

RESEARCH ARTICLE

The inclusiveness of China's development finance: China's hybrid approach to aid and poverty reduction in Africa

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Recent years have seen China emerging as a new donor outside of the West's club of traditional donors, seeking to fill the financing gap for the Sustainable Development Goals (SDGs). The Chinese government has adopted a hybrid approach to international aid, in which it supplies trade credit and other types of loans to underdeveloped countries through its policy banks and state-owned enterprises in addition to traditional aid. As such a hybrid approach is considered more market-oriented than traditional donors, much of the literature on it has focused on its impact on economic growth rather than on social welfare and poverty reduction. It is critical to note, however, that in reality, the Chinese government has long-valued poverty reduction as a priority of the SDGs, regardless of the context of domestic governance or international aid. Therefore, this article used the panel data of African countries between 2000 and 2016 to test the relationship between China's development finance and its corresponding poverty-reduction effect in Africa. Empirical results shown that China's hybrid approach reduced poverty in Africa, particularly in poorer sub-Saharan countries and "heavily indebted poor countries." Further, in a similar vein to China's domestic inclusive-growth model, its poverty reduction in Africa tended to be achieved indirectly through production sectors rather than directly through the provision of social relief.

Keywords: China's hybrid approach to aid, International development finance, Poverty reduction, Inclusive growth, Official Chinese capital flows

1. Introduction

In 2015, when the Sustainable Development Goals (SDGs) were officially launched, the United Nations (UN, 2015) declared, "Eradicating poverty in all its forms and dimensions is the greatest global challenge and an indispensable requirement for sustainable development" (p. 1). As a measure of poverty, the Human Development Index (HDI) was formulated by the United Nations Development Program (UNDP) that take into account multiple aspects of poverty, including income, education, and health and is considered to be more comprehensive than primitive income-only measures, such as setting a poverty line of US\$1.25 on a daily basis (Deaton, 2006). Among the world's regions, the African continent is the most impoverished, with more

people living in poverty than the rest of the world combined at the end of the Millennium Development Goals (MDGs). Out of 54 countries within this region, 46 are classified as low-income countries, and 33 are classified as "heavily indebted poor countries" (HIPCs; World Bank, 2018). The COVID-19 pandemic has further aggravated the vulnerability of fragile countries in Africa, threatening to undo decades of hard-won progress in reducing poverty (UN, 2020).

International aid is regarded as one of the most effective weapons in the fight against poverty (UNDP, 2005, p. 7). As the most mainstream form of international aid, Official Development Assistance (ODA) is defined by the Development Assistance Committee of the Organization for Economic Cooperation and Development (OECD DAC) as, "those flows to countries and territories on the DAC List of ODA Recipients and to multilateral institutions which are provided by official agencies, including state and local governments, or by their executive agencies; and each transaction of which is administered with the promotion of the economic development and welfare of developing countries as its main objective; and is concessional in character and conveys a grant element of at least 25 percent," as well as the other official flows (OOF), that is, "other official sector transactions do not meet ODA

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criteria of concession.”¹ A worrying trend in international aid has been China becoming the most prominent donor (Manning, 2006; Woods, 2008), with counterparts as OECD DAC members, which are also known as the emerging donor versus the traditional donor club. These phenomena are considered essential manifestations of China's rise as an economic power in recent years, particularly after the global financial crisis of 2008. In spite of the Chinese government's claim that its aid serves to achieve MDGs and SDGs by coordinating with traditional donors (State Council Information Office of China, 2011, 2014, 2021a), Chinese aid practices are consistently criticized by policymakers and scholars in OECD DAC countries, such as the well-known argument that rogue donors like China rely on foreign aid as a tool to advance its interest abroad but care less about recipients' welfare (Naim, 2009).

Among these criticisms, a key point of contention is that Chinese aid is frequently mixed with more commercially oriented sources and types of state financing, which are large in scope, fail to meet the definitions of ODA and OOF, and violate aid norms and best practices of the OECD DAC (Brautigam, 2011; Massa, 2011). This hybrid approach to aid, also called as “China's overseas lending boom” or “official Chinese capital flows” (Horn et al., 2021), includes not only ODA and OOF provided by the Chinese governments and its official export credit institutions such as policy banks but also loans provided by various types of state-owned enterprises mixed with China's outward foreign direct investment (FDI), which tends to be more market-oriented and cannot be simply incorporated into official sector transactions. In light of this, can the “official Chinese capital flows” contribute to the poverty-reduction target of SDGs? Has its hybrid approach and market orientation compromised its effects on poverty reduction and international development?

Meanwhile, the concept of “international development finance” has begun to emerge in recent years, which is closer to describing the “official Chinese capital flows” than the traditional concepts like ODA or OOF. Immediately after the MDGs were launched, the first UN International Conference on Financing for Development took place with the aim of mobilizing all available development financing resources beyond international aid. Following this, the UN organized the Doha, 2008 and Addis Ababa, 2015 Conferences on Financing for Development, establishing a new global framework for financing the SDGs. Accordingly, the OECD DAC formally proposed a concept of “Total Official Support for Sustainable Development” (TOSSD) in 2012 to modernize the definition and statistics of ODA and better reflect the complex landscape of international development finance. TOSSD is a combination of traditional ODA and private funding leveraged by public resources, such as guarantees,

syndicated loans, shares of collective investment vehicles, credit lines, direct investment in companies, cofinancing arrangements, and project financing schemes.² There has been a growing body of research that has used the concept of “international development finance” when referring to China's hybrid approach to aid in underdeveloped countries, regardless of whether the Chinese government reports data on aid and other official capital flows to the OECD DAC to match the TOSSD statistical framework (Lin and Wang, 2017; Dollar, 2018; Humphrey and Michaelowa, 2019; Chen, 2020; Dreher, 2021). In light of that “China's development finance” can more easily be incorporated into existing theoretical framework and literature system, this article unified the use of the concept in the following sections to describe the China's hybrid approach to aid or the “official Chinese capital flows” and empirically test its poverty-reduction effect in Africa.

In light of the above context, the core research question of this article is whether China's development finance reduces poverty in Africa, and the structure of this article is as follows: the second section reviews related literature; the third section discusses model specification, estimation methods, and detailed descriptive statistics on China's development finance to Africa; the fourth section covers the empirical results in 3 parts: baseline regression, heterogeneity analysis, and robustness testing, followed by conclusion and outlook.

2. Literature review

In terms of the existing literature, few quantitative studies have examined the impact of China's development finance on poverty reduction and welfare improvement in host countries. This article argues that this empirical gap exists primarily due to an inherent perception of the dichotomy between traditional and emerging donors, namely, the tendency to focus on the poverty-reduction effect of OECD DAC (Collier and Dollar, 2002; Gomanee et al., 2005; Bahmani-Oskooee and Oyolola, 2009; Alvi and Senbeta, 2012; Page and Shimeles, 2015; Mahembe and Odhiambo, 2020) and on the aid-growth relationship of China (Dong and Fan, 2020; Xu et al., 2020; Dreher, 2021). According to the above literature, ODA from the OECD DAC primarily reduces poverty in 2 ways: The first is to directly reduce poverty by supporting the governments of underdeveloped countries in increasing their social public expenditures, including support for their education and health sectors as well as direct transfers to those in need; second, poverty reduction can be achieved indirectly or through spillovers, by fostering good governance and promoting economic growth in recipient countries. Economic growth, however, may cause inequality that maintains or exacerbates poverty (Gohou and Soumare, 2012). As for China's development finance, it emphasizes infrastructure and production sectors more than social sectors (Dreher and Nunnenkamp, 2011; Dreher et al., 2015; Hwang et al., 2016; Guillon and Mathonnat, 2020) and does not

1. <https://www.oecd.org/development/financing-sustainable-development/development-finance-standards/officialdevelopmentassistance/definitionandcoverage.htm>. Accessed November 8, 2022.

2. <https://www.tossd.org/what-is-tossd/>. Accessed November 8, 2022.

condition a country's institutional quality (Hernandez, 2017; Dreher, 2018), which indicates that China's development finance is unlikely to directly reduce poverty by support social sectors in the recipient countries; the indirect way of reducing poverty through good governance does not exist; and the economic-growth channel should be empirically tested to determine whether it would worsen poverty by increasing inequality or not.

While the reality of China's development finance in underdeveloped countries differs somewhat from the conventional literature and perception of the emerging donor versus traditional donors. Based on the *White Paper on China's Foreign Aid* (State Council Information Office of China, 2011, 2014, 2021a), the Chinese government has historically placed a high priority on poverty reduction in its foreign aid, even before it opened up to the world in 1978. For instance, China has dispatched medical assistance teams to impoverished countries since the 1960s, emphasizing the importance of stationing these teams in rural areas away from economically prosperous urban areas.³ Second, Chinese authorities are also open to learning from the OECD DAC's experience on poverty alleviation assistance. It can be evidenced by the fact that China provides a substantial amount of "livelihood aid" in addition to supporting infrastructure and production sectors in the underdeveloped countries. As well, the Chinese government has been providing debt relief to African countries through the Forum on China-Africa Cooperation since 2000, which coincides with the HIPC debt relief initiative promoted by the traditional donors. And following the practice of OECD DAC, the Chinese government began sending young volunteers to poor countries in 2002 and incorporated the "Youth Volunteer Overseas Service Program" into its foreign aid system in 2004. Third, China has actively applied its domestic experience of poverty alleviation to international aid projects. In 2012, the 18th National Congress of the Communist Party of China (CPC) decided to mobilize nationwide efforts to eradicate absolute poverty domestically by 2021, the 100th anniversary of the CPC's founding. In 2021, it in due course declared that "China has completed the arduous task of eliminating extreme poverty" and was willing to exchange and cooperate internationally to share experience and address poverty issue worldwide (State Council Information Office of China, 2021b).

Meanwhile, several qualitative studies have been conducted on China's domestic poverty-reduction model and its influence internationally, showing that its characteristics of inclusiveness, such as pro-poor growth and trickle-down effect, can spill over into developing countries along with China's aid (Wang and Zhang, 2020; Zuo et al., 2020). And in quantitative studies of China's poverty reduction domestically, inclusiveness has been measured as whether and to what extent disparities between rural and urban areas have decreased, or whether the

relatively poor western and central provinces of China have benefited more than the eastern regions (Zhang et al., 2019; Li et al., 2020). As well, inclusiveness-related concepts have been emphasized in global development governance in recent years, with the word "inclusive" being mentioned 46 times in the UN Report on the Launch of the SDGs (UN, 2015). Multilateral institutions, such as the World Bank and the Asian Development Bank, use "inclusive growth" to advocate poverty reduction through growth, namely, narrowing the income gap and other key social indicators between the wealthy and impoverished by generating productive employment and additional opportunities during economic growth (Rauniyar and Kanbur, 2010).

Furthermore, FDI from developed countries to underdeveloped countries has also been empirically studied for its poverty-reduction effect. The main argument is that, while the primary driver of FDI to developing countries is business interest, it promotes productive employment for the poor, strengthens human capital, and facilitates the transfer of technology, indirectly reducing poverty in the host countries (Gohou and Soumare, 2012; Fowowe and Shuaibu, 2014; Ahmad et al., 2019). In several papers, however, FDI has been shown to widen income inequality and regional disparities (Wu, 2001; Nunnenkamp et al., 2007; Fleisher et al., 2010; Lessmann, 2013; Wong, 2016). For instance, wages for skilled labor would rise disproportionately to wages for unskilled labor; different regions of a country typically do not equally receive FDI; weak governance or institutional flaws in host countries exacerbate redistributive injustice. Compared with ODA from the OECD DAC, China's development finance is more similar to FDI from private sector, with market-oriented attribute and driven primarily by economic interest rather than the SDGs. Could it have an indirect poverty-reduction effect like FDI, or could it exacerbate the income gap and regional disparities in Africa?

After reviewing the literature, we further decomposed the core question "Does China's development finance reduce poverty in Africa?" into the following 3 research subquestions. It is first necessary to test quantitatively whether China's hybrid approach to aid has reduced poverty in Africa. Because there exists an empirical gap, namely, a number of quantitative studies on the economic-growth effect of Chinese aid and the poverty-reduction effect of ODA from the OECD DAC, but few have evaluated the poverty-reduction effect of China's development finance in specific regions such as Africa. Second, can China's development finance in Africa help narrow the development disparity across subregions and countries, similar to its domestic poverty-reduction efforts? Third, does China's hybrid approach, which is more like FDI, indirectly reduces poverty in host countries by stimulating production sectors rather than directly providing social assistance? It can be said that China's development finance in Africa reduces poverty under the framework of inclusive growth if the empirical test answers to all 3 subquestions are positive.

3. http://en.cidca.gov.cn/2018-10/22/c_284614.htm. Accessed November 8, 2022.

3. Model specification, estimation methods, and data description

3.1. Model specification

The focus of this article is on the poverty-reduction effect of China's development finance in Africa. Therefore, the poverty-reduction effect is the dependent variable, and China's development finance in Africa is the core independent variable. Referring to Gohou and Soumaré (2012), the preliminary empirical model is as follows:

$$\text{HDI}_{it} = \beta_0 + \beta_1 \text{Aid}_{it} + \sum_{j=2}^T \beta_j X_{it}^j + v_i + \varepsilon_{it}. \quad (1)$$

The subscripts i and t of each variable represent the individual recipient country and the year of receiving development finance, respectively; HDI_{it} stands for the HDI of African countries, which measures the effect of poverty reduction; Aid_{it} is the amount of China's development finance to Africa; X_{it} is a series of control variables; v_i stands for fixed effects (FEs); and \tilde{a}_{it} is the unobservable disturbance in the model.

Because poverty is highly inertial, that is, the poverty level in the current period is affected by its lag phase, the lagged HDI (HDI_{it-1}) needs to be included in the above regression model. In addition, it is expected that there is as a certain time lag in the poverty-reduction effect of China's aid projects in Africa and that development finance and poverty are contemporaneously and mutually related. Therefore, we followed Dreher et al. (2021) by using the development finance data with second-order lags (Aid_{it-2}) for the regression. The modified empirical model is thus as follows:

$$\text{HDI}_{it} = \beta_0 + \beta_1 \text{HDI}_{it-1} + \beta_2 \text{Aid}_{it-2} + \sum_{j=3}^T \beta_j X_{it}^j + v_i + \varepsilon_{it}. \quad (2)$$

3.2. Estimation methods

Empirical model (1) can be estimated using conventional methods of panel data, but since Equation 2 has lagged variables, a dynamic panel approach is necessary. The commonly used dynamic panel estimation methods include the differential generalized method of moment (DGMM) and systematic generalized method of moment (SGMM). In the former, the difference transformation is first applied to Equation 2 to eliminate the unobservable individual FEs. We then select explanatory variables that are lagged by 2 phases or above as the instrumental variables of the difference equation before obtaining consistent estimates of the parameters. DGMM only utilizes the information contained in the difference equation, which can pose the problem of weak instrument variables if a panel is short. This can subsequently result in estimation bias. Arellano and Bover (1995) and Blundell and Bond (1998) thus proposed the improved SGMM that operates on the assumption that if the first difference of explanatory variables is not correlated with the FEs in the original equation, the difference term can therefore be used as the instrument variable of the level equation and form a joint estimation with the difference equation. SGMM contains more information than DGMM, and it can control for

country-specific effect that do not vary over time. In this way, endogeneity issues can be alleviated and estimations are more reliable (Ullah et al., 2018; Smaoui and Ghouma, 2020). Therefore, the rest empirical analysis following the baseline regressions in this article selected the lagged dependent and independent variables as instrument variables and used the 2-stage SGMM. Further, the Hansen/Sargan test and the Arellano-Bond test for AR(1) and AR(2) were used to verify the validity of instrument variable and the serial correlation of residuals.

3.3. Variable selection and data description

3.3.1. Dependent variable: HDI as a measure of poverty in Africa

An accurate definition and measurement of poverty is the precondition to understand the poverty-reduction effect of China's development finance in Africa. Currently, 2 main approaches are used to define and measure poverty of households, communities, and countries: the basic needs approach (BNA) and the multidimensional poverty mixed approach (MPA). The BNA defines poverty as a lack of money, and it also denotes a level of consumption that is indispensable for the most basic needs of life. This approach usually sets a minimum level of income, that is, the poverty line, as a criterion to classify the poor from the nonpoor. The MPA, on the other hand, recognizes that poverty is a multidimensional phenomenon that encompasses a range of issues such as health, security, income, and consumption and that the measurement of poverty includes both monetary and nonmonetary factors. The UNDP has been publishing the HDI since 1990, which measures 3 basic dimensions of human development that include a long and healthy life, being knowledgeable, and having a decent standard of living. Specifically, the health dimension is measured by life expectancy at birth; the education dimension is measured by the mean of years of schooling for adults aged 25 years and more, as well as expected years of schooling for the children of school entering age; and the standard of living by the gross national income per capita. And the HDI is a scale of 0–1, with a higher HDI value indicating a lower poverty level. Hence, this article utilizes HDI to measure poverty in African countries.

3.3.2. Independent variable: China's development finance in Africa

Since the Chinese government has not yet published detailed data on its international aid and other types of official capital flows, this article referred to the "Global Chinese Official Finance Dataset version 1.0" published by the AidData Research Laboratory at the College of William and Mary for analysis. The dataset provides information of 5,466 China's development finance projects to more than 140 countries around the world during 2000–2014. Of these, the number of credible projects for China's development finance in Africa is 2,345, accounting for 54.4% of the total number, and the cumulative amount of China's development finance to Africa is nearly US\$94 billion (in constant 2010 U.S. dollars), accounting for 33.7% of the total amount in that period.

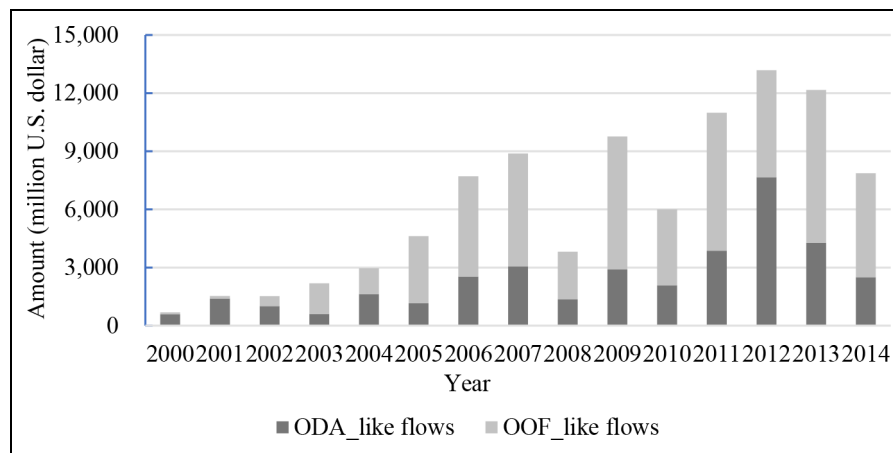


Figure 1. The amount of China's development finance in Africa.

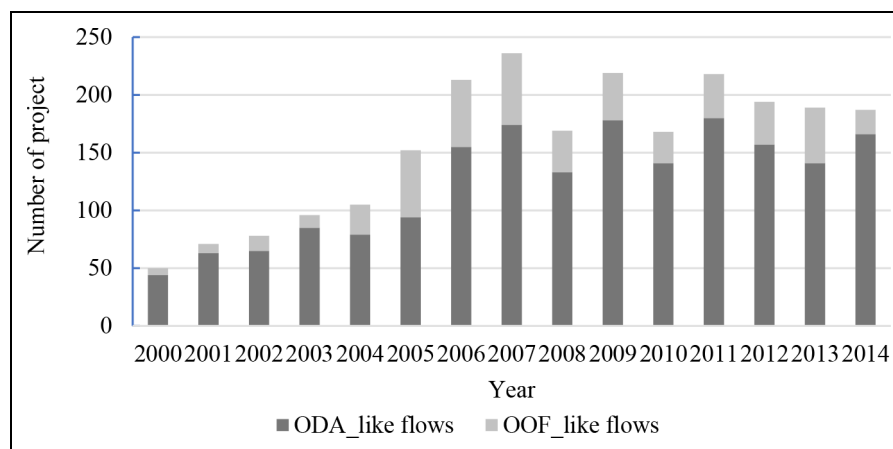


Figure 2. The number of China's development finance projects in Africa.

In terms of financing form, the AidData dataset includes both foreign aid provided by the Chinese government that meets OECD DAC criteria for ODA, which is referred to as “ODA_like” flows, and other development finance that does not meet OECD criteria for ODA, which is called as “OOF_like” flows. This article used the amount of China's development finance to African countries (aidall) as the core explanatory variable, and relied on the number of projects in lieu of the amount for robustness testing. **Figures 1** and **2** illustrate the overall picture of China's development finance in Africa. Since 2000, China's development finance in Africa has continued to increase in the quantity of projects. Although the 2008 global financial crisis saw the decrease, both the capital scale and the number of projects quickly recovered, surpassing their original peaks. In terms of the number of projects, China's development finance in Africa was dominated by ODA_like flows between 2000 and 2014, accounting for more than 80% of the total; however, in terms of the capital scale, OOF_like flows took up a relatively larger portion, peaking at more than 70% in 2009.

Figures 3 and **4** further show the changing structure of China's development finance in Africa. Using the sectoral classification criterion provided by the OECD, this

article subdivided China's development finance into 4 categories: social sectors that include education, health, fertility, water resources, and so on; infrastructure sectors that include transportation, storage, communications, energy, and so on; production sectors that include agriculture, forestry, industry, mining, construction, tourism, and so on; and other sectors cover environmental protection, financial support, debt relief, humanitarian response, and the rest that cannot be clearly classified.⁴ It is evident that main capital is concentrated in the infrastructure sectors, while the social sectors see the highest number of projects. In order to investigate the heterogeneity, this article then used regressions based on the amount of development finance flowing into African social sectors (aid1), infrastructure sectors (aid2), production sectors (aid3), and other sectors (aid4), respectively.

3.3.3. Control variables

To accurately estimate the poverty-reduction effect of China's development finance in Africa, the regression also

4. <https://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/dacandcrscodelists.htm>.

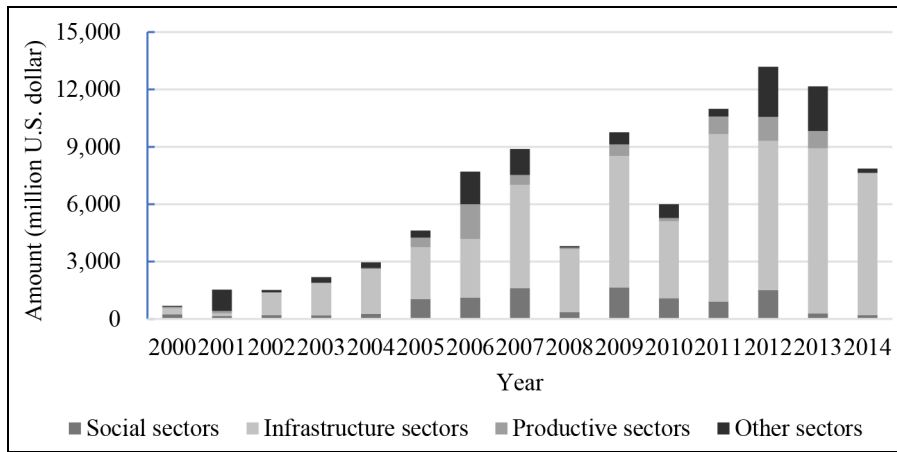


Figure 3. Sector allocation of China's development finance in Africa.

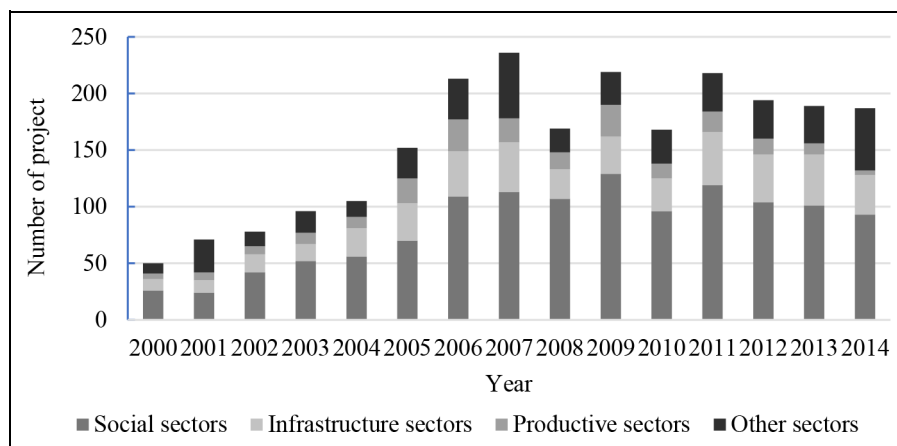


Figure 4. Sector allocation of China's development finance in Africa (number of projects).

controls several exogenous time-varying variables that reflect the macroeconomic conditions of African countries as **Table 1** shows.

- 1) External debt size ($debt_{it}$), represented by the percentage of total debt in gross domestic product (GDP), and used to measure the macro debt burden of African countries;
- 2) Financial development level ($credit_{it}$), represented by the percentage of domestic bank credit to the private sector in GDP, and used to reflect the ease of access to financial support for individuals in African countries;
- 3) Inflation ($infl_{it}$), represented by annual inflation rate that is measured by the GDP deflator, and used to reflect the macroeconomic fluctuations of African countries;
- 4) Institutional quality ($inst_{it}$), represented by the mean of the 6 indicators of institution provided by the World Governance Index, that is, corruption control, government efficiency, political stability and elimination of violence/terrorism, regulatory quality, rule of law, and voice and accountability;
- 5) Other countries' aid ($otheraid_{it}$), represented by the amount of ODA from OECD DAC to Africa to exclude its possible influence on the regression results.

The above control variables except the “institutional quality” were all obtained from the World Development Indicators database published by the World Bank. **Table 1** shows the descriptive statistics of the variables used in the regressions. The panel data for 49 African countries⁵ taken between 2000 and 2016 were selected as the study sample after considering data availability and the lags of instrumental variables used in the dynamic panel regressions. To eliminate the possible effects of price and exchange rate fluctuations on the regression results, all data regarding the amount of development finance in this article were converted to constant 2010 U.S. dollars and taken in the logarithmic form accordingly. In addition, to better present regression

5. The 49 African countries specifically include: Algeria, Angola, Benin, Botswana, Burundi, Cameroon, Cape Verde, Central Africa, Chad, Comoros, Democratic Republic of the Congo, Republic of Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Ghana, Guinea, Guinea-Bissau, Côte d'Ivoire, Kenya, Lesotho Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Republic of Congo, Rwanda, Senegal, Seychelles, Sierra Leone, South Africa, South Sudan, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, and Zimbabwe.

Table 1. Variables and descriptive statistics

Variables	About the Variables	Mean	Variance	Min	Max	Num
HDI	Human Development Index (multiplied by 1,000)	500.30	119.20	253.00	801.00	810
Aidall	Logarithmic amount of China's development finance in Africa	17.23	2.36	8.76	21.77	474
ODA	Logarithmic amount of China's ODA_like flows to Africa	16.52	2.18	8.76	21.46	430
OOF	Logarithmic amount of China's OOF_like flows to Africa	18.00	2.32	8.02	21.67	189
Aid1	Logarithmic amount of China's development finance in social sectors in Africa	15.29	2.51	8.02	20.61	303
Aid2	Logarithmic amount of China's development finance in infrastructure sectors in Africa	18.02	2.19	11.03	21.67	217
Aid3	Logarithmic amount of China's development finance in production sectors in Africa	16.12	2.62	4.95	20.75	94
Aid4	Logarithmic amount of China's development finance in other sectors in Africa	16.07	2.11	7.79	20.96	227
Aidalln	Number of projects of China's development finance in Africa	3.91	3.35	1.00	33.00	597
ODAn	Number of projects of China's ODA_like flows to Africa	3.24	2.43	1.00	15.00	568
OOFn	Number of projects of China's OOF_like flows to Africa	1.95	2.63	1.00	31.00	251
Aid1n	Number of projects in social sectors of China's development finance in Africa	2.46	1.86	1.00	20.00	502
Aid2n	Number of projects in infrastructure sectors of China's development finance in Africa	1.71	1.26	1.00	14.00	264
Aid3n	Number of projects in production sectors of China's development finance in Africa	1.35	0.79	1.00	6.00	157
Aid4n	Number of projects in other sectors of China's development finance in Africa	1.58	1.16	1.00	10.00	276
Debt	External debt (percentage in GDP)	57.94	59.72	2.56	610.50	730
Credit	Domestic banks' credit to private sector (percentage in GDP)	19.60	18.50	0.40	106.30	799
Inflation	Inflation rate (measured by GDP deflator, %)	12.69	95.09	-29.69	2,630.00	804
Institution	Institutional quality	-0.65	0.61	-2.01	0.88	775
Otheraid	Logarithmic amount of ODA from OECD DAC to Africa	19.71	1.36	13.09	23.22	771

GDP = gross domestic product; OOF = other official flows; ODA = Official Development Assistance; OECD DAC = Development Assistance Committee of the Organization for Economic Cooperation and Development.

coefficients, all indices of HDI were augmented by a factor of 1,000.

4. Empirical results and analysis

4.1. Baseline regression

The correlation coefficients of the variables were tested before performing the regression, which showed no significant multicollinearity. Then, this article used different regression methods to identify the poverty-reduction effect of China's development finance in Africa. First, the ordinary least squares (OLS) regression test with clustered robust standard errors was performed, and the correlation results are presented in column (1) of **Table 2**. The coefficient of aidall with 2-phase lag is significantly, preliminarily confirming that China's development finance in Africa and poverty reduction there positive correlated. Second, regression tests were performed using FEs on the panel data, which is considered to be one of

the most important tools in the causal inference tool kit (Cunningham, 2021). And the results are presented in column (2) of **Table 2**: Although the coefficient of aidall is lower, the significance remains unchanged, further consolidating the findings by the OLS regression. Third, to further alleviate the possible intergroup heteroscedasticity as well as intragroup autocorrelation in the panel data, this article also used the full generalized least squares (FGLS) regression and obtained the same findings.

In the final step of the baseline regression, this article incorporated the one-phase lag of the dependent variable (HDI_{it-1}) as an instrumental variable on the right side of equation and then used the 2-stage SGMM estimation method to regress the same panel data, which confirmed the findings and alleviated potential endogeneity. Additionally, both Hansen/Sargan and AR(2) tests have p values greater than 0.1, indicating that all instrumental

Table 2. Baseline regression results

	(1) OLS	(2) FE	(3) FGLS	(4) SGMM
L.HDI				0.95*** (0.00)
L2.aidall	6.89*** (1.54)	2.74*** (0.75)	0.26** (0.11)	0.18*** (0.04)
Debt	-0.33*** (0.11)	-0.31*** (0.08)	0.01 (0.01)	-0.03*** (0.00)
Credit	2.98*** (0.30)	1.58** (0.64)	0.12** (0.06)	0.12*** (0.03)
Inflation	0.75*** (0.26)	-0.20 (0.13)	-0.01 (0.02)	0.03*** (0.00)
Institution	42.10*** (7.83)	22.12* (13.28)	24.31*** (2.54)	2.70*** (0.98)
Otheraid	-16.82*** (3.66)	8.63** (3.34)	-0.57 (0.64)	-0.31*** (0.07)
Constant term	691.62*** (75.24)	504.78*** (65.19)	689.98*** (13.36)	35.00*** (2.43)
AR(1)				[0.01]
AR(2)				[0.45]
Hansen/ Sargan stat.				37.28 [1.00]
Observations	386	386	386	384

The L. before the explanatory variable indicates one phase lag; values within () are standard errors, and values within [] are *p* values of the corresponding test statistic; *, **, and *** represent the 10%, 5%, and 1% significance levels, respectively. HDI = Human Development Index; FGLS = full generalized least squares; OLS = ordinary least squares; FE = finite element; SGMM = systematic generalized method of moment.

variables used in the regression are valid and that residual terms do not have second-order serial correlations. Overall, the regression results above confirm that China's development finance have the poverty-reduction effect on the 49 African countries during the period of 2000–2016.

In addition, among the control variables, the regression coefficient of external debt size is negative, which implies that a country suffering from a higher overall debt burden is not in a good economic position to improve welfare and reduce poverty. Conversely, the coefficient of the financial environment shows a significant positive relationship with poverty reduction, which indicates that bank credit to the domestic private sector is beneficial. This echoes the finding by Banerjee and Duflo (2012) who argued that the greater the financial support received by poor households,

the more it helps them to achieve poverty alleviation. Meanwhile, the inflation rate can reflect monetary policy stability in African countries. Moderate inflation helps guide expectations and stimulate consumer spending, which in turn lowers poverty rates. It is also evident that institutional quality in recipient countries is highly correlated with poverty reduction at the 1% level. Last, compared to China's development finance, the aid from other countries had no significant positive effect on HDI in these African countries.

4.2. Heterogeneity analysis

4.2.1. Different country groups and the 2008 financial crisis

As a new sample, the Sub-Saharan African (SSA) countries were chosen by excluding 6 countries in North Africa based on their geographic differences and development levels.⁶ The regression results are presented in columns (1) and (2) in **Table 3**. Overall, for SSA countries, the regression coefficients of the total amount of China's development finance, as well as the ODA_like amount are significantly positive and larger than the regression results of the original sample. This suggests that the poverty-reduction effect of China's development finance is more pronounced for SSA countries. That is, the poverty-reduction effect of China's official capital is more prominent among the group of poorer countries in Africa.

We also screened 33 HIPCs in Africa and conducted regression tests using the same methods. The regression results are shown in columns (3) and (4) of **Table 3**. Compared with the baseline regression, the coefficient of China's development finance to HIPCs in Africa increases from 0.181 to 0.307 and the coefficient of China's ODA_like flows increases from 0.221 to 0.392, with the same significance. This indicates that China's development finance is more effective in improving poverty in HIPCs in Africa. The results demonstrate, on the one hand, that China's development finance is inclusive because its poverty-reduction effect is more pronounced in poorer nations, narrowing the welfare gap between countries in Africa; on the other hand, different country sample sets screened according to different criteria do not alter the main conclusion of this study.

To test whether the 2008 financial crisis changed the poverty-reduction effect of China's development finance in Africa, this article divided the "aidall" and "oda" into 2 phrases, that is, before and after 2008, and performed separate regression tests of the samples. The regression results are shown in columns (5)–(8) in **Table 3**. After the 2008 crisis, China's development finance had a pronounced poverty-reduction effect and its amount increased. As for ODA_like flows, the regression coefficients remain stable. This indicates that China's poverty-reduction efforts in Africa are not compromised by the 2008 crisis, but its impact on the social development of

6. The 6 North African countries are Algeria, Egypt, Libya, Morocco, Sudan, and Tunisia, whereas the rest African countries belong to Sub-Saharan African countries.

Table 3. Regression results by different categories I

	SSA Countries		HIPCs		Before 2008		After 2008	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.HDI	0.96*** (0.00)	0.95*** (0.01)	0.94*** (0.02)	0.93*** (0.03)	0.99*** (0.00)	0.99*** (0.00)	0.94*** (0.01)	0.94*** (0.01)
L2.aidall	0.24*** (0.05)		0.31*** (0.08)		0.14*** (0.04)		0.29*** (0.03)	
L2.oda		0.34*** (0.04)		0.39*** (0.06)		0.16*** (0.01)		0.18*** (0.04)
Control variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant term	33.83*** (3.37)	27.87*** (5.75)	14.17 (12.60)	29.54*** (10.77)	-6.97*** (1.75)	-4.93*** (1.60)	63.45*** (4.50)	60.04*** (8.17)
AR(1)	[0.01]	[0.01]	[0.03]	[0.03]	[0.04]	[0.05]	[0.01]	[0.03]
AR(2)	[0.67]	[0.58]	[0.82]	[0.85]	[0.42]	[0.23]	[0.33]	[0.54]
Hansen/Sargan stat.	33.41 [1.00]	32.09 [1.00]	19.50 [1.00]	22.60 [1.00]	33.43 [0.98]	34.41 [0.97]	33.93 [1.00]	32.59 [1.00]
Observations	348	324	270	250	170	153	214	196

The L. before the explanatory variable indicates lag periods; values within () are standard errors, and values within [] are *p* values of the corresponding test statistic; *, **, and *** represent the 10%, 5%, and 1% significance levels, respectively. HDI = Human Development Index; SSA = Sub-Saharan African; HIPCs = heavily indebted poor countries.

recipient countries has been gradually increasing as China steps up its development finance scale.

4.2.2. Capitals in different forms and sectors

To thoroughly understand the heterogeneous effect of different types of China's development finance on poverty reduction, we conducted separate regressions on HDI in African countries by different capital forms and sectoral allocations. To ensure that the regression results are comparable, this section follows the same SGMM method as the baseline regression. First, the ODA_like and OOF_like parts are regressed separately according to the different degrees of concession, and the correlation results are presented in columns (1) and (2) in **Table 4**. The results show that even if the strictest definition of China's aid is used, the poverty-reduction effect on African countries is still significant. Further, China's OOF_like flows in Africa also contribute to poverty reduction, and the regression coefficient for OOF_like flow is even higher than that for ODA_like flows. Second, in terms of sector allocation (i.e., social sectors, infrastructure sectors, production sectors, and other sectors), all coefficients are significantly positive, as shown in columns (3)–(6) of **Table 4**. Among them, the poverty-reduction effect of China's development finance in the production sectors is the most prominent. Theoretically, ODA should be focused on reducing social poverty, whereas OOF should be focused on economic growth; similarly, the production sectors should serve growth goals, while the social sectors ought to be more concerned with social welfare. On the contrary, the China's development finance has indirectly reduced

poverty in Africa due to its more associated forms and sectors of economic growth rather than social relief, illustrating the feature of trickle down and inclusive growth.

4.3. Robustness test

This article uses data of the amount of China's development finance in the baseline regression and heterogeneity analysis, which helps to capture the impact of development finance of different sizes on poverty reduction. However, as some projects lack data in terms of amount, we used the corresponding number of projects as a proxy variable and performed regression tests on the core explanatory variable. In this way, we are able to present a more comprehensive picture of the overall situation of China's development finance in Africa, as well as demonstrate the robustness of main findings. As **Table 5** shows, on the one hand, provided that both the Hansen test and the AR(2) test are passed, the number of China's development finance projects in Africa affect poverty reduction; on the other hand, the coefficients are significantly positive at the 1% level, for regressions on the number of projects funded by ODA_like and OOF_like flows, as well as on the number of projects in different sectors. The results suggest that changing the measurement of China's development finance in Africa does not affect the core conclusions of this article, indicating that the empirical results are robust.

5. Conclusion and outlook

Using the panel data estimates the relationship between China's development finance and HDI in 49 African

Table 4. Regression results by different categories II

	Human Development Index (HDI)					
	(1)	(2)	(3)	(4)	(5)	(6)
L.HDI	0.95*** (0.00)	0.96*** (0.00)	0.96*** (0.00)	0.98*** (0.00)	0.98*** (0.01)	0.99*** (0.00)
L2.oda	0.22*** (0.04)					
L2.oof		0.29*** (0.03)				
L2.aid1			0.29*** (0.04)			
L2.aid2				0.06*** (0.01)		
L2.aid3					0.55*** (0.09)	
L2.aid4						0.51*** (0.05)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Constant term	27.95*** (7.36)	41.52*** (2.14)	25.98*** (3.38)	16.87*** (3.22)	7.72 (8.82)	1.17 (1.50)
AR(1)	[0.01]	[0.25]	[0.02]	[0.54]	[0.28]	[0.11]
AR(2)	[0.65]	[0.14]	[0.19]	[0.90]	[0.31]	[0.19]
Hansen/Sargan stat.	35.46 [1.00]	30.85 [1.00]	34.10 [1.00]	29.63 [1.00]	22.42 [0.95]	36.13 [1.00]
Observations	349	150	253	174	83	180

The L. before the explanatory variable indicates one phase lag; values within () are standard errors, and values within [] are *p* values of the corresponding test statistic; *, **, and *** represent the 10%, 5%, and 1% significance levels, respectively. Regression results of control variables are not shown in the table, the same for the table below.

countries from 2000 to 2016, this article finds that official Chinese capital flows have contributed to welfare improvement and poverty reduction in Africa. Moreover, the heterogeneity analysis shows that poorer subregions and HIPC countries within the continent benefit more from the poverty-reduction effect of China's development finance. It shows that China's development finance promotes pro-poor development and reduces the welfare gap at regional and national levels, thus demonstrating the feature of inclusiveness. At the same time, a more prominent poverty-reduction effect is observed when China's development finance is allocated to the production sectors rather than the social sectors, and in a more market-oriented form of financing rather than pure aid. It indicates that rather than directly providing social relief, China's development finance indirectly reduces poverty in Africa through economic growth. Overall, this article concludes that China's hybrid approach to aid contributed to poverty reduction in Africa between 2000 and 2016, with inclusive growth characteristics.

In terms of policy implications, the following 3 aspects should be taken into account: first, China's hybrid approach to aid, which has a lower level of concession and mixed attributes, is more market-driven than traditional donors but is still able to indirectly reduce poverty and spur inclusive growth; second, China's domestic development achievements are impressive, such as eliminating absolute poverty within the country by 2021, ahead of the SDGs 2030 timetable; third, the OECD DAC has acknowledged that ODA alone cannot cover the financing gap for the SDGs and has also extended the concept to TOSSD. Based on the above, it is essential to enhance coordination between traditional and emerging donors in global development governance and to develop more pragmatic and comprehensive concepts and rules for international development finance, so that official Chinese capital flows can be effectively integrated into and contribute to the SDGs.

This study, relying on country-level panel data, was limited in its analysis to overall welfare improvements and

Table 5. Robustness test results

	Human Development Index (HDI)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
L.HDI	0.95*** (0.00)	0.95*** (0.00)	0.96*** (0.00)	0.95*** (0.00)	0.94*** (0.00)	1.00*** (0.00)	0.98*** (0.0)
L2.aidalln	0.24*** (0.03)						
L2.oadn		0.16*** (0.03)					
L2.oofn			0.28*** (0.03)				
L2.aid1n				0.98*** (0.07)			
L2.aid2n					0.77*** (0.05)		
L2.aid3n						0.83*** (0.06)	
L2.aid4n							0.26*** (0.04)
Control variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant term	40.84*** (4.83)	35.80*** (3.12)	52.22*** (5.00)	47.44*** (6.12)	48.95*** (1.09)	-1.88 (3.32)	-2.88 (5.40)
AR(1)	[0.08]	[0.09]	[0.22]	[0.07]	[0.26]	[0.19]	[0.03]
AR(2)	[0.25]	[0.29]	[0.38]	[0.89]	[0.29]	[0.28]	[0.16]
Hansen/Sargan stat.	38.96 [1.00]	39.27 [1.00]	37.24 [1.00]	39.79 [1.00]	32.88 [1.00]	29.71 [1.00]	29.96 [1.00]
Observations	479	454	200	406	206	138	214

The L. before the explanatory variable indicates lag periods; values within () are standard errors, and values within [] are *p* values of the corresponding test statistic; *, **, and *** represent the 10%, 5%, and 1% significance levels, respectively.

disparity mitigation in African countries. Nevertheless, the most cutting-edge research on aid evaluation has employed randomized controlled trials (RCTs) to collect project-level data to support more accurate causal inference about international aid and poverty reduction (Banerjee and Duflo, 2012). Unfortunately, research costs and policy coordination dilemmas make it difficult to conduct RCTs of China's international aid and development finance projects in host countries. RCTs can be used in the future to validate the micromechanism of poverty reduction in Chinese overseas projects.

Data accessibility statement

Data of China's development finance in Africa are publicly available through the Aiddata website: <https://www.aiddata.org/data/chinese-global-official-finance-dataset-version-1-0>. Data of HDI are publicly available through the UNDP website: <https://hdr.undp.org/data-center/human-development-index#/indicies/HDI>. Data of institutional

quality of African countries are publicly available through the World Governance Indicators database: <http://info.worldbank.org/governance/wgi/>. All data including external debt size, financial development level, inflation, and international aid from other countries are publicly available through the World Development Indicators database: <https://databank.worldbank.org/source/world-development-indicators>.

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The authors declare no competing interests.

Author contributions

Contributed to conception and design: ZW, KF.
Contributed to acquisition of data: ZW, KF.

Contributed to analysis and interpretation of data:
ZW, KF.

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References

- Ahmad, F, Draz, MU, Su, L, Ozturk, I, Rauf, A, Ali, S.** 2019. Impact of FDI inflows on poverty reduction in the ASEAN and SAARC economies. *Sustainability* **11**(9): 2565. DOI: <http://dx.doi.org/10.3390/su11092565>.
- Alvi, E, Senbeta, A.** 2012. Does foreign aid reduce poverty? *Journal of International Development* **24**(8): 955–976. DOI: <http://dx.doi.org/10.1002/jid.1790>.
- Arellano, M, Bover, O.** 1995. Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics* **68**(1): 29–51. DOI: [http://dx.doi.org/10.1016/0304-4076\(94\)01642-D](http://dx.doi.org/10.1016/0304-4076(94)01642-D).
- Bahmani-Oskooee, M, Oyolola, M.** 2009. Poverty reduction and aid: Cross-country evidence. *International Journal of Sociology and Social Policy* **29**(5/6): 264–273. DOI: <http://dx.doi.org/10.1108/01443330910965796>.
- Banerjee, AV, Duflo, E.** 2012. *Poor economics: A radical rethinking of the way to fight global poverty*. New York City, NY: Public Affairs.
- Blundell, R, Bond, S.** 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* **87**(1): 115–143. DOI: [http://dx.doi.org/10.1016/S0304-4076\(98\)00009-8](http://dx.doi.org/10.1016/S0304-4076(98)00009-8).
- Brautigam, D.** 2011. *The Dragon's gift: The real story of China in Africa*. Oxford, UK: Oxford University Press.
- Chen, M.** 2020. Beyond donation: China's policy banks and the reshaping of development finance. *Studies in Comparative International Development* **55**: 436–459. DOI: <http://dx.doi.org/10.1007/s12116-020-09310-9>.
- Collier, P, Dollar, D.** 2002. Aid allocation and poverty reduction. *European Economic Review* **46**(8): 1475–1500. DOI: [http://dx.doi.org/10.1016/S0014-2921\(01\)00187-8](http://dx.doi.org/10.1016/S0014-2921(01)00187-8).
- Cunningham, S.** 2021. *Causal inference: The Mixtape*. New Haven, CT: Yale University Press.
- Deaton, A.** 2006. Measuring poverty, in Banerjee, AV, Benabou, R, Mookherjee, D eds., *Understanding poverty*. Oxford, UK: Oxford University Press: 2006: 3–15.
- Dollar, D.** 2018. Is China's development finance a challenge to the international order? *Asian Economic Policy Review* **13**(2): 283–298. DOI: <http://dx.doi.org/10.1111/aep.12229>.
- Dong, Y, Fan, C.** 2020. The role of China's aid and ODI in the economic growth of African countries. *Emerging Markets Review* **44**: 100713. DOI: <http://dx.doi.org/10.1016/j.ememar.2020.100713>.
- Dreher, A, Fuchs, A.** 2015. Rogue aid? An empirical analysis of China's aid allocation. *Canadian Journal of Economics* **48**(3): 988–1023. DOI: <http://dx.doi.org/10.1111/caje.12166>.
- Dreher, A, Fuchs, A, Parks, B, Strange, A, Tierney, MJ.** 2018. Apples and dragon fruits: The determinants of aid and other forms of state financing from China to Africa. *International Studies Quarterly* **62**(1): 182–194. DOI: <http://dx.doi.org/10.1093/isq/sqx052>.
- Dreher, A, Fuchs, A, Parks, B, Strange, A, Tierney, MJ.** 2021. Aid, China, and Growth: Evidence from a new global development finance dataset. *American Economic Journal: Economic Policy* **13**(2): 135–174. DOI: <http://dx.doi.org/10.1257/pol.20180631>.
- Dreher, A, Nunnenkamp, P, Thiele, R.** 2011. Are 'new' donors different? Comparing the allocation of bilateral aid between nonDAC and DAC donor countries. *World Development* **39**(11): 1950–1968. DOI: <http://dx.doi.org/10.1016/j.worlddev.2011.07.024>.
- Fleisher, B, Li, H, Zhao, M.** 2010. Human capital, economic growth, and regional inequality in China. *Journal of Development Economics* **92**(2): 215–231. DOI: <http://dx.doi.org/10.1016/j.jdeveco.2009.01.010>.
- Fowowe, B, Shuaibu, MI.** 2014. Is foreign direct investment good for the poor? New evidence from African countries. *Economic Change and Restructuring* **47**: 321–339. DOI: <http://dx.doi.org/10.1007/s10644-014-9152-4>.
- Gohou, G, Soumaré, I.** 2012. Does foreign direct investment reduce poverty in Africa and are there regional differences? *World Development* **40**(1): 75–95. DOI: <http://dx.doi.org/10.1016/j.worlddev.2011.05.014>.
- Gomanee, K, Morrissey, O, Mosley, P, Verschoor, A.** 2005. Aid, government expenditure, and aggregate welfare. *World Development* **33**(3): 355–370. DOI: <http://dx.doi.org/10.1016/j.worlddev.2004.09.005>.
- Guillon, M, Mathonnat, J.** 2020. What can we learn on Chinese aid allocation motivations from available data? A sectorial analysis of Chinese aid to African countries. *China Economic Review* **60**: 101265. DOI: <http://dx.doi.org/10.1016/j.chieco.2019.01.004>.
- Hernandez, D.** 2017. Are new donors challenging World Bank conditionality? *World Development* **96**: 529–549. DOI: <http://dx.doi.org/10.1016/j.worlddev.2017.03.035>.
- Horn, S, Reinhart, CM, Trebesch, C.** 2021. China's overseas lending. *Journal of International Economics* **133**: 103539. DOI: <http://dx.doi.org/10.1016/j.jinteco.2021.103539>.
- Humphrey, C, Michaelowa, K.** 2019. China in Africa: Competition for traditional development finance institutions. *World Development* **120**: 15–28. DOI: <http://dx.doi.org/10.1016/j.worlddev.2019.03.014>.
- Hwang, J, Brautigam, D, Eom, J.** 2016. How Chinese money is transforming Africa: It's not what you think. SAIS-CARI Policy Briefs 11/2016, Johns

- Hopkins University, School of Advanced International Studies (SAIS), China Africa Research Initiative (CARI).
- Lessmann, C.** 2013. Foreign direct investment and regional inequality: A panel data analysis. *China Economic Review* **24**: 129–149. DOI: <http://dx.doi.org/10.1016/j.chieco.2012.12.001>.
- Li, J, Peng, Y, Ma, S.** 2020. Inclusive finance and economic development in China: Multidimensional connotation and empirical analysis (in Chinese). *Economic Research Journal* **55**(4): 37–51.
- Lin, Y, Wang, Y.** 2017. *Going beyond aid: Development cooperation for structural transformation*. Cambridge, UK: Cambridge University Press. DOI: <http://dx.doi.org/10.1017/9781316597354>.
- Mahembe, E, Odhiambo, NM.** 2020. Development aid and its impact on poverty reduction in developing countries: A dynamic panel data approach. *International Journal of Development Issues* **19**(2): 145–168. DOI: <http://dx.doi.org/10.1108/IJDI-08-2019-0144>.
- Manning, R.** 2006. Will 'emerging donors' change the face of international cooperation? *Development Policy Review* **24**(4): 371–385. DOI: <http://dx.doi.org/10.1111/j.1467-7679.2006.00330.x>.
- Massa, I.** 2011. Export finance activities by the Chinese government. Briefing paper requested by the European Parliament's Committee on International Trade. Available at [https://www.europarl.europa.eu/RegData/etudes/note/join/2011/433862/EXPO-INTA_NT\(2011\)433862_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/note/join/2011/433862/EXPO-INTA_NT(2011)433862_EN.pdf). Accessed November 8, 2022.
- Naim, M.** 2009. Rogue aid. *Foreign Policy*. Available at <https://foreignpolicy.com/2009/10/15/rogue-aid/>. Accessed November 8, 2022.
- Nunnenkamp, P, Schweickert, R, Wiebelt, M.** 2007. Distributional effects of FDI: How the interaction of FDI and economic policy affects poor households in Bolivia. *Development Policy Review* **25**(4): 429–450. DOI: <http://dx.doi.org/10.1111/j.1467-7679.2007.00379.x>.
- Page, J, Shimeles, A.** 2015. Aid, employment and poverty reduction in Africa. *African Development Review* **27**(S1): 17–30. DOI: <http://dx.doi.org/10.1111/1467-8268.12136>.
- Rauniyar, G, Kanbur, R.** 2010. Inclusive growth and inclusive development: A review and synthesis of Asian Development Bank literature. *Journal of the Asia Pacific Economy* **15**(4): 455–469. DOI: <http://doi.org/10.1080/13547860.2010.517680>.
- Smaoui, H, Ghouma, H.** 2020. Sukuk market development and Islamic banks' capital ratios. *Research in International Business and Finance* **51**: 101064. DOI: <http://dx.doi.org/10.1016/j.ribaf.2019.101064>.
- State Council Information Office of China.** 2011. China's foreign aid. Available at http://english.www.gov.cn/archive/white_paper/2014/09/09/content_281474986284620.htm. Accessed November 8, 2022.
- State Council Information Office of China.** 2014. China's foreign aid. Available at http://english.www.gov.cn/archive/white_paper/2014/08/23/content_281474982986592.htm. Accessed November 8, 2022.
- State Council Information Office of China.** 2021a. China's international development cooperation in the new era. Available at https://english.www.gov.cn/archive/whitepaper/202101/10/content_WS5ffa6bbbc6d0f72576943922.html. Accessed April 19, 2022.
- State Council Information Office of China.** 2021b. Poverty alleviation: China's experience and contribution. Available at http://english.www.gov.cn/archive/whitepaper/202104/06/content_WS606bc77ec6d0719374afc1b9.html. Accessed April 19, 2022.
- Ullah, S, Akhtar, P, Zaefarian, G.** 2018. Dealing with endogeneity bias: The generalized method of moments (GMM) for panel data. *Industrial Marketing Management* **71**: 69–78. DOI: <http://dx.doi.org/10.1016/j.indmarman.2017.11.010>.
- United Nations.** 2015. Transforming our world: The 2030 Agenda for Sustainable Development. Available at <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>. Accessed November 8, 2022.
- United Nations.** 2020. Shared responsibility, global solidarity: Responding to the socio-economic impacts of COVID-19. DOI: <http://dx.doi.org/10.18356/5c353f7e-en>.
- United Nations Development Program.** 2005. HDR 2005—International cooperation at cross roads: Aid, trade, and security in an unequal world. Human Development Report (1990 to present). DOI: <http://dx.doi.org/10.18356/4727c470-en>.
- Wang, X, Zhang, X.** 2020. *Towards 2030—China's Poverty Alleviation and Global Poverty Governance*. Singapore: Springer. DOI: <http://dx.doi.org/10.1007/978-981-15-6356-0>.
- Wong, MYH.** 2016. Democratic persistence and inequality: The role of foreign direct investments. *Studies in Comparative International Development* **51**: 103–123. DOI: <http://dx.doi.org/10.1007/s12116-015-9202-6>.
- Woods, N.** 2008. Whose aid? Whose influence? China, emerging donors and the silent revolution in development assistance. *International Affairs* **84**(6): 1205–1221. DOI: <http://dx.doi.org/10.1111/j.1468-2346.2008.00765.x>.
- World Bank.** 2018. Poverty and shared prosperity 2018: Piecing together the poverty puzzle. Available at <https://openknowledge.worldbank.org/handle/10986/30418>. Accessed April 15, 2022.
- Wu, X.** 2001. Foreign direct investment, intellectual property rights, and wage inequality in China. *China Economic Review* **11**(4): 361–384. DOI: [http://dx.doi.org/10.1016/S1043-951X\(01\)00035-9](http://dx.doi.org/10.1016/S1043-951X(01)00035-9).

- Xu, Z, Zhang, Y, Sun, Y.** 2020. Will foreign aid foster economic development? Grid panel data evidence from China's aid to Africa. *Emerging Markets Finance and Trade* **56**(14): 3383–3404. DOI: <http://dx.doi.org/10.1080/1540496X.2019.1696187>.
- Zhang, X, Wan, G, Zhang, J, He, Z.** 2019. Digital economy, finance inclusion, and inclusive growth (in Chinese). *Economic Research Journal* **54**(8): 71–86.
- Zuo, C, Huang, C, He, X, Wang, X.** 2020. *Inclusive development and poverty reduction*. Singapore: Springer. DOI: <http://dx.doi.org/10.1007/978-981-15-8446-6>.

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