



The Impact of China's Aid to Africa on Africa's Development

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Abstract

This paper seeks to analyze the effect of Chinese aid on socioeconomic development in Africa. China's aid to Africa has significantly impacted the continent's development, focusing on economic, social, and political dimensions. Economically, China's aid has led to infrastructure projects like roads, railways, and ports, improving connectivity and trade. However, concerns have been raised about the debt sustainability of these projects and their long-term impact on African economies. Socially, China's aid has supported healthcare, education, and poverty alleviation initiatives, improving living standards for many Africans. However, questions have been raised about the quality and sustainability of these social development projects. Politically, China's aid has influenced diplomatic relations between African countries and other global powers, leading to shifts in alliances and power dynamics. The non-interference policy of China in African domestic affairs has been praised for respecting sovereignty but criticized for enabling corruption and human rights abuses. Based on the assumption that Chinese aid differs from traditional ODA, and that China does not publish its aid data many studies have tried to identify its impact on economic growth in Africa. There is still reliance on anecdotal evidence of Chinese aid to recipient African countries. There is still no final consensus on the impact of Chinese aid on socioeconomic welfare in recipient countries. All the African countries were used as the main unit of analysis, since it represents the major recipient of Chinese aid. The findings indicate that in recipient African countries Chinese ODA-like aid has a positive effect on socioeconomic development, and its component dimensions. Overall, China's foreign aid strategy reflects a unique approach that challenges traditional donor-recipient dynamics, emphasizes mutual benefit, and prioritizes sovereignty and non-interference in domestic affairs [1]. This approach has garnered recognition from many African countries and highlights China's evolving role in international development efforts.

Subject Areas

Economics, Sociology

Keywords

Foreign Aid, BRI, Economic Development, Infrastructure, African Countries, China

1. Introduction

China's emergence as a significant aid donor in recent decades has reshaped the global aid landscape, challenging the dominance of traditional Western donors [2]. According to the China Africa Research Initiative (CARI), global aid outflows from China reached US\$ 3 billion in 2015, after which it declined to US\$ 2.3 billion in 2016 and then rose to US \$ 2.94 billion in 2020. African countries have been major recipients, receiving 44.65% of the flows between 2013 and 2018 (Information Office of the State Council, 2021).

The significant volumes of Chinese aid in African economies make it an interesting case to analyze its impact on African development. China's growing involvement in Africa through aid, investment, and development projects has sparked debate about its impact on the continent's development trajectory. As one of the largest sources of aid and investment in Africa, China's initiatives have the potential to significantly shape the economic, social, and political landscapes across the region. China's aid to Africa includes infrastructure development, capacity building, healthcare initiatives, and agricultural projects, often part of broader economic cooperation agreements between China and African countries. The scale and scope of China's aid to Africa have grown significantly over the past two decades, positioning China as a key player in Africa's development agenda.

Despite its role in addressing development challenges like infrastructure gaps and poverty alleviation, China's aid has raised concerns about debt sustainability, transparency, and the long-term impact on local economies. The focus on infrastructure projects and resource extraction has led to debates about its implications for local industries, job creation, and environmental sustainability. China's non-interference policy in African domestic affairs has both positive and negative consequences, shaping governance structures and power dynamics within the region. Critically examining China's aid's impact on Africa's development is essential to consider the opportunities and challenges it presents for sustainable growth and inclusive development.

2. Problem Statement

Evidence on the impacts of Chinese investment is partially skewed towards anecdotal evidence [3]. Anecdotal evidence of the impact of Chinese investments

is largely negative, and there is paucity of reliable data and the challenges this poses to understanding the China-Africa relationship and measuring China's development impact in Africa [4]. It is hard to ascertain a comprehensive picture, as the majority of studies focus on small samples or particular industries and countries [5]. Prior to studies by Dreher, A. and Fuchs, A. [2], data on Chinese aid was scarce, and therefore its analysis was rather inconclusive. Hence the need to carry out a study on Chinese aid's influence on socioeconomic development in Africa. It should be of major significance to study the impact of China's assistance on Africa's social and economic development. It tries to find the positive impact of China's aid on Africa's development, so as to eliminate the misunderstanding, distortion, and attack of China's aid, and even smear it as a debt trap.

3. Literature Review

3.1. Theoretical Underpinning

3.1.1. Positive Effect of Foreign Aid: Liberal Theory

Different schools of thought have found that foreign aid is the solution to erase inequalities and kick-start social development in developing countries. Many of them base their assumption upon consolidated economic models, as in the case of liberalism. Classical liberalism prescribes capital as the key element for economic development. Starting with Adam Smith's theory of economic development, labor growth and capital accumulation were identified as the main engine of economic growth. This is important because, by the end of 19th century, social liberalism has shifted the focus from sole economic development to social development, at the time concentrated on the extension of human rights. Precursor to this school of thought was John Stuart Mill, who combined the liberal economics with social and political theories when he formulated his theory of wealth and income distribution [6].

Although these classical thinkers did not write about foreign aid, they established a clear connection between capital, economic growth, and social development. They first explored the role of capital in forwarding economic and technological improvement in a developing country, especially thanks to the attraction power it has towards investment. Following a similar reasoning, in the early days of foreign aid up until the 70s it was believed that economic growth per se would be the driver of development and that it would be able to eliminate social inequalities in newly independent least-developed countries through modernization. In this sense, the use of GDP as a measure of development was widespread, and recipient countries' economic growth was considered the main objective of foreign aid. The established common view was that even though GDP growth did not represent the most appropriate assessment of welfare, it provided valuable insights on the human conditions.

Development theories that best represents this school of thought are the Balanced Growth Theory [7] and the Big Push theory [8]. The Economic Balanced Growth Theory prescribes governments to make large investments in many industries of the agricultural and industrial sectors simultaneously. This will

eventually attract private investors by enlarging the size of the market [7]. In the context of underdeveloped countries, funds are expected to be domestically raised to the largest extent possible. The possibility of foreign aid is still considered as a last resort option, in an attempt to avoid the emergence of aid dependency.

Following a similar initiative like the, “comprehensive development approach”, but with a more optimistic view towards aid, the big push theory describes the benign effect of capital inflows in a country’s economy. Building on the concept of economies of scale, Rosenstein-Rodan’s (1943) [8] Big Push Theory predicts that industrialization is most likely to happen when an entire sector is the target of investment, and firms’ expectations that the industry will grow as a result are high. Both theories do not account for differences between GDP growth and development, and prescribe capital flows to underdeveloped countries in order to foster their development.

In the book “The End of Poverty: Economic Possibilities of Our Time” Jeffrey Sachs [9] delineates the characteristics of his foreign aid theory, which heavily borrows from the Big Push Theory. Sachs [9] elaborates on the causes of poverty in Sub-Sahara Africa, claiming that the absence of income-generating investment, due to little capital availability, is the main obstacle to development, leaving countries in a poverty trap. A similar concept was explored by Nurske [8] with the vicious poverty circle, where a country is poor because it is poor, and its poverty impedes development [8]. To overcome the poverty trap, Jeffrey Sachs [9] prescribes foreign aid packages to kick-start foreign investment by making the market more attractive to foreign private and public entrepreneurs.

3.1.2. Negative Effect of Foreign Aid: Principal-Agent Theory

The effectiveness of aid has often been criticized on the basis of Principal Agent Theory. Firstly, introduced by Jensen and Meckling [10], the theory describes how principal and agent’s divergent interests could lead to a sub-optimal outcome, compared to initial objectives. This mainly happens because of moral hazard, that is, the fact that the agent’s actions do not reflect the principal’s objectives, in conjunction with of asymmetry of information between players. In the context of aid, a number of principal-agent relationships are established. While the theory was initially conceived to describe behavior in a working environment, its implications have reverberated across many fields of studies, most notably in models of institutional behavior within international organizations [11].

Another concept that dismisses the positive effect of foreign aid, being a negative externality that stems from it, is aid dependency. Drawing on Bauer’s [12] argument, which affirms that aid disincentivises the recipient country to take a policy reform path, Bräutigam [13] claims that aid dependency hinders the recipient government’s functions, therefore weakening its institutional capabilities and limiting the distribution of public services. The end result is that institutions

in recipient countries are only able to operate when aid funds are available [13]. Therefore, aid dependency and also accounts for aid ineffectiveness, by describing what happens when high amounts of aid do not correspond by any form of development in the recipient country.

Furthermore, we add that compared to the past donor countries there have become more and more entwined in the recipient countries politics in order to better monitor internal aid allocation. This is described as being detrimental to the recipient's autonomy, especially in the implementation of long-term strategies, since the donor's interest is likely to model the political environment of the recipient country.

3.2. Empirical Review

3.2.1. Types of Aid

AidData [14] categorizes the aid flows into three types; official development assistance (ODA), other official flows (OOF), or vague flows (VF). ODA represents aid flows from official agencies to developing economies that are listed in DAC's ODA recipients [14]. These flows ought to be channeled at improving welfare and economic development and must be concessional with a grant element of 25% or more⁴. Financial flows that do not meet the requirements of ODA are labelled as OOF. VF is a third category to capture flows that are neither ODA nor OOF. With an estimated USD 843 billion contributed across 165 countries, China has recently become the largest provider of development finance to low- and middle-income countries and now outspends the US by two to one in Africa [15].

3.2.2. Aid for Economic Growth

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. Dreher *et al.* [16] seminal study on Chinese aid shows that Chinese projects boost economic growth in Africa. However, Busse *et al.* [17] do not find a statistically significant and robust effect of Chinese aid on economic growth in Africa. A recent cross-country study concluded that there are positive short-term effects of Chinese aid on economic growth [18]. One reason for this dearth of evidence lies in the non-transparency surrounding China's aid programs, as China does not publish disaggregated data on the projects it finances. Another reason is that identifying the causal impact of aid on recipients is difficult because there may be other factors that influence both the amount of aid a country receives and its subsequent economic development.

Li Ronglin; Chen Mo. International, [15] said that "China's aid to Africa significantly promotes the economic growth and the welfare of African countries, but the impact of different types of aid is heterogeneous. Among them, the non-transfer payment assistance can promote economic growth, but the impact on the welfare level of residents is the reverse U shape; and public expenditure

type of aid can directly promote economic growth and improve the welfare level of residents”. African countries are active and important participants in the China-proposed Belt and Road Initiative (BRI). Among the 53 African countries that have established diplomatic relations with China, 52, plus the African Union Commission, have signed BRI cooperation documents with China, and cooperation projects on roads, electricity, communications and ports have spread across Africa, enhancing their capacity for autonomous, sustainable development.

The 10th anniversary of the BRI will be celebrated in 2023. Over the past decade, China-Africa economic and trade cooperation has yielded fruitful results in trade, direct investment and infrastructure. The trade relationship between China and African countries has seen significant growth over the past decade, with the total trade surpassing \$2 trillion as shown in **Figure 1**. China has maintained its position as the largest trading partner for Africa since 2009, with trade reaching \$282 billion in 2022 as shown in **Figure 1**, marking an 11 percent increase [19]. This growth can be attributed to China’s substantial domestic investment, which has created a high demand for global goods, including those from sub-Saharan Africa [19].

As part of China’s plan to increase its trade with African countries to \$300 billion by 2025, the Chinese government has enacted a policy that covers almost 8,800 kinds of products, including clothes and footwear, agricultural goods and chemical products.

China also waived tariffs on 98 percent of taxable imports from nine countries in Africa on December 1, 2022. Over the past decade, China’s total direct investment in African countries has exceeded \$30 billion, making China the fourth-largest source of investment in Africa [20]. In 2022, China’s new direct investment in African countries was \$3.4 billion, and there were more than 3,000 Chinese companies investing in the continent.

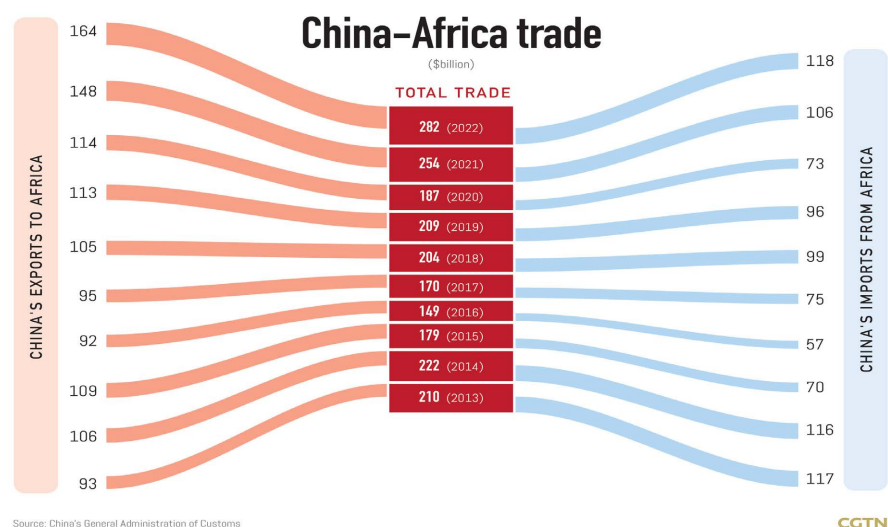


Figure 1. China’s general administration of customs.

3.2.3. China's Aid for Infrastructure Development in Africa

Bluhm *et al.* [21] show that Chinese infrastructure investments reduce within-region economic inequality in low- and middle-income countries. Chinese infrastructure investments have been shown to reduce within-region economic inequality in low- and middle-income countries, but they have weak links to growth and lead to limited job creation in host countries. China is not a member of the Organization for Economic Cooperation and Development's (OECD) Development Assistance Committee (DAC), and its development financial flows to Africa do not align with DAC definitions. Aid Data's global dataset of Chinese development finance found that China provides very little aid in this strict sense globally, with the large proportion of Chinese development finance being categorized as other official flows.

The Belt and Road Initiative (BRI) has had a significant impact on infrastructure development in Africa. BRI has facilitated the construction and improvement of transportation networks, such as roads, railways, ports, and airports, which have enhanced connectivity within and between African countries. Improved transportation infrastructure has facilitated trade, boosted economic growth, and increased regional integration. The expansion of telecommunications infrastructure in Africa has been supported by the BRI, including fiber-optic networks, satellite communication systems, and data centers. BRI has also supported the construction and rehabilitation of water infrastructure in Africa, including dams, irrigation systems, and water supply projects. This has benefited agriculture, food security, and water management in the continent. The development of industrial parks, economic zones, and manufacturing facilities in Africa has attracted foreign investment, promoted industrialization, and created employment opportunities. Despite debates about its long-term impact, debt sustainability, and the need for local capacity building, BRI has played a role in addressing Africa's infrastructure challenges and supporting its development agenda. Over the past decade, China has helped African countries build over 6,000 kilometers of railway, 6,000 kilometers of road, around 20 ports, over 80 large power facilities, and more than 130 hospitals and 170 schools.

Proposed by China in 2013, the BRI refers to the Silk Road Economic Belt and the 21st-Century Maritime Silk Road, which aims at building a trade and infrastructure network connecting Asia with Europe and Africa along the trade routes of the ancient Silk Road.

3.2.4. Aid for Social Development

Donou-Adonsou and Lim [22] argue that Chinese foreign direct investment facilitated by the Chinese government-established China-Africa Development Fund has a positive effect on the standard of living defined in terms of per capita income. We can argue that bilateral trade plays a statistically significant, positive role in predicting China's development finance to Africa. China prioritizes its commercial partners and the countries it is more politically aligned with when allocating development finance. Conversely, Xu *et al.* [23] find the opposite for

Africa. Beyond its economic effect, Chinese foreign assistance is found to influence social outcomes in recipient economies [23]. According to Martorano *et al.* [24], households living in areas hosting Chinese aid projects enjoy better education and lower child mortality.

Cruzatti *et al.* [25] 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. In the same vein, infrastructure projects have the potential to expand trade and lower poverty in participating countries according to the World Bank [26], although risks inherent to large infrastructure projects, including debt sustainability issues from excessive borrowing remain a concern [27].

3.2.5. The Impact of China's Aid on African Geopolitics

The motives behind China's foreign aid are highly debated. Critics have accused China of using foreign aid to advance geopolitical goals, secure access to natural resources, and create economic opportunities for its own firms rather than primarily to help the world's poor [16]. Some of China's development projects have allegedly created debt traps, and increased corruption with limited benefits for recipient populations, [28]. However, the small body of evidence, largely derived from AidData datasets on Chinese investment in Africa, found out that Chinese investments have positive economic growth impacts including increases in GDP and flattening spatial inequalities.

China exhibits donor characteristics that have been shown elsewhere to undermine foreign aid efficacy. For example, China regularly provides aid to countries with poor institutions such as Angola or Sudan, as unlike Western donors, China prides itself on not interfering with the recipient countries' politics, (State Council 2011). Additionally, much of China's aid is in the form of bilateral loans, and Chinese state-owned firms (SOEs) are often contracted to implement these infrastructure projects [29]. These firms typically bring their own materials and workers, and could crowd out local businesses and jobs. Moreover, the broad involvement of SOEs fuels suspicions that aid is being wielded as a political tool.

A recent cross-country study concluded that there are positive short-term effects of Chinese aid on economic growth, [18]. One reason for this dearth of evidence lies in the non-transparency surrounding China's aid programs, as China does not publish disaggregated data on the projects it finances. Another reason is that identifying the causal impact of aid on recipients is difficult because there may be other factors that influence both the amount of aid a country receives and its subsequent economic development.

The allocation of aid contracts to Chinese firms based on China's domestic political goals also strongly affects which countries receive how much foreign aid from China. Because a firm typically works with a specific set of countries, those countries tend to receive more aid when there is more unrest in the firm's home

prefecture. It was found out that there were large positive effects on the levels and growth rates of aid recipients' GDP in the short run. On average, three years after the implementation of an additional large-scale infrastructure aid project, GDP per capita increased by USD 118 (2.5% of the mean) and GDP growth by 0.92 percentage points. The estimates indicate that the economic benefits to Chinese aid projects exceed their costs. Aid meeting its own goals, especially in SSA, has been an issue of concern. Despite the significant amount of aid SSA has received in past decades, the sub-region remains the poorest in the world [30], raising a debate on aid effectiveness which has been dominant in aid literature.

Dreher *et al.*'s [16] study into the extent of Chinese aid including aid, concessional and non-concessional found out that Chinese financing affects economic growth in recipient countries. For the average recipient country, Dreher *et al.* [16] estimated that one additional Chinese ODA project produces a 0.7 percentage point increase in economic growth two years after the project is committed. This effect is sizable in relation to the fact that the average economic growth rate of recipient countries is 2.8% points. However, the study was based on AidData's global dataset Global Chinese Development Finance, which includes 138 countries. The data in the study is presented in aggregate form and not per region, so contributions to African growth, as opposed to results for the average country, are not presented [16].

3.3. Hypothesis

The main research questions are:

1. Does Chinese Foreign Aid have a positive impact on socioeconomic development?
2. Does Chinese Foreign Aid have a negative impact on socioeconomic development?
3. Does Foreign Aid have a conditionally positive impact on socioeconomic development?

Drawing from developmental theories on traditional aid effectiveness, and taking into consideration the characteristics of Chinese aid as outlined in the literature review, the following hypotheses were formulated:

H1: The Null Hypothesis is that Chinese ODA has no effect on development in recipient African Countries.

H2: Chinese ODA has a positive effect on development in recipient African countries

H3: Chinese ODA has a negative effect on recipient African countries

H4: Chinese ODA has conditional positive effect in recipient African countries

4. Methodology

4.1. Research Design

The research design is a longitudinal non-experimental study. The research design is justified, as the model employed is thought to offer the best ground for

the analysis at hand. The objective of this research is to find whether Chinese ODA has influenced the socioeconomic development in recipient African countries, covering the period 2000-2016. In order to investigate the causal relationship between the two phenomena, a quantitative analysis is carried out. Panel Data Analysis allows for a longitudinal examination of the observed data, therefore it is considered the most appropriate tool for the analysis of Chinese foreign aid [31]. The data presented in the AidData database will serve as the main source of information.

Studies that examine both the variance of indicators over the time and space dimensions similarly to this study, as 47 countries are taken into account over the period 2002 - 2016, are referred to as longitudinal, or panel data. The advantages of longitudinal data are plenty. Firstly, a longitudinal study enjoys a great level of generalization, since the results are derived from a very large number of observations, that span across. In fact, panel data potentially encompasses a greater level of variability than cross-sectional or time-series studies, as it focuses on the subjects over time.

Secondly, in the context of econometric studies such as this paper, panel data has shown to have greater capacity for capturing the complexity of human behavior than a single cross-section or time series data [31]. Panel data allows to test more complex hypotheses, and to better control for the impact of omitted variables. On the other hand, one of the biggest obstacles of longitudinal analysis is data availability. However, as noted by Hsiao [31], the longitudinal design has become more and more viable in recent years, and not only in developed countries since panel data have also become increasingly available in developing countries [31].

An experimental design is a plan for assigning experimental units to treatment levels and the statistical analysis associated with the plan [32]. Moreover, according to Kirk [32], any experimental design should account for independent variable manipulation, and careful observation on its impact over one or more dependent variables. For the nature of the sample, and the purpose of this research, it is not possible to employ an experimental design. The nature of the sample (countries) and the environment in which the analysis is conducted makes it impossible to manipulate or control independent variables. It is impossible to set up an experiment in which the effect of foreign aid is completely isolated from the influence of other variables. Therefore, a non-experimental design was chosen for this study. It has been demonstrated in previous studies that the independent variables employed in this kind of research are not modifiable due to the nature of the sample.

The Large-N design is dictated by the purpose of this research, which is to analyze the effect of Chinese ODA on recipient African countries socioeconomic development. Since China has devolved ODA to the majority of African countries, it would be dismissive to analyze only a share of them: “inferences made from single-country studies are necessarily less secure than those made from the comparison of several or many countries, [33]. Large-N studies do however suf-

fer from limitations: while their results tend to be more generalizable, they do not offer the same in-depth information of Small-N studies. This means that large-n studies sacrifice precise causal stories typically unearthed by Small-N studies in exchange for better generalization of trends.

Moreover, a Large-N design is better suited for the confirmation or rejection of a hypothesis, while Small-N studies are generally more exploratory. Small-N studies are usually better at describing the causal mechanisms between the independent and dependent variables. However, this is not the purpose of this research, which on the other hand only intends to find whether there is any causality, its magnitude, and whether it is positive or negative.

4.2. Population and Sample

The population of study consists of 54 African countries. Inclusion and exclusion criteria included receipt of ODA from China, and availability of data. South Sudan recently got independence and has not received any significant aid from China. The Kingdom of eSwatini, Burkina Faso, Sao Tome and Príncipe, and the Gambia were excluded as they have never received ODA from China. Somalia and Eritrea were excluded due to data unavailability. The total sample therefore consists of 47 African countries. The choice to extend the sample to all African countries was made to maximize the external validity of this study and was made possible by the availability of data. The time frame considered for the research is from 2004-2016, considering that the AidData database spans from 2000 to 2014, and Chinese Aid is operationalized with 2 years lagged effect.

4.3. Study Variables

4.3.1. Fixed Effects Panel Data Regression

The most widespread models of panel data are: Pooled OLS, Random Effects (FE) model, and the Fixed-Effects (RE) model. The Fixed effects model was chosen after the data underwent the Durbin-Wu-Hausmann test, to determine whether the random effects model or the fixed effects model were the most appropriate for the analysis at hand. This specifies that the covariance matrices be based on a common estimate of disturbance variance, accounting for the negative observations present in the dataset [34]. The rejection of the null hypothesis ($p < 0.05$), which states that a Random Effects model would be more appropriate for the data analysis, determines the choice of a Fixed Effect estimation model. The typical fixed effects model equation takes the following form:

$$y_{i,t} = \beta_1 \times x_{i,t} + a_i + u_{i,t}, \text{ for } t = 1, T \text{ and } i = 1, N$$

Where $y_{i,t}$ is the dependent variable, β_1 is the estimated regression coefficient, a is the unobserved, time invariant fixed effect, and u is the error. The parameter t indicates time, while i denotes the subject. Differently from the RE model, the FE model takes into account a time-invariant unobserved effect. While in RE the unobserved effect is assumed to behave randomly, in FE a_i is

specific to each individual in the sample. Therefore, FE models rely on the assumption that there are time-invariant unobservable factors influencing the LHS and RHS of the regression. In this kind of model, the individual specific effect is expected to be correlated with the independent variable [35]. Given the heterogeneity of the sample, it is plausible to have country specific, unobserved effects that influence the socioeconomic development, and its indicators. These effects account for the country's predisposition towards socioeconomic development.

Moreover, a country's development can be affected by a multitude of factors, therefore it would be impossible to design a model that includes every variable influencing development, and its components. Having selected the variables relevant to the analysis, the following equation was used for the dependent variable socioeconomic development:

$$\text{development} = \beta_1 \times CFA_{i,t-2} + \beta_2 \times TRA_{i,t} + \beta_3 \times ODA_{i,t-2} + \beta_4 \times INV_{i,t} + \beta_5 \times IQ_{i,t} + \beta_6 \times INF_{i,t} + a_i + u_i, t$$

x is the estimated coefficient;

a is the unobserved time invariant individual effect; u is the error term; i is the country index $i = 1, 2, \dots, 49$; t is the time index, in years' $t = 2002, 2005, \dots, 2016$;

CFA denotes the main independent variable Chinese ODA-like foreign aid;

TRA denotes trade openness;

ODA denotes official development aid inflows;

INV denotes total investment;

IQ denoted institutional quality;

INF denotes consumer price inflation

The Hausmann Test has also been run for the other three dependent variables, namely Income, Health and Schooling. In every case, the null hypothesis has been rejected. The Hausmann test for the dependent variable Income reports a value (=0.0452) near, but still inferior, to 0.05.

In line with the selection of Fixed Effects Models, the following equations were adopted:

$$\text{Income}_{i,t} = \beta_1 \times CFA_{i,t-2} + \beta_2 \times TRADE_{i,t} + \beta_3 \times ODA_{i,t-2} + \beta_4 \times INV_{i,t} + \beta_5 \times IQ_{i,t} + \beta_6 \times INF_{i,t} + a_i + u_i, t$$

$$\text{Health}_{i,t} = \beta_1 \times CFA_{i,t-2} + \beta_2 \times TRADE_{i,t} + \beta_3 \times ODA_{i,t-2} + \beta_4 \times INV_{i,t} + \beta_5 \times IQ_{i,t} + \beta_6 \times INF_{i,t} + a_i + u_i, t$$

$$\text{Schooling}_{i,t} = \beta_1 \times CFA_{i,t-2} + \beta_2 \times TRADE_{i,t} + \beta_3 \times ODA_{i,t-2} + \beta_4 \times INV_{i,t} + \beta_5 \times IQ_{i,t} + \beta_6 \times INF_{i,t} + a_i + u_i, t$$

4.3.2. Dependent Variable

The main dependent variable is socioeconomic development. This paper sought to investigate whether there is an impact of Chinese ODA on socioeconomic development, and what its magnitude is.

4.3.3. Main Independent Variables

The main independent variable is Chinese Foreign Aid. Accordingly, only Official Development Assistance is taken into account, in order to exclude any aid directly targeted towards economic ventures. As alluded to earlier on, China

does not report its aid figures to the Creditor Reporting System, therefore data about Chinese aid flows were retrieved thanks to the mixed system methodology developed by Strange *et al.* [36], namely the Tracking Underreported Financial Flows (TUFF), under the aegis of AidData [14].

For the purpose of this paper, only aid directed towards African countries is taken into account. Furthermore, only the data that has been labeled as appropriate for research is selected. Following the methodology employed by Dreher *et al.* [16], within the dataset only the aid which reached the stage of commitment is considered. Therefore, pledged aid is not taken into account. Moreover, a lagged effect of 2 years is employed (t-1): Aid is expected to have any effect on local indicators only after a considerable period, which in this paper is 2 years, following the methodology applied in Dreher's [16] study.

4.3.4. Control Variables

The main independent variable, Chinese ODA, and the dependent variable is socioeconomic development. The control variables are discussed below.

Trade Openness

According to international economics, open market practices that foster trade are believed to be beneficial for the economic welfare in the countries involved, (Krugman, 2018). When the tariffs are low, which boost trade, consumer enjoys goods and services at a lower price. Moreover, thanks to trade, multinational companies can engage in practices of vertical and horizontal production, and lower the overall cost of products available to consumers. In fact, studies have shown that trade openness is indeed positively associated with development, in this analysis, trade openness is proxied by combining the GDP share of exports and imports. The data is retrieved from the World Bank database [26].

Inflation

Macroeconomic theories predict that high levels of inflation hinder general welfare, inasmuch as they reduce consumers' purchasing power of goods and services. Moreover, high inflation can greatly reduce the benefits derived from income increases. A number of studies have highlighted the significant positive correlation between inflation and poverty increase [37]. However, it has been proven that inflation can be positively correlated with HDI. Despite the contrasting conclusions about its effects, Inflation has been included in many indicators of development [38].

ODA Inflows

In order to isolate the effect of the main independent variable, that is, Chinese ODA, it is fundamental to leave out the other Official Development Aid directed towards African Countries. Unfortunately, not all countries subscribe to the Creditor Report System, meaning that they are not required to report their development data. Countries such as Brazil, India, Mexico, and South Africa fall into this group. However, the collective development finance devolved by non-reporting countries is estimated to be far smaller than aid provided by reporting countries, multilateral organizations, and other private donors. Accord-

ing to OECD estimates, this aid amounts to 4.4% of total aid flows (OECD, 2016).

Investment

The main justification relies on the argument that investment is among the main drivers of economic growth in most African countries [39]. Therefore, poverty alleviation and increase of socioeconomic welfare are believed to be positive externalities of investment otherwise directed towards commercial objectives. To measure gross domestic investment, data is retrieved from the World Bank database for the period 2002 - 2016. Total investment is expected to have a positive effect on development and its component dimensions.

5. Results

5.1. Aid Received by African Countries

Figure 2 below shows aid received by African countries for the period 2000 to 2014 as detailed. There is uneven distribution of aid by recipient countries. Chinese Aid to Africa has been rising gradually and peaked in 2012.

It is worth mentioning that in terms of amount received, the distribution of Chinese Aid in Africa is very uneven throughout the continent (See **Figure 2**). From 2000 to 2014 Cote d'Ivoire was the country that received the most Chinese ODA (US\$ 3.96Bln) followed by Ethiopia (3.66), Zimbabwe (3.6). Cameroon (3.4), Nigeria (3.08), and Tanzania (3.02). On a regional level, Northern African countries are the bottom receivers of Aid, with an average of US\$ 273Mln received, along with Southern African countries, where the average ODA received by each country amount to US\$ 284Mln; in comparison, the average Western African country has received US\$ 1.11Bln. More surprisingly, the sub-Saharan countries of the Democratic Republic of Congo (DRC), the Central African Republic (CAR), and Somalia, which rank bottom of the list in a number of human development indicators, are also among the countries which received less Chinese ODA. While the figures portray the general distribution of Chinese foreign aid in

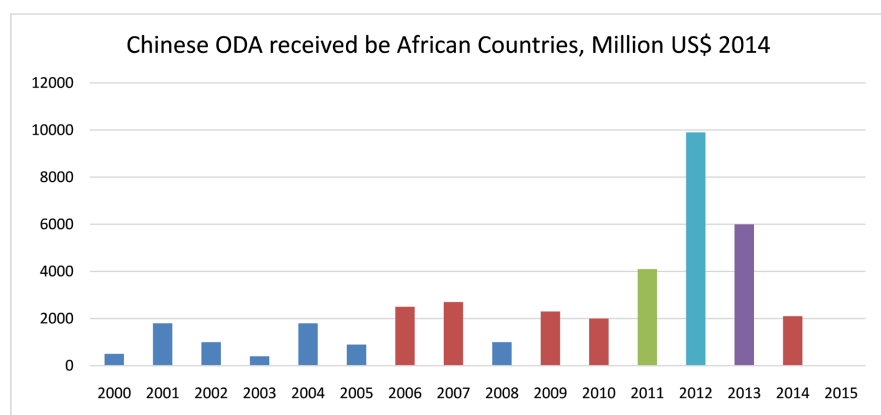


Figure 2. Foreign Aid devolved by China to African Countries, 2000 - 2014, The dotted line represents the upward trend of Chinese aid's amounts (angular coefficient). Source: AidData.

Africa, this data representation suffers from some clear limitations. It shows the amount of ODA received in absolute terms, not adjusted to the characteristics of the recipient countries. In fact, the countries considered differ in many respects, most markedly the development categories to which they belong and their population size. For example, the comparison between the absolute aid received by Nigeria, which has 154 million inhabitants*, and Tanzania, populated by 57 million, is not very descriptive, given that the amount of aid received by the two countries is very similar. Likewise, comparing an upper middle-income country such as Algeria and a least developed country like Chad.

Figures retrieved from: Aid, China, and Growth: Evidence from a New Global Development Finance Dataset Aid Data Working Paper #46 [14]. US\$ are adjusted to US\$2014 to facilitate comparison Regions classified accordingly to the Standard country or area codes for statistical use (M49) published by the UN Statistics Division Population figures refer to 2018 levels [26].

5.2. Descriptive Results

As shown in **Table 1** below it can be observed that there is a great degree of heterogeneity in values can be observed across many variables. The biggest variance is registered among the dependent variable Income and the independent

Table 1. Covariance Analysis.

Variable	Years	Measurement	Mean	Std. Dev.	Min	Max	n	N
Socioeconomic Development								
Human Development Index	2002 - 2016	Index	0.506	0.119	0.263	0.793	47	70
Health								
Life expectancy at birth	2002 - 2016	Years	59.268	7.839	40.7	76.1	47	70
School								
Expected Years of schooling	2002 - 2016	Years	9.901	2.496	3	16	47	70
Income								
GNI per capita	2002 - 2016	Current US\$, PPP	4871.816	5716.432	430	29010	47	70
CFA								
China ODA per capita	2000 - 2014	Current US\$	6.742	33.988	0	664.868	47	70
INF								
Consumer Price Inflation	2002 - 2016	Percentage change by year	0.069	0.085	-0.098	1.089	47	70
TRA								
Trade Openness	2002 - 2016	Export + Import as% GDP	0.771	0.375	0.191	3.114	47	70
ODA								
ODA per capita	2000 - 2014	Current US\$	62.842	76.253	0.460	691.925	47	70
INV								
Gross Capital Formation	2002 - 2016	%GDP	0.242	0.097	0.015	0.615	47	70
GOV								
Government Effectiveness	2002 - 2016	Index	-0.699	0.613	-1.884	1.044	47	70
RULE								
Rule of Law	2002 - 2016	Index	-0.669	0.635	-2.009	1.077	47	70

variables CFA, ODA, and INF, as in every of these instances the reported standard deviation is bigger than the mean. Due to the many zero values of CFA, the standard deviation is more than 5 times the mean, representing a very high degree of variance in the sample. On the other hand, the remaining dependent variables, Welfare, Health, and School, and the independent variables INV, GOV, RULE, and TRA do not show similar levels of variation. Many variables also present a large difference between the minimum and maximum values, showing the presence of several outliers in the sample. The outliers are included in the final analysis, as they do not represent erroneous data, and there is no theoretical justification to support their exclusion. In fact, they mostly regard the per capita values of small states, and only in certain years when China increased its aid commitments: the variation is therefore accounted for by the fixed effects model.

5.3. Regression Analysis

Table 1 above shows the regression analysis. The main focus of this paper, is that effect of Chinese foreign aid on socioeconomic development, is shown to have a positive, significant relation with all dependent variables. These findings subvert all the hypotheses previously formulated, with the exception of H4. CFA is in fact shown to have a positive significant effect on Income, as a 1% growth in CFA corresponds to a 0.13% increase in GNI per capita.

Table 2. Regression Analysis (Adapted from [16]).

	Welfare	Health	School	Income
	HDI index	Life expectancy (years)	Expected years of schooling	Logged GNI per capita, US\$ PPP
Constant	0.3855419*** (5.15)	2.527004*** (34.47)	5.681974*** (2.74)	5.957379*** (8.24)
CFA Logged Chinese ODA per capita, US\$	0.0106983*** (4.14)	0.09714929*** (3.79)	0.0249971*** (2.70)	0.1359981*** (3.87)
GOV Government Effectiveness	(-0.0058297) (-0.39)	(-0.8907244) (-0.64)	(-0.0556424) (-0.13)	(-0.0968684) (-0.51)
TRA 4th root of Export Import, %GDP	0.0299859 (0.51)	4.074772 (0.67)	0.7801613 (0.49)	0.1871882 (0.30)
INV Gross Capital Formation, %GDP	0.1453365*** (3.20)	14.22557*** (2.73)	3.860604*** (2.96)	1.268479*** (2.00)
INFL 4th root of Consumer Price Inflation, % growth by year	(-0.0647791) (-1.37)	(-4.627342) (-1.12)	(-1.730072) (-1.28)	(-0.7619813) (-1.23)
ODA Logged ODA per capita, US\$	0.0512803*** (5.07)	4.753102*** (5.06)	1.104889*** (3.80)	0.5514972*** (4.14)
N	705	705	705	705
R²	0.2668	0.2771	0.1732	0.171
F	13	8.37	8.76	14.51
Significance	0.0000	0.0000	0.0000	0.0000
***=coefficient significant at 0.01 level				
**=coefficient significant at 0.05 level				
*=coefficient significant at 0.1 level				
Names of transformed indexes have been italicized.				

These findings confirm those resulted are consistent with Dreher *et al.* [16] study on the effect of Chinese ODA on economic growth which is shown on **Table 2**, where CFA is shown to have a positive and significant effect on the economic dimension. On the other hand, contrary to the hypothesis, CFA is shown to have a positive effect on socioeconomic development as well, with high significance ($p < 0.01$). A one percent increase in Chinese aid per capita corresponds to an $\beta_1 = 0.000136$ increase in HDI [40].

Similarly, coefficients are shown to be positive and significant for the health variable ($p < 0.05$), where a 1% growth of CFA corresponds to a 0.009 growth in years of life expectancy, and for the

School/Education dimension ($p < 0.01$), where a 1% increase in CFA results in a .000119 increase in expected years of education. Therefore, the positive externalities generated by Chinese ODA-like foreign aid are not offset by the development of aid dependence and the economic dominance obtained by Chinese enterprises. While it has been shown in this research that Chinese Aid is often entangled with commercial investment [3], and it is usually accompanied by R4I practices [41], its spillover effects still benefit the well-being of recipient populations. Therefore, the results fall more in line with the aid theories explored, while they discount the expectations on Chinese aid. Still, the registered effect of CFA on socioeconomic welfare is fairly limited. However, as the R2 indexes suggest, the conclusions of this research are not conclusive, since there is a number of factors influencing the chosen socioeconomic welfare dimension which could not be captured by the models employed.

The coefficient describing the relation between GOV and the dependent variables are all negative. However, none of this relation is shown to be significant. Therefore, it is concluded that the Governance Indicator of Government effectiveness does not influence the variance of Socioeconomic Welfare, Health, Education and Income in the selected African countries.

Across every model, Trade openness is shown to have a positive effect on the dependent variable. However, in every case, no significance is observed. These results conclude that, contrary to expectations, there is no relationship between the countries' openness to trade, and their Welfare, Health, Education and Income dimensions, according to the measurements offered by the selected indicators. The coefficients describing the relation between the independent variable Investment and the Welfare, Health, Education, and Income dimensions are all shown to be positive. Moreover, high degrees of significance ($p < 0.01$) are registered in every model. Therefore, it is concluded that total investment has a positive effect on the dimensions Welfare, Health, Education and Income in the selected African countries.

The independent variable INFL is shown to have a negative effect on every dimension considered. However, the coefficients reported are never statistically significant. Therefore, it is concluded that inflation does not have an effect on the dependent variables Welfare, Education, Income, and Health. Official Development Aid is shown to have a positive, significant ($p < 0.01$) relation with

the indicators of socioeconomic Welfare, Health, Education, and Income. A 1% increase in ODA per capita corresponds to a 0.000513 increase in the HDI index. Regarding the Health dimension, a 1% growth of ODA per capita results in a 0.047-unit increase in Life expectancy years, while it is corresponded by 0.01045 additional school expectancy years. Finally, a 1% growth in ODA per capita is corresponded by a 0.5% increase in GNI per capita. Hence, it is concluded that Official Development Aid from Non-Chinese sources have a positive effect on the dependent variables considered.

6. Conclusion

The panel data Fixed Effect Model (FE) was employed in this paper, in order to answer the second study question. Five different panel data FE regressions are run for each dependent variable, in the respective order: Socioeconomic developments, Health, School, and Income. In every model the main dependent variable is present, and the control variables are added one by one, in order to identify the best-fit model for the data at hand. The order of their inclusion in the model is dictated by their degree of correlation, i.e., the Pearson index, with the model-specific dependent variable.

Chinese aid has, in recent years, become a major focus of aid research owing to China's meteoric ascent to become a major donor, issuing volumes of aid that rivals that of traditional donors. To test the hypotheses, data on Chinese aid projects in SSA between 2002 and 2016. The study results indicate that in recipient African countries Chinese ODA-like aid have a positive effect on socioeconomic development, and its component dimensions.

Conflicts of Interest

The author declares no conflicts of interest.

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