empirical evidence on the effectiveness of Chinese foreign assistance, we employ a meta-regression analysis whereby a systematic review and quantitative analysis of the empirical literature is conducted (Stanley et al., 2013, Havránek et al., 2020). MRA seeks to summarize and explain the wide variation found among econometric results for a given body of research (Stanley, 2001). MRA can assess the extent of publication selection bias in the literature, induced by researchers' and journal editors' tendencies to prefer studies with statistically significant results, thus leading to an overrepresentation of larger and more significant estimates in the research record (Stanley and Doucouliagos, 2012). Publication bias can also arise from the general inclination among scholars to report results that match the conventional view (Card and Kruger, 1995). In the case at hand, MRA can detect and correct for such bias with a view to isolating the genuine or "true" effect of Chinese aid on recipient countries. Steps for implementing MRA are described in the next section.

III. DATA

A. Meta-dataset Compilation

We followed MRA guidelines by Havránek et al. (2020) in building the meta-dataset.[13] Since empirical studies on Chinese aid effectiveness surged with the release of AidData's Global Chinese Official Finance Dataset, we started by conducting a literature search on Google Scholar using as keyword "Aid, China, and Growth: Evidence from a New Global Development Finance Dataset", i.e., the title of the study that formally introduced the dataset. We also examined the working papers published on AidData's website and investigated the references cited in these papers. This process identified 190 studies based on a search that ended in December 2020. Next, we conducted an additional screening and excluded the following studies: (i) papers not written in English; (ii) unpublished papers and theses constituting the so-called "grey" literature; (iii) papers unrelated to the research question;[14] and (iv) descriptive or qualitative studies that do not report the quantitative information

[12] Using descriptive analysis, Morgan (2019) also finds that Beijing's aid contributes to positive perceptions of China among African citizens.

[13] Appendix Figure A1 provides a diagram illustrating the meta-dataset construction process.

[14] This includes studies that investigated the determinants of Chinese aid allocation. Papers retained in the meta-dataset feature Chinese foreign assistance as an explanatory variable and a measure of recipient countries' outcome as the dependent variable.

required for implementing MRA, namely the number of observations, regression coefficients, and associated standard errors or t-statistics (Stanley and Jarrell, 1989; Stanley and Doucouliagos, 2012). We exclude regression coefficients produced from estimation techniques that do not account for endogeneity.[15] Additionally, when both working paper and peer-reviewed versions of a study are available, or in the event of several working paper versions, we retain the most recent edition to avoid double-counting.

The final meta-dataset consists of 15 studies and 473 estimates, as referenced in Appendix Table A1.[16] For each study, we collect the sample size, regression coefficients, and either standard errors or t-statistics (depending on what the authors reported). We also code several characteristics such as the paper's title, publication year and outlet, the author(s)' name and affiliation, the type of development outcome considered (dependent variable), the measurement of the independent variable of interest, the sample of study, and model specification.[17] For ease of analysis, recipients' outcomes are organized in six categories:[18] (i) "economic development" captures real GDP per capital growth and nighttime light intensity as proxies for economic activity, and indicators of spatial concentration of economic activity based on the Gini index; (ii) "social development" includes the country-level human development index score and household-level health and education outcomes such as child/infant mortality and average years of education; (iii) "governance" includes variables capturing perceptions and experience of corruption, citizens' trust in government and engagement, democracy, and government willingness to implement reforms; (iv) "stability" comprises measures of conflict, violence, and social unrest; (v) "other foreign finance" includes both development assistance from other donors and inflows of other types of finance from China, namely FDI; (vi) "soft power" includes variables measuring attitudes towards China and political alignment with Beijing's vote at the United Nations (UN).[19]

Table 1 provides the definitions of all the coded variables along with their descriptive statistics. About 42 percent of estimates in the meta-dataset are published in peer-reviewed journals and a quarter are taken from studies with at least one author affiliated with a Chinese institution. The majority have a regional focus, leverage micro-level data, and deal with the effect of Chinese foreign assistance on economic and social outcomes in recipient countries (Figure 1). Only 6 percent of estimates are derived from regressions controlling for aid from other donors. Chinese official finance is proxied by the number of aid projects for 15 percent of the meta-

[15] We consider estimates obtained from regressions employing two-stage least square (2SLS), difference-in-differences, and generalized method of moments (GMM) estimators.

[16] We removed two studies where Chinese aid solely entered in the form of an interaction term since regression coefficients are not directly comparable with those from linear models. Including these studies in the meta-dataset does not alter the findings of the paper (see Section IV. C).

[17] The coding was independently checked by the two authors as recommended by Havránek et al. (2020).

[18] To harmonize the interpretation of Chinese aid effectiveness across dependent variables, we code the opposite value of regression coefficients associated with unfavorable outcomes such as corruption, conflict, inequality, and child mortality.

[19] Only 6 observations pertain to regressions examining the effect of Chinese aid on recipient country's foreign policy alignment with Beijing.

dataset. Most studies rely on an aggregate measure of aid and do not distinguish across flow types.[20]

Table 1. Meta-Regression Variable Definition and Descriptive Statistics

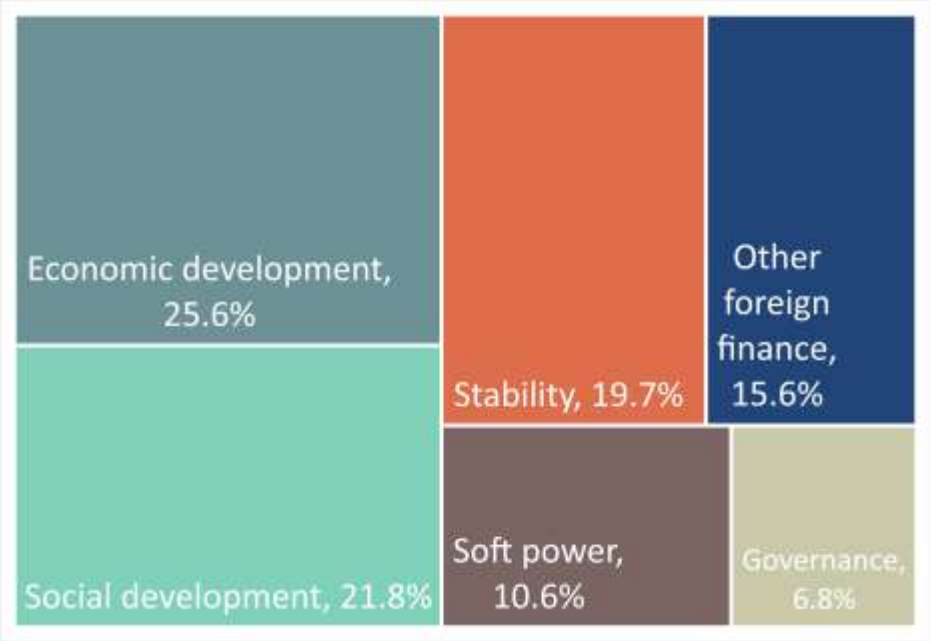
		(N= 473)	
Variable name	Variable description	Mean	S.D.
Partial correlation	Partial correlation between Chinese aid and recipients' outcome	0.001	0.076
SE	Standard error of the partial correlation	0.021	0.016
Author affiliation			
Non-Chinese°	BV = 1: none of the authors has a Chinese affiliation	0.753	0.432
Chinese	BV = 1: at least one author has a Chinese affiliation	0.247	0.432
Publication outlet			
Working paper°	BV = 1: the paper is published as a working paper	0.581	0.494
Peer-reviewed journal	BV = 1: the paper is published in a peer-reviewed journal	0.419	0.494
Measurement of Chinese aid			
All or non-ODA flows°	BV = 1: if Chinese aid is not ODA or not exclusively ODA	0.552	0.498
ODA flows only	BV = 1: if Chinese aid is exclusively ODA	0.448	0.498
Sector-specific°	BV = 1: if Chinese aid is sector-specific	0.201	0.423
Aggregate	BV = 1: if Chinese aid is aggregated	0.799	0.423
Continuous°	BV = 1: if Chinese aid is a continuous variable	0.630	0.483
Dummy	BV = 1: if Chinese aid is a dummy variable	0.218	0.413
Number of projects	BV = 1: if Chinese aid is a count variable (number of projects)	0.152	0.360
Model specification			
Without other donors°	BV = 1: if regression does not control for aid from other donors	0.937	0.244
Other donors	BV = 1: if regression controls for aid from other donors	0.063	0.244

[20] AidData's Global Chinese Official Finance Dataset categorizes Chinese aid projects into three types of flows: (i) official development assistance (ODA) flows are intended to promote development and are highly concessional with a grant element of at least 25 percent; (ii) other official flows (OOF) either have a non-developmental purpose or are insufficiently concessional to qualify as ODA; (iii) vague official finance refers to flows with insufficient information to make a clear determination as to whether they are ODA or OOF (Dreher et al., 2018).

Sample			
Micro°	BV = 1: if micro-level data	0.638	0.481
Macro	BV = 1: if macro-level data	0.362	0.481
Worldwide°	BV = 1: if regression uses worldwide sample	0.307	0.462
Region: Africa	BV = 1: if regression uses data on Africa	0.651	0.477
Region: LAC/Asia	BV = 1: if regression uses data on Latin America or Asia*	0.042	0.201
Recipients' outcome			
Economic development°	BV = 1: if DV is real GDP per capital growth, nighttime light intensity, or Gini index for spatial concentration of activity	0.256	0.437
Governance	BV = 1: if DV is perceptions and experience of corruption, citizens' trust in government and engagement, democracy, or government willingness to implement reforms	0.068	0.251
Other foreign finance	BV = 1: if DV is aid from other donors or inflows of Chinese FDI	0.156	0.364
Social development	BV = 1: if DV is the human development index or household-level health and education outcomes (e.g., child/infant mortality, average years of education)	0.218	0.413
Soft power	BV = 1: if DV is attitudes towards China and political alignment with Beijing's vote at the United Nations General Assembly	0.106	0.308
Stability	BV = 1: if DV is conflict, violence, or social unrest	0.197	0.398

Notes: BV means binary variable, with a value of 1 if condition is fulfilled and zero otherwise. DV stands for dependent variable. To harmonize the interpretation of Chinese aid effectiveness across dependent variables, we take the opposite value of regression coefficients when the dependent variable is associated with unfavorable outcomes (e.g., corruption, conflict, child mortality). ° used as reference category in MRA. * The bulk of the estimates (95 percent) are obtained from regressions using data on Latin America.

Figure 1. Distribution of Estimates Across Recipients' Development Outcomes



Notes: Authors' elaboration.

Of the 473 estimates recorded in the meta-dataset, only 15 percent relate to negative and statistically significant effects of Chinese foreign assistance on recipient countries – half the size of those reporting positive effects – while the bulk (55 percent) find null effects. This seems to suggest that, on average, the empirical literature recorded in the meta-dataset lends little support to those claiming either the beneficial or harmful effect of Beijing's official finance. However, more rigorous methods are warranted to ensure that these statistics reflect "true" effects.

B. Conversion to a Common Effect Size

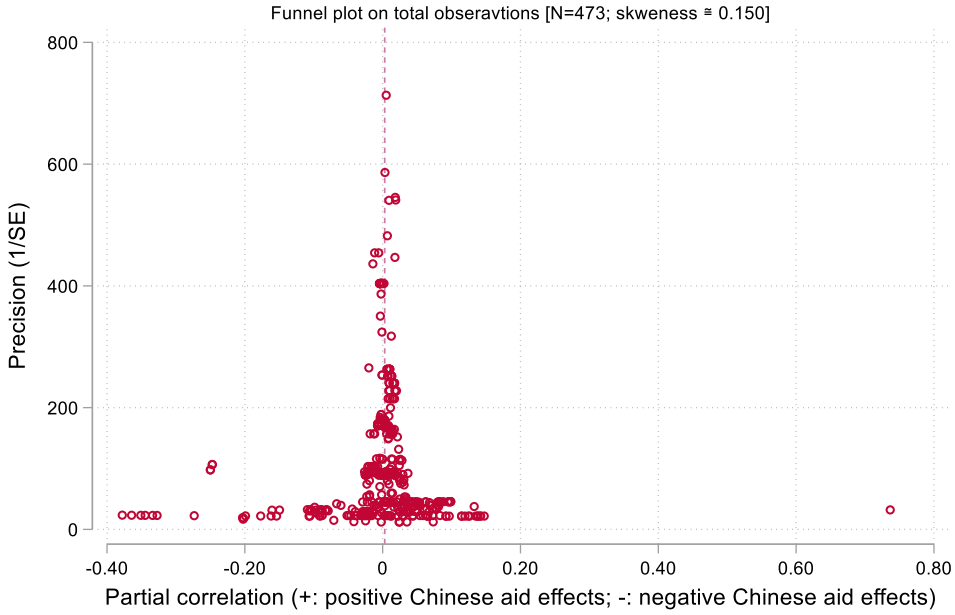
Given the variety of dependent variables and measures of Chinese aid used in the literature, regression coefficients are not comparable across observations. To address this issue, we convert them into a common effect size, namely partial correlation coefficients, using the following formula:

$$r = \frac{t}{\sqrt{t^2 + df}}$$

Where t is the t-statistic of the regression coefficient and df denotes the degrees of freedom. As the latter are rarely reported by authors, we rely instead on the number of observations (Stanley and Doucouliagos, 2012). Partial correlation coefficients measure the strength and direction of the association between Chinese foreign assistance and recipients' outcomes, holding all other factors constant. Since they are unitless, they allow comparing results from studies using different measures of the dependent and explanatory variables.

To illustrate the distribution of observations, we produce a funnel chart by plotting precision (the inverse of the standard error)[21] against the partial correlation. By construction, estimates with a larger standard error (less precision) are spread at the bottom of the graph while those that are more precise form the top of the funnel. In the absence of publication selection bias, the funnel plot should be symmetric, with observations randomly distributed around the "true" effect (Egger et al., 1997; Stanley, 2008; Stanley and Doucouliagos, 2012). Given the mixed empirical evidence on Chinese aid effectiveness, there are a priori no strong reasons to believe that researchers will selectively report positive or negative results consistent with a commonly accepted wisdom. The funnel chart displayed in Figure 2 suggests potentially null genuine effects of Beijing's official finance as the more precise estimates are closely distributed around zero.[22] The funnel plot appears broadly symmetric, with both negative and positive estimates reported (the prob-value for skewness is 0.15), indicating no clear visible sign of publication selection bias.

Figure 2. Funnel Plot: Partial Correlations Between Chinese Aid and Recipients' Outcomes



Notes: The dashed vertical line shows the weighted average partial correlation (0.003), using inverse variance weights. Precision is measured as the inverse of the estimated standard error of the partial correlations.

[21] This is the standard error of the partial correlation, computed as $\sqrt{(1-r^2)/df}$ in line with Stanley and Doucouliagos (2012).

[22] This seems consistent with the very small positive average partial correlation coefficient found for the 15 studies (Appendix Table A1).

IV. META-REGRESSION ANALYSIS

A. Model Specification

To formally test for publication selection bias and a genuine effect of Chinese aid beyond publication selection, we implement Stanley (2005 and 2008)'s FAT-PET regression, or Funnel-Asymmetry test and Precision-Effect test specified as follows:

$$r_{ij} = \beta_0 + \beta_1 SE_{ij} + v_j + \epsilon_{ij} \quad (1)$$

where r is the partial correlation between Chinese foreign assistance and recipients' outcome of the i^{th} estimate from the j^{th} study, SE denotes the standard error of the partial correlation, and ϵ_{ij} is the error term. Because multiple estimates are reported by each study, we correct for potential within-study dependence by including study fixed-effects v_j and by clustering standard errors by study and recipient outcome (Rosenberger and Loomis, 2000b; Bateman and Jones, 2003). The introduction of study fixed-effects has the added advantage of minimizing omitted variable (and thus misspecification) bias by controlling for the influence of both observed and unobserved heterogeneity across studies, such as differences in study quality or authors' ideology that could be correlated with SE and thus bias MRA estimates if not accounted for (Stanley and Doucouliagos, 2012).

The model is used to test for funnel asymmetry. The absence of statistical association between partial correlations and their standard errors ($\beta_1 = 0$) would indicate that the empirical literature on Chinese aid effectiveness is free of publication selection bias.[23] The precision or genuine effect is investigated by testing whether β_0 is statistically different from zero. In other words, rejecting $H_0: \beta_0 = 0$ would confirm the presence of an authentic empirical effect of Chinese aid after controlling for publication bias. In line with the MRA literature, the model is estimated with weighted least squares (WLS) using precision squared (i.e., the inverse variance) as weights to accommodate heteroscedasticity and assign greater weight to those estimates that are more precise (Stanley and Doucouliagos, 2012).[24]

We start by estimating equation (1) over the sample of 473 observations, then run separate subgroup MRAs to check whether the choice of dependent variable, publication outlet, and author affiliation influence the results. Given the broad range of dependent variables investigated in the literature, distinguishing between types of recipients' outcomes can provide additional insights into Chinese aid effectiveness. Whether the study is published as a working paper or in a peer-reviewed journal can make a difference too: publication selection bias could be more pronounced for the latter insofar as researchers have stronger incentives to "polish" their results to secure publication in top-tier academic journals (Brodeur et al., 2016).[25] Author

[23] In the presence of publication selection bias, researchers faced with small samples and large standard errors will tend to search for model specifications, data, and econometric techniques that yield larger estimates and deliver greater statistical significance.

[24] This is akin to implementing the least-squares dummy variable (LSDV) approach using the inverse variance as the analytic weights.

[25] Several MRAs in economics and other disciplines have found "polishing" to be a widespread practice in empirical analysis (Doucouliagos and Paldam, 2008).

affiliation could also matter since it can influence researchers' priors. Authors with a Chinese affiliation could be more inclined to search for and publish positive and statistically significant effects of Beijing's aid to align with institutional interests and ideology. For instance, China's 2021 White Paper on development describes Beijing's commitment to use foreign aid to support developing countries in achieving economic growth, reducing poverty, and reaching the UN Sustainable Development Goals. National and institutional interests can thus cause researchers in China to have priors that Beijing's aid "works", making them less likely to publish negative results. In contrast, authors affiliated with a non-Chinese institution could tend to search for and report non-beneficial effects of Beijing's aid if one assumes that the priors of researchers in Western institutions are influenced by geopolitical considerations.[26]

B. Results

Table 2 presents the FAT-PET results. Estimating equation (1) over the meta-dataset of 473 observations reveals no publication selection bias in the empirical literature investigating the effect of Chinese official finance on recipient countries, consistent with the quasi-symmetry of the funnel plot in Section III.B (Panel I). There is no evidence of genuine effect either. But a breakdown of the MRA sample across outcome categories points to significant heterogeneity (Panel II). After accommodating publication selection bias, Beijing's aid is associated with a positive – albeit negligible – genuine effect on economic growth, somewhat consistent with the claim that Chinese government-financed transport projects contribute to closing developing countries' infrastructure gaps.[27] Beijing's aid also appears to improve social outcomes in recipient countries but has the opposite effect on governance, although very small in size. There is no evidence of a statistically significant effect on socio-economic stability, the inflow of other types of foreign finance to developing countries, or perceptions of China among citizens in recipient countries. Substantial publication selection bias[28] is detected for the body of research published in peer-reviewed journals, suggesting that studies that fail to uncover statistically significant effects are less likely to be submitted to journals, or accepted for publication (Panel III).[29] Finally, institutional affiliation does not seem to matter (Panel IV).

While the small number of papers underpinning the sub-sample MRAs is a limitation, our results provide a first attempt at comparing the effects of Chinese aid with that of traditional OECD DAC donors, based on estimates obtained from rigorous identification strategies. They suggest that the impact of Chinese foreign assistance on recipient countries' development outcomes bears similarities with that of traditional aid from Western donors. For instance, the positive but negligible effect of Chinese aid on economic outcomes is consistent with Doucouliagos and Paldam (2008) who conducted an MRA of the aid-growth literature using

[26] The 2018 US National Defense Strategy and several speeches by NATO officials mention the challenges of strategic competition with China.

[27] Following Cohen (1988), the genuine effect is "negligible" when $|\beta_0| < 0.10$, "small" when $0.10 < |\beta_0| < 0.30$, "medium" when $0.30 < |\beta_0| < 0.50$, and "large" when $|\beta_0| > 0.50$.

[28] According to Doucouliagos and Stanley (2013), the publication selection bias is deemed "little to modest" if $|\beta_1| < 1$, "substantial" if $1 \leq |\beta_1| \leq 2$, and "severe" if $|\beta_1| > 2$.

[29] Publication selection bias is also detected in the MRAs of aid effectiveness conducted by Doucouliagos and Paldam (2006, 2008, 2009, 2010), although Mekasha and Tarp (2013, 2016) conclude to the absence of publication selection bias in the aid-growth literature.

543 estimates from 68 studies covering 40 years of research and found a positive but statistically insignificant average association between development aid and economic growth in recipient countries. Mekasha and Tarp (2013, 2019)'s more recent MRAs uncover a positive and statistically significant average effect of traditional aid, though not large enough to be economically meaningful (Doucouliagos and Paldam, 2013). The positive average effect of Chinese aid on social outcomes is also in line with the overwhelming evidence of positive contributions of OECD DAC aid to education, as summarized by Riddell and Niño-Zarazúa (2016), and health (see for instance Odokonyero et al., 2016 on Uganda; Marty et al., 2017 on Malawi; and Kotsadam et al., 2018 on Nigeria). Similarly, the negative average effect of Chinese official assistance on governance outcomes appears to echo findings from the Western aid literature, with some studies showing that aid increases corruption (e.g. Svensson, 2000; Knack, 2001), undermines democracy (Djankov et al., 2008), and disincentivizes domestic reforms (Bräutigam and Knack, 2004).[30]

However, our results for China contrast with studies that identified the conflict-fueling effect of aid from Western donors (e.g., Besley and Persson, 2011; Crost et al., 2014; Nunn and Qian, 2014; Dube and Naidu, 2015; Bluhm et al., 2020). In the same vein, our MRA results for China depart from the literature showing that Western donors tend to exhibit competitive or herding behavior amongst them, thereby increasing aid in line with other donors (Frot and Santiso, 2011; Fuchs et al., 2015; and Davies and Klasen, 2017). There is also evidence that countries receiving aid from a given OECD DAC donor attract FDI from the same donor (e.g., Anyanwu, 2012; Garriga and Phillips, 2014). Likewise, the empirical literature on the impact of traditional aid on Western donors' soft power mostly points to positive effects, diverging from the lack of statistically significant average effect found for Beijing.[31]

[30] However, other studies find beneficial effects of aid on governance (e.g., Tavares, 2003; Okada and Samreth, 2012).

[31] Andrabi and Das (2017) find that Western aid to Pakistan following the 2005 earthquake improved the local population's trust in Europeans and Americans. Dell and Querubin (2017) show that during the Vietnam war, citizens in regions where the US military implemented development programs reported more positive attitudes towards Americans. Other studies providing support for positive perceptions of the US among citizens of countries receiving US aid include Goldsmith et al. (2014), Eichenauer et al. (2018), and Dietrich et al. (2019). There is also evidence that aid-recipient countries tend to align their UN votes with that of Western donors (see for instance Wang, 1999 and Dreher et al., 2008).

Table 2. FAT-PET Meta-Regression Results – Baseline

	(1) FAT (β_1) Funnel asymmetry		(2) PET (β_0) Meta-average		RMSE	# studies	Obs.	% obs.
(i) Baseline								
All observations	0.205	(0.849)	0.002	(0.003)	0.020	15	473	100%
(ii) Recipients' outcome								
Economic development	1.371 ***	(0.167)	0.005 ***	(0.001)	0.006	5	121	25.6%
Social development	1.187 ***	(0.084)	0.003 ***	(0.000)	0.014	3	103	21.8%
Governance	8.615 ***	(0.656)	-0.071 ***	(0.005)	0.008	3	32	6.8%
Stability	-0.018	(0.484)	-0.017	(0.005)	0.051	2	93	19.7%
Other foreign finance	-2.603	(7.714)	0.017	(0.035)	0.047	3	74	15.6%
Soft power	2.359	(0.870)	-0.010	(0.003)	0.003	2	50	10.6%
(iii) Publication outlet								
Peer-reviewed journal	1.145***	(0.313)	0.006 ***	(0.002)	0.031	8	198	41.9%
Working paper	-0.833	(1.489)	0.005	(0.006)	0.018	7	275	58.1%
(iv) Author affiliation								
Chinese	-25.496	(14.057)	0.978	(0.534)	0.116	2	117	24.7%
Non-Chinese	0.350	(0.809)	0.002	(0.003)	0.017	13	356	75.3%

Notes: Models are estimated with WLS with precision squared weights and study fixed effects. The dependent variable is the adjusted partial correlation between Chinese aid and recipients' outcome. Brackets report standard errors adjusted for study and outcome level clustering. FAT: funnel asymmetry test. PET: precision-effect test. RMSE: root mean square error. Panel (i) reports the baseline MRA model. Panels (ii)-(iv) report estimates from subgroup MRAs, distinguishing across recipients' outcomes (Panel ii), publication outlet (Panel iii), and author affiliation (Panel iv). A detailed description of all variables is available in Table 1. Cohen (1988)'s guidelines: the genuine effect (PET, β_0) is "negligible" when $|\beta_0| < 0.10$, "small" when $0.10 < |\beta_0| < 0.30$, "medium" when $0.30 < |\beta_0| < 0.50$, and "large" when $|\beta_0| > 0.50$. Doucouliagos and Stanley (2013)'s guidelines: the publication bias (FAT, β_1) is "little to modest" if $|\beta_1| < 1$, "substantial" if $1 < |\beta_1| < 2$, and "severe" if $|\beta_1| > 2$. *p < 0.10, **p < 0.05, ***p < 0.01.

C. Robustness

We check the robustness of our MRA results in several ways. First, we cluster standard errors by study only. Second, we use Fisher's z-transform as an alternative effect-size measure since it is commonly known that the distribution of the partial correlation is not normal when its value gets close to -1 and +1.[32] Third, we expand the meta-dataset by including interaction terms. Fourth, we exclude GMM estimates. Fifth, we exclude estimates of the effect of official finance from China on its soft power in developing countries as one may argue that this outcome captures a beneficial effect for China and not the recipients per se. Sixth, we remove the study with the largest number of reported estimates, Gehring et al. (2019), which accounts for close to 15 percent of the sample observations.[33] Results are summarized in Appendix Tables A2 to A7. They broadly remain quantitatively and qualitatively unchanged.

V. Investigating Heterogeneity

In this section, we formally investigate the wide variation routinely found among reported results in the Chinese aid effectiveness literature. We examine to what extent the publication process, researchers' institutional affiliation, choice of data, and model specification can explain the differences in reported estimates. To model heterogeneity, we follow Stanley and Doucouliagos (2012) and adopt a multiple MRA approach:

$$r_{ij} = \beta_0 + \sum \beta_k Z_{ki} + \beta_1 SE_{ij} + \epsilon_{ij} \qquad (2)$$

where Z is a vector of moderator variables believed to influence estimates of Chinese aid effectiveness. In other words, heterogeneity introduced by differences in institutional affiliation, research design choices and publication outlet can be identified and quantified by the coefficients β_k. Specifically, we introduce six binary variables to account for differences in dependent variables across studies, with "economic development" as the omitted category. We also include moderators reflecting differences in the measurement of the Chinese aid variable along three dimensions: (i) whether Chinese foreign assistance is proxied by the number of aid projects, a binary indicator for the presence of aid projects, or a continuous variable such as the dollar amount of the financing (the latter is used as the reference category); (ii) whether Chinese aid is measured at the aggregate or sectoral level (e.g., infrastructure, health, education, etc.); and (iii) whether regressions use ODA flows only or include less concessional types of official finance flows.

Additionally, we explore if differences in model specification influence the reported results by including a dummy taking one if the regression controls for other sources of foreign finance. We check if differences in sample characteristics influence the estimates of Chinese aid effectiveness, namely the use of macro- vs. micro-level data, and whether the sample is worldwide (the former is used as the reference category) or regional, i.e., whether the data

[32] Fisher's z-transform also addresses the issue of the standard error of r not being independent of the value of r (Stanley and Doucouliagos, 2012).

[33] We also check the robustness of our results by excluding each of the 15 studies individually, which does not materially alter the findings. Results are available upon request.

cover Africa or Latin America. Finally, we introduce binary variables for Chinese affiliation and publication in peer-reviewed journal to capture differences arising from author affiliation and publication outlet. Since these variables do not exhibit within-study variation, equation (2) is estimated without study fixed-effects.

Results are presented in Table 3, where the baseline model is gradually augmented with moderator variables (col. 1-6). As is common in the MRA literature, we also report the results from the general-to-specific MRA after removing variables that are not statistically significant (col. 7).[34] We find that the choice of the outcome variable matters as studies assessing the effect of Beijing's official finance on economic outcomes tend to report stronger Chinese aid effectiveness estimates relative to studies focusing on other outcomes. The measurement of the independent variable is also important. First, distinguishing between ODA and other aid flows matters, with the positive coefficient on "ODA flows only" indicating that Chinese aid effectiveness is stronger when aid is concessional. This is consistent with Dreher et al. (2017), who find that Chinese ODA boosts short-term economic growth in recipient countries, but not less concessional and more commercially oriented forms of Chinese official finance.[35] Similarly, Brazys et al. (2017) show that Chinese aid projects are associated with increased local corruption in Tanzania, but the relationship is not verified for ODA-like projects. Regressions relying on Chinese aid measured with a continuous variable (e.g., dollar amount of the project) tend to yield a stronger positive (weaker negative) effect of Chinese foreign assistance. Data granularity matters, with estimates using micro data yielding stronger aid effectiveness. There is also some evidence that, compared with a worldwide sample, Chinese aid is less effective in Africa, while the opposite holds in Latin America/Asia. The use of aggregate vs. sector-specific aid, controlling for official assistance from other donors, and author affiliation with a Chinese institution do not appear to influence the size of the partial correlations in the literature. Finally, and consistent with baseline results, studies published in peer-reviewed journal tend to report larger positive (smaller negative) effects of Beijing's foreign assistance on recipient countries, compared with studies published in working papers.

[34] The general-to-specific approach is recommended to minimize the potential of identifying spurious research dimensions through data mining (Stanley and Doucouliagos, 2012).

[35] Dreher et al. (2021) published after the compilation of the meta-dataset do not find a differential effect of Chinese ODA and OOF on growth.

Table 3. Multiple MRA of Chinese Aid Effectiveness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(i) Baseline							
Constant	0.011***	-0.006	-0.006	-0.006	-0.016	0.006	0.025***
	(0.002)	(0.021)	(0.021)	(0.021)	(0.023)	(0.020)	(0.008)
SE	0.199	0.064	0.065	0.065	0.658	0.689	0.451
	(0.327)	(0.431)	(0.471)	(0.471)	(0.489)	(0.503)	(0.459)
(ii) Recipients' outcome							
Social development	-0.004	-0.001	-0.001	-0.001	-0.002	-0.006***	-0.006***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.005)	(0.002)	(0.002)
Governance	-0.019*	-0.025**	-0.025**	-0.025**	-0.060***	-0.067***	-0.084***
	(0.009)	(0.010)	(0.009)	(0.009)	(0.016)	(0.019)	(0.014)
Stability	-0.029*	-0.046***	-0.046***	-0.046***	-0.078***	-0.086***	-0.096***
	(0.016)	(0.009)	(0.009)	(0.009)	(0.009)	(0.011)	(0.018)
Other foreign finance	-0.006**	-0.010***	-0.010	-0.010	-0.026	-0.047**	-0.053***
	(0.002)	(0.003)	(0.024)	(0.024)	(0.018)	(0.018)	(0.015)
Soft power	-0.013***	-0.017***	-0.017***	-0.017***	-0.056***	-0.063***	-0.082***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.015)	(0.019)	(0.015)
(iii) Chinese aid measurement							
ODA flows only		0.028**	0.028**	0.028**	0.055***	0.066***	0.069***
		(0.011)	(0.011)	(0.011)	(0.010)	(0.012)	(0.014)
Aggregate aid		0.020	0.020	0.020	0.019	0.019	
		(0.020)	(0.020)	(0.020)	(0.020)	(0.019)	
Dummy for Chinese projects		-0.005**	-0.005**	-0.005**	0.001	-0.019***	-0.021**
		(0.002)	(0.002)	(0.002)	(0.006)	(0.004)	(0.008)
Number of Chinese projects		-0.024**	-0.024**	-0.024**	-0.015	-0.017	
		(0.011)	(0.011)	(0.011)	(0.011)	(0.010)	
(iv) Model specification							
Other donors			0.000	0.000	0.025	-0.003	
			(0.025)	(0.025)	(0.019)	(0.016)	
(vi) Sample							
Macro					-0.030	-0.054**	-0.058***
					(0.019)	(0.021)	(0.018)
Region: Africa					0.009	-0.014***	-0.014*
					(0.006)	(0.004)	(0.007)
Region: LAC/Asia					0.049**	0.036*	0.053***
					(0.018)	(0.018)	(0.011)
(vii) Affiliation and publication outlet							
Chinese affiliation						-0.010	
						(0.021)	

Peer-reviewed journal						0.031***	0.032***
						(0.004)	(0.008)
RMSE	0.021	0.020	0.020	0.020	0.019	0.019	0.019
Adjusted R^2	0.126	0.257	0.217	0.217	0.254	0.278	0.240
Number of studies	15	15	15	15	15	15	15
Observations	473	473	473	473	473	473	473

Notes: Models are estimated with WLS with precision squared weights. The dependent variable is the adjusted partial correlation between Chinese aid and recipients' outcome. Brackets report standard errors adjusted for study and outcome level clustering. RMSE: root mean square error. Col. (7) reports results from the general-to-specific approach. A detailed description of all variables is available in Table 1. *p < 0.10, **p < 0.05, ***p < 0.01.

VI. CONCLUSION

The rapid rise of China as a major source of development finance is the subject of much speculation and debate, partly due to the lack of comprehensive data on Beijing's foreign aid activities. But the release of AidData's Global Chinese Official Finance Dataset has spurred a growing body of research relying on rigorous empirical analysis to understand the nature and consequences of Chinese foreign assistance. To date, the empirical evidence on the effectiveness of Chinese official finance has been mixed, with studies finding positive, negative, or even no impact of Beijing's aid on recipient countries. In this paper, we employ MRA to conduct a systematic review and quantitative analysis of this conflicting empirical literature. Using the entire sample of 473 estimates from 15 studies, we find no genuine empirical effect of Chinese foreign assistance on recipient countries after correcting for publication selection bias – the widespread tendency of researchers, journal editors or reviewers to report or publish empirical estimates that are statistically significant or that conform to their expectations. However, running MRA over sub-samples of outcome categories reveals that, on average, Beijing's aid has had a positive effect on economic and social outcomes, but the opposite on governance, albeit negligible in size. There is no evidence of a statistically significant effect on socio-economic stability, the inflow of other types of foreign finance to developing countries, or perceptions of China among citizens in recipient countries. Publication selection bias is detected when restricting the meta-dataset to papers published in peer-reviewed journals, suggesting that studies that fail to uncover statistically significant effects are less likely to be submitted to journals, or accepted for publication. While MRA results are not driven by authors' institutional affiliation, differences in study characteristics such as the type of development outcome considered, how the Chinese aid variable is measured, the geographic region under study, and publication outlet explain the large variations among Chinese aid effectiveness estimates reported in the empirical literature.

While the small number of papers underpinning the sub-sample MRA analysis is a limitation, our results provide a first attempt at quantifying the impact of Chinese aid on recipient countries' development outcomes, based on estimates obtained from rigorous identification strategies. Our MRA provides an objective summary and evaluation of the empirical literature on Chinese aid effectiveness and suggests that, on average and based on the empirical literature captured in our meta-dataset, Chinese official assistance has had some bearing on development outcomes in recipient countries, but its effect is heterogeneous and very small in size. It also presents similarities and differences with the effect of traditional aid from OECD DAC donors extensively documented in the aid effectiveness literature. While MRA aims at a comprehensive assessment of the research record, a useful caveat to note is its unlikeliness to capture the entirety of the existing literature given the criteria applied to produce the meta-dataset. Specifically, our meta-dataset does not capture qualitative analyses nor studies produced in languages other than English or using research methods that are not amenable to MRA (e.g., Computable General Equilibrium analysis). Notwithstanding, MRA remains a useful approach for reviewing and summarizing the empirical literature, especially when it presents mixed evidence. Given the considerable interest in China's footprint in developing countries, one important extension would be to apply MRA to investigate the development effects of other Chinese flows such as trade and FDI. The debated literature on the determinants of Chinese aid allocation could also lend itself to MRA. Going forward, China's recent pledge

to develop a modern statistical information system for foreign assistance[36] is a welcome step towards transparency that could potentially provide fertile ground for further research.

[36] The State Council Information Office of the People's Republic of China (2021): China's International Development Cooperation in the New Era, January 2021.

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Appendix

Figure A1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Diagram

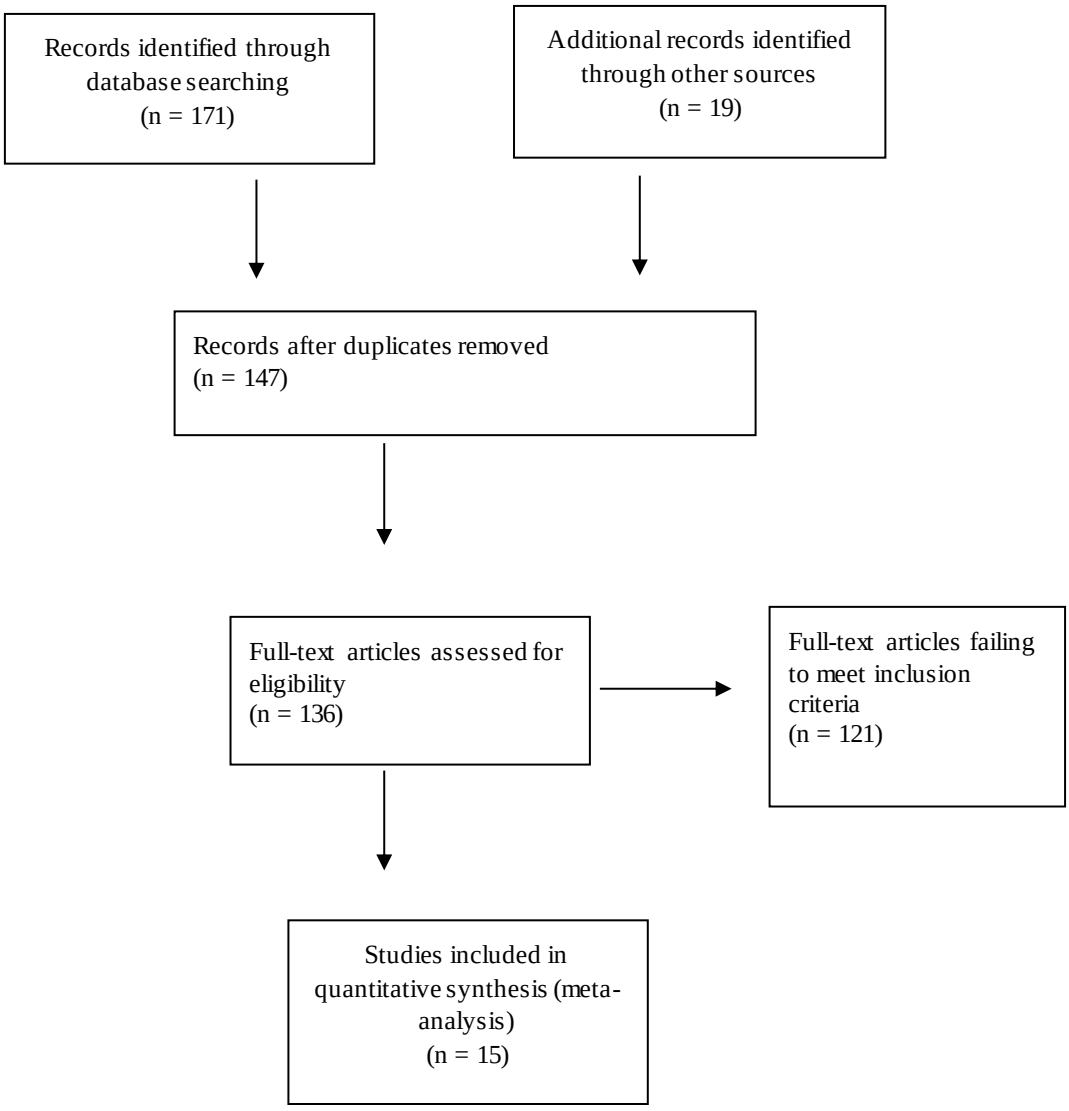

Table A1. Characteristics of Individual Studies

#	Study	Recipients' outcome(s)	Sample	Study level	Measure of Chinese aid	Type of Chinese aid flow	Aggregate/ Sectoral aid	Estimation technique(s)	% total reg.	Average partial corr.
1	Bluhm et al. (2020)	Economic dvpt	Africa; Asia; LAC; Worldwide	Micro	Amount; dummy; nb. of projects	OF	Aggregate; sectoral	2SLS	9.9%	0.008 ***
2	Brazys and Vadlamannati (2020)*	Governance	Worldwide	Macro	Amount	ODA; OOF; OF	Aggregate	2SLS; GMM	3.8%	-0.094 ***
3	Busse et al. (2016)*	Economic dvpt	Africa	Macro	Amount	OF	Aggregate	GMM	1.1%	0.031 *
4	Cruzatti et al. (2020)	Social dvpt	Worldwide	Micro	Dummy	OF	Aggregate; sectoral	2SLS	2.1%	-0.001
5	Dong and Fan (2017)*†	Other foreign fi.	Africa	Macro	Amount	ODA	Aggregate; sectoral	GMM	13.7%	-0.005
6	Dreher et al. (2017)	Economic dvpt	Worldwide	Macro	Amount; nb. of projects	ODA; OOF & vague	Aggregate; sectoral	2SLS	3.8%	0.037 ***
7	Dreher et al. (2016)	Economic dvpt	Africa	Micro	Amount	OF	Aggregate	2SLS	10.4%	0.013 ***
8	Eichenauer et al. (2018)	Soft power	LAC	Micro	Amount; nb. of projects	OF	Aggregate	2SLS	3.8%	-0.003 ***
9	Gehring et al. (2019)	Stability	Africa	Micro	Amount	ODA	Aggregate; sectoral	2SLS	14.6%	-0.001
10	Kilama (2016)*	Other foreign finance	Africa	Macro	Amount; dummy; nb. of proj; other	ODA	Aggregate; sectoral	DiD; GMM	1.3%	0.017
11	Li (2017)*	Governance	Africa	Macro	Amount; dummy	OF	Aggregate	2SLS	1.3%	-0.145 ***

12	Martorano et al. (2020)*	Eco. dvpt; social dvpt	Africa	Micro	Dummy	OF	Aggregate; sectoral	DiD	9.1%	0.018 ***
13	Sardoschau and Jarotschkin (2019)	Governance; soft power; stability	Africa	Micro	Amount; nb. of projects	OF, ODA	Aggregate; sectoral	2SLS	13.5%	-0.010 *
14	Yuan (2020)*†	Social dvpt	Worldwide	Macro	Amount	OF	Aggregate	GMM	11.0%	0.021 ***
15	Zeitz (2021)*	Other foreign fi.	Worldwide	Macro; micro	Amount	OF	Aggregate	2SLS	0.6%	0.006

Notes: * published in peer-reviewed journal. † Chinese affiliation. OF: official finance. ODA: official development assistance. OOF: other official flow. OLS: ordinary least square. 2SLS: two-stage least square. GLS: generalized least square. GMM: general method of moments. DiD: difference-in-differences. PPML: Poisson pseudo-maximum likelihood. PCSE: panel corrected standard error. reg: regressions. corr. correlation. LAC: Latin America and the Caribbean. The sample average partial correlation is 0.003***.

Table A2. FAT-PET Meta-Regression Results – One-way Cluster

	(1) FAT (β_1) Funnel asymmetry		(2) PET (β_0) Meta-average		RMSE	# studies	Obs.	% obs.
(i) Baseline								
All observations	0.205	(0.985)	0.002	(0.005)	0.020	15	473	100%
(ii) Recipients' outcome								
Economic development	1.371 ***	(0.167)	0.005 ***	(0.001)	0.006	5	121	25.6%
Social development	1.187 ***	(0.084)	0.003 ***	(0.000)	0.014	3	103	21.8%
Governance	8.615 ***	(0.656)	-0.071 ***	(0.005)	0.008	3	32	6.8%
Stability	-0.018	(0.484)	-0.017	(0.005)	0.051	2	93	19.7%
Other foreign finance	-2.603	(7.714)	0.017	(0.035)	0.047	3	74	15.6%
Soft power	2.359	(0.870)	-0.010	(0.003)	0.003	2	50	10.6%
(iii) Publication outlet								
Peer-reviewed journal	1.145**	(0.345)	0.006 **	(0.002)	0.031	8	198	41.9%
Working paper	-0.833	(1.720)	0.005	(0.008)	0.018	7	275	58.1%
(iv) Author affiliation								
Chinese	-25.496	(14.057)	0.978	(0.534)	0.116	2	117	24.7%
Non-Chinese	0.350	(0.950)	0.002	(0.004)	0.017	13	356	75.3%

Notes: Models are estimated with WLS with precision squared weights and study fixed effects. The dependent variable is the adjusted partial correlation between Chinese aid and recipients' outcome. Brackets report standard errors adjusted for study and outcome level clustering. FAT: funnel asymmetry test. PET: precision-effect test. RMSE: root mean square error. Panel (i) reports the baseline MRA model. Panels (ii)-(iv) report estimates from subgroup MRAs, distinguishing across recipients' outcomes (Panel ii), publication outlet (Panel iii), and author affiliation (Panel iv). A detailed description of all variables is available in Table 1. Cohen (1988)'s guidelines: the genuine effect (PET, β_0) is "negligible" when $|\beta_0| < 0.10$, "small" when $0.10 < |\beta_0| < 0.30$, "medium" when $0.30 < |\beta_0| < 0.50$, and "large" when $|\beta_0| > 0.50$. Doucouliagos and Stanley (2013)'s guidelines: the publication bias (FAT, β_1) is "little to modest" if $|\beta_1| < 1$, "substantial" if $1 < |\beta_1| < 2$, and "severe" if $|\beta_1| > 2$. *p < 0.10, **p < 0.05, ***p < 0.01.

Table A3. FAT-PET Meta-Regression Results – Fisher Partial Correlation

	(1) FAT (β_1) Funnel asymmetry		(2) PET (β_0) Meta-average		RMSE	# studies	Obs.	% obs.
(i) Baseline								
All observations	0.153	(0.881)	0.002	(0.004)	0.022	15	473	100%
(ii) Recipients' outcome								
Economic development	1.371 ***	(0.167)	0.005 ***	(0.001)	0.006	5	121	25.6%
Social development	1.192 ***	(0.085)	0.003 ***	(0.000)	0.014	3	103	21.8%
Governance	8.720 ***	(0.618)	-0.072 ***	(0.005)	0.008	3	32	6.8%
Stability	-0.013	(0.495)	-0.017	(0.005)	0.052	2	93	19.7%
Other foreign finance	-4.232	(10.151)	0.025	(0.046)	0.053	3	74	15.6%
Soft power	2.359	(0.870)	-0.010	(0.003)	0.003	2	50	10.6%
(iii) Publication outlet								
Peer-reviewed journal	1.068**	(0.419)	0.007 ***	(0.002)	0.031	8	198	41.9%
Working paper	-0.858	(1.512)	0.006	(0.006)	0.018	7	275	58.1%
(iv) Author affiliation								
Chinese	-33.181	(20.219)	1.272	(0.767)	0.128	2	117	24.7%
Non-Chinese	0.341	(0.821)	0.002	(0.003)	0.018	13	356	75.3%

Notes: Models are estimated with WLS with precision squared weights and study fixed effects. The dependent variable is the adjusted partial correlation between Chinese aid and recipients' outcome. Brackets report standard errors adjusted for study and outcome level clustering. FAT: funnel asymmetry test. PET: precision-effect test. RMSE: root mean square error. Panel (i) reports the baseline MRA model. Panels (ii)-(iv) report estimates from subgroup MRAs, distinguishing across recipients' outcomes (Panel ii), publication outlet (Panel iii), and author affiliation (Panel iv). A detailed description of all variables is available in Table 1. Cohen (1988)'s guidelines: the genuine effect (PET, β_0) is "negligible" when $|\beta_0| < 0.10$, "small" when $0.10 < |\beta_0| < 0.30$, "medium" when $0.30 < |\beta_0| < 0.50$, and "large" when $|\beta_0| > 0.50$. Doucouliagos and Stanley (2013)'s guidelines: the publication bias (FAT, β_1) is "little to modest" if $|\beta_1| < 1$, "substantial" if $1 < |\beta_1| < 2$, and "severe" if $|\beta_1| > 2$. *p < 0.10, **p < 0.05, ***p < 0.01.

Table A4. FAT-PET Meta-Regression Results – Keeping Interactive Models

	(1) FAT (β_1) Funnel asymmetry		(2) PET (β_0) Meta-average		RMSE	# studies	Obs.	% obs.
(i) Baseline								
All observations	0.362	(0.663)	0.002	(0.003)	0.018	15	636	100%
(ii) Recipients' outcome								
Economic development	1.143 ***	(0.034)	0.003 ***	(0.000)	0.008	5	189	29.7%
Social development	1.084 ***	(0.049)	0.004 ***	(0.000)	0.015	3	172	27.0%
Governance	8.615 ***	(0.656)	-0.071 ***	(0.005)	0.008	3	32	5.0%
Stability	-0.018	(0.484)	-0.017	(0.005)	0.051	2	93	14.6%
Other foreign finance	-1.773	(6.318)	0.014	(0.029)	0.047	3	76	11.9%
Soft power	1.501 ***	(0.080)	-0.008 ***	(0.000)	0.003	2	74	11.6%
(iii) Publication outlet								
Peer-reviewed journal	1.068***	(0.220)	0.006 **	(0.001)	0.031	8	269	42.3%
Working paper	-0.499	(1.283)	0.005	(0.005)	0.016	7	367	57.7%
(iv) Author affiliation								
Chinese	-11.198	(14.716)	0.411	(0.517)	0.098	2	168	26.4%
Non-Chinese	0.468	(0.634)	0.002	(0.002)	0.016	13	468	73.6%

Notes: Models are estimated with WLS with precision squared weights and study fixed effects. The dependent variable is the adjusted partial correlation between Chinese aid and recipients' outcome. Brackets report standard errors adjusted for study and outcome level clustering. FAT: funnel asymmetry test. PET: precision-effect test. RMSE: root mean square error. Panel (i) reports the baseline MRA model. Panels (ii)-(iv) report estimates from subgroup MRAs, distinguishing across recipients' outcomes (Panel ii), publication outlet (Panel iii), and author affiliation (Panel iv). A detailed description of all variables is available in Table 1. Cohen (1988)'s guidelines: the genuine effect (PET, β_0) is "negligible" when $|\beta_0| < 0.10$, "small" when $0.10 < |\beta_0| < 0.30$, "medium" when $0.30 < |\beta_0| < 0.50$, and "large" when $|\beta_0| > 0.50$. Doucouliagos and Stanley (2013)'s guidelines: the publication bias (FAT, β_1) is "little to modest" if $|\beta_1| < 1$, "substantial" if $1 < |\beta_1| < 2$, and "severe" if $|\beta_1| > 2$. *p < 0.10, **p < 0.05, ***p < 0.01.

Table A5. FAT-PET Meta-Regression Results – Excluding GMM Estimates

	(1) FAT (β_1) Funnel asymmetry		(2) PET (β_0) Meta-average		RMSE	# studies	Obs.	% obs.
(i) Baseline								
All observations	0.346	(0.812)	0.002	(0.003)	0.017	12	347	100%
(ii) Recipients' outcome								
Economic development	1.371 ***	(0.172)	0.005 **	(0.001)	0.006	4	116	33.4%
Social development	1.229 **	(0.028)	0.004 ***	(0.000)	0.013	2	51	14.7%
Governance	8.018 ***	(0.077)	-0.064 ***	(0.001)	0.006	3	30	8.6%
Stability	-0.018	(0.484)	-0.017	(0.005)	0.051	2	93	26.8%
Other foreign finance	2.416	(0.650)	0.001	(0.001)	0.007	2	7	2.0%
Soft power	2.359	(0.870)	-0.010	(0.003)	0.003	2	50	14.4%
(iii) Publication outlet								
Peer-reviewed journal	1.426***	(0.221)	0.008 ***	(0.001)	0.012	5	72	20.7%
Working paper	-0.833	(1.489)	0.005	(0.006)	0.018	7	275	79.3%

Notes: Models are estimated with WLS with precision squared weights and study fixed effects. The dependent variable is the adjusted partial correlation between Chinese aid and recipients' outcome. Brackets report standard errors adjusted for study and outcome level clustering. FAT: funnel asymmetry test. PET: precision-effect test. RMSE: root mean square error. Panel (i) reports the baseline MRA model. Panels (ii) and (iii) report estimates from subgroup MRAs, distinguishing across recipients' outcomes (Panel ii) and publication outlet (Panel iii). MRAs by author affiliation are not run as papers with at least one author affiliated with a Chinese institution employ the GMM estimator. A detailed description of all variables is available in Table 1. Cohen (1988)'s guidelines: the genuine effect (PET, β_0) is "negligible" when $|\beta_0| < 0.10$, "small" when $0.10 < |\beta_0| < 0.30$, "medium" when $0.30 < |\beta_0| < 0.50$, and "large" when $|\beta_0| > 0.50$. Doucouliagos and Stanley (2013)'s guidelines: the publication bias (FAT, β_1) is "little to modest" if $|\beta_1| < 1$, "substantial" if $1 < |\beta_1| < 2$, and "severe" if $|\beta_1| > 2$. *p < 0.10, **p < 0.05, ***p < 0.01.

Table A6. FAT-PET Meta-Regression Results – Excluding Soft Power

	(1) FAT (β_1) Funnel asymmetry		(2) PET (β_0) Meta-average		RMSE	# studies	Obs.	% obs.
(i) Baseline								
All observations	0.460 ***	(0.591)	0.004	(0.003)	0.024	14	423	100%
(ii) Recipients' outcome								
Economic development	1.371 ***	(0.167)	0.005 ***	(0.001)	0.006	5	121	28.6%
Social development	1.187 ***	(0.084)	0.003 ***	(0.000)	0.014	3	103	24.3%
Governance	8.615 ***	(0.656)	-0.071 ***	(0.005)	0.008	3	32	7.6%
Stability	-0.018	(0.484)	-0.017	(0.005)	0.051	2	93	22.0%
Other foreign finance	-2.603	(7.714)	0.017	(0.035)	0.047	3	74	17.5%
(iii) Publication outlet								
Peer-reviewed journal	1.144 ***	(0.313)	0.006 ***	(0.002)	0.031	8	198	46.8%
Working paper	-0.329	(1.000)	0.006	(0.006)	0.022	6	225	53.2%
(iv) Author affiliation								
Chinese	-25.496	(14.057)	0.978	(0.534)	0.116	2	117	27.7%
Non-Chinese	0.609	(0.535)	0.003	(0.003)	0.021	12	306	72.3%

Notes: Models are estimated with WLS with precision squared weights and study fixed effects. The dependent variable is the adjusted partial correlation between Chinese aid and recipients' outcome. Brackets report standard errors adjusted for study and outcome level clustering. FAT: funnel asymmetry test. PET: precision-effect test. RMSE: root mean square error. Panel (i) reports the baseline MRA model. Panels (ii)-(iv) report estimates from subgroup MRAs, distinguishing across recipients' outcomes (Panel ii), publication outlet (Panel iii), and author affiliation (Panel iv). A detailed description of all variables is available in Table 1. Cohen (1988)'s guidelines: the genuine effect (PET, β_0) is "negligible" when $|\beta_0| < 0.10$, "small" when $0.10 < |\beta_0| < 0.30$, "medium" when $0.30 < |\beta_0| < 0.50$, and "large" when $|\beta_0| > 0.50$. Doucouliagos and Stanley (2013)'s guidelines: the publication bias (FAT, β_1) is "little to modest" if $|\beta_1| < 1$, "substantial" if $1 < |\beta_1| < 2$, and "severe" if $|\beta_1| > 2$. *p < 0.10, **p < 0.05, ***p < 0.01.

Table A7. FAT-PET Meta-Regression Results – Removing Gehring et al. (2019)

	(1) FAT (β_1) Funnel asymmetry		(2) PET (β_0) Meta-average		RMSE	# studies	Obs.	% obs.
(i) Baseline								
All observations	0.292	(0.977)	0.002	(0.004)	0.021	14	404	100%
(ii) Recipients' outcome								
Economic development	1.371 ***	(0.167)	0.005 ***	(0.001)	0.006	5	121	30.0%
Social development	1.187 ***	(0.084)	0.003 ***	(0.000)	0.014	3	103	25.5%
Governance	8.615 ***	(0.656)	-0.071 ***	(0.005)	0.008	3	32	7.9%
Stability	-2.603	(7.714)	0.017	(0.035)	0.047	3	74	18.3%
Other foreign finance	2.359	(0.870)	-0.010	(0.003)	0.003	2	50	12.4%
(iii) Publication outlet								
Peer-reviewed journal	1.145***	(0.313)	0.006 ***	(0.002)	0.031	8	198	49.0%
Working paper	-1.119	(2.285)	0.007	(0.009)	0.018	6	206	51.0%
(iv) Author affiliation								
Chinese	-25.496	(14.057)	0.978	(0.534)	0.116	2	117	29.0%
Non-Chinese	0.464	(0.923)	0.002	(0.003)	0.018	12	287	71.0%

Notes: Models are estimated with WLS with precision squared weights and study fixed effects. The dependent variable is the adjusted partial correlation between Chinese aid and recipients' outcome. Brackets report standard errors adjusted for study and outcome level clustering. FAT: funnel asymmetry test. PET: precision-effect test. RMSE: root mean square error. Panel (i) reports the baseline MRA model. Panels (ii)-(iv) report estimates from subgroup MRAs, distinguishing across recipients' outcomes (Panel ii), publication outlet (Panel iii), and author affiliation (Panel iv). A detailed description of all variables is available in Table 1. Cohen (1988)'s guidelines: the genuine effect (PET, β_0) is "negligible" when $|\beta_0| < 0.10$, "small" when $0.10 < |\beta_0| < 0.30$, "medium" when $0.30 < |\beta_0| < 0.50$, and "large" when $|\beta_0| > 0.50$. Doucouliagos and Stanley (2013)'s guidelines: the publication bias (FAT, β_1) is "little to modest" if $|\beta_1| < 1$, "substantial" if $1 < |\beta_1| < 2$, and "severe" if $|\beta_1| > 2$. *p < 0.10, **p < 0.05, ***p < 0.01.

PUBLICATIONS

Has Chinese Aid Benefited Recipient Countries? Evidence from a Meta-Regression Analysis
Working Paper No. **WP/22/46**