China's Foreign Aid, Recipient Countries' Economic Growth, and the Mediating Effect of Aid in Infrastructure

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Abstract: *Based on the panel data of China's foreign aid in 2003-2014 from AidData, this paper empirically investigates the relationship between China's foreign aid and economic growth in recipient countries. Using the principal component analysis (PCA), the authors propose a variable, i.e. the infrastructure index, to measure the effects of aid on the economic growth of recipient countries. This study shows that aid from China has significantly improved the level of economic growth in recipient countries, which provides a new evidence of China's aid effectiveness. Through analysis of the ways by which aid in infrastructure induces economic growth, the authors conclude that the improvement of local infrastructure accounts for 55.30% of the aggregate economic growth effect of China's aid to recipient countries.*

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1. Introduction

Since the global financial crisis of 2007-2009, growth in foreign aid from conventional Western donors has slowed, while economic aid from non-conventional donors led by China has grown significantly. According to AidData, from 2000 to 2014 China provided aid worth 354.4 billion US dollars to 140 countries, and the United States provided aid worth 394 billion US dollars over the same period. In the depth of the global financial crisis in 2009, aid from China was twice as much as that from the US and accounted for half of total Development Assistance Committee (DAC) aid, reflecting China's role as a responsible stakeholder. Despite the broad statistical scope of AidData, it can be expected that the amount of aid from China will keep growing amid the implementation of the Belt and Road Initiative (BRI).

Compared with aid from developed countries, most of the foreign aid from the Chinese government is catalytic or leverage capital, i.e. other official flows (OOF). Instead of simply transferring funds to recipients, China attaches great importance to fostering local development capabilities. This unique approach to foreign aid, however, became questioned by some Western countries. Several academics considered that compared with conventional aid, China's aid programs lacked altruism and only served its national interest. They blamed China for "debt-trapping" aid recipient countries and "plundering" their resources (Alden 2005; Tull 2006; Halper, 2010). Given those criticisms, it is important and

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necessary to analyze the economic effects of China's foreign aid.

In its foreign aid programs, China has attached great importance to the livelihoods and economic development of recipient countries, especially their economic and social infrastructure. In 2010-2012, China devoted 44.8% of its aid funds to economic infrastructure, including transportation, energy, and communication infrastructures, and 27.6% of aid funds to social infrastructure such as education and healthcare facilities (see Figure 1). In their empirical study, Gopel et al. (2013) found that China's massive aid for infrastructure in Africa have played a positive role in Africa's economic development. Most existing studies have investigated how foreign aid may contribute to economic growth in recipient countries via such avenues as international trade (Zhu and Huang, 2018) and public spending (Gomanee et al., 2005); researchers did rarely address infrastructure as a mediating conduit. To fill this void, here we discuss how aid from China contributes to economic growth in recipient countries via economic aid in infrastructure.

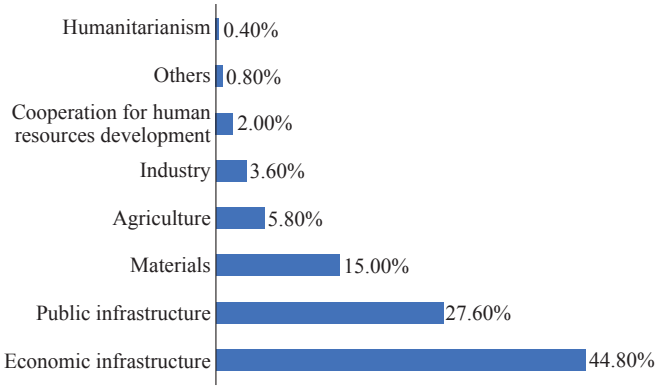

Figure 1: Distribution of China's Foreign Aid

Source: White Paper of China's Foreign Aid (2014).

Based on the above motivation, we propose an infrastructure index using the principal component analysis method to measure the infrastructure conditions of recipient countries in the transportation, energy, healthcare, and communication sectors. First, we employ the mediating effect method to discuss the relationship between aid from China and economic growth in recipient countries from an infrastructure perspective. Thus, we aim to provide theoretical evidence for the conduit in which foreign aid for infrastructure spurs economic growth. Second, we employ the propensity score matching (PSM) method to create an infrastructure index variable to measure the level of infrastructure in recipient countries from a comprehensive multidimensional perspective. Third, we perform a 2SLS regression using the instrumental variable of foreign aid to mitigate the endogeneity problem to some extent.

2. Literature Review and Explanation of the Theoretical Mechanism

2.1 Literature Review

One of the goals of foreign aid is to assist recipient countries in developing their economies. Yet some recipient countries have failed to thrive economically after receiving massive inflows of international aid. Since the 1960s, whether foreign aid is conducive to economic growth in recipient countries has been controversial.

Capital accumulation is a key driver of economic growth, and is scant in many developing countries; foreign aid is supposed to boost their economic growth by injecting that much-needed capital, as discussed in empirical studies such as those by Papanek (1973), Levy (1988), and Hansen and Tarp (2000). Going one step further, Minoiu and Reddy (2010) differentiated aid for economic development (i.e. development aid) from non-development aid, and found development aid to be conducive to economic growth in the long run. After examining the duration of the economic effect of foreign aid in recipient countries, Feeny and Fry (2014) concluded that half of the growth effect occurred in the first two years after aid was received.

Aid potentially hurts economic growth by breeding corruption, which causes aid funds to be used ineffectively. Economides et al. (2008) considered the effects of international aid to be twofold: First, foreign aid for infrastructure has a positive direct effect on economic growth; second, excessive foreign

aid also has a negative direct effect that hurts economic growth by encouraging individual participation in rent-seeking competition rather than productive activity. The negative direct effects, they argue, may offset the positive ones. Leshoro (2013) considered that short-term and long-term international aid had negative effects on economic growth in South Africa largely due to corruption. Some studies found that probably no significant correlation exists between foreign aid and economic growth (Rajan and Subramanian, 2005).

Some papers have started to consider whether foreign aid may induce economic growth in recipient countries under certain conditions. Research has attributed aid effectiveness to such factors as policy environment (Burnside and Dollar, 2000; Dalgaard and Hansen, 2001; Dalgaard et al., 2002), economic freedom and trade openness (Teboul and Moustier, 2001; Young and Sheehan, 2014), democracy (Svensson, 2000), external environment (Guillaumont and Chauvet, 2001), and cultural differences between donor and recipient countries (Minasyan, 2014).

There has been scarce research conducted by Chinese academics about the relationship between China's foreign aid and economic development in recipient countries, owing to data unavailability. Using China-Africa economic cooperation data as the proxy for China's aid to Africa, Wang and Zhao (2014) have verified the significantly positive economic growth effect of aid from China for African countries. Zhu et al. (2018) suggested that China's aid in Africa has induced economic development in recipient countries through three conduits: Replenishing material capital, increasing human capital, and technology transfer and its spillover. Using the system GMM method, they evaluated the effectiveness of China's aid for Africa in 2001-2013 and found that China's aid had accelerated economic growth in Africa, especially sub-Saharan Africa. Zhu and Huang (2018) revealed an inverted U-shaped effect of China's foreign aid via trade as a conduit. Using the human development index (HDI) as the proxy variable of poverty, Zhang (2018a) tested the effectiveness of China's aid for Latin America, and found that aid (especially OOF) from China was able to mitigate poverty in Latin America.

According to the World Bank's classification, infrastructure can be divided into economic, such as transportation, communication, and energy infrastructure, and social infrastructures, such as healthcare and education. Economic infrastructure may participate in social production as a physical capital to promote productivity, and the improvement of social infrastructure helps increase the human capital factor for economic development (Li et al., 2011). Empirical research also supports the view that infrastructure improvement promotes economic development. Aschauer (1988) for the first time attributed the decline of US productivity in the 1970s to the stagnation of infrastructure construction, such as roads and schools, triggering a wave of economic research. Munnell (1990) found that slowing investment in public infrastructure may largely explain the slowdown of economic growth. Finn (1993) classified government spending into corporate, private, and highway capital and verified that government investment in highway infrastructure may increase economic output. Based on an open economic growth model, Shioji (2001) estimated the effect of public capital on per capita output and showed the significant positive effects of infrastructure investment from public capital on the per capita output in the US and Japan. After reviewing research literature on the relationship between infrastructure and economic growth, Romp and Haan (2007) stated that most researches had verified the economic growth effects of infrastructure.

To summarize, there is a rich body of literature on the relationships between foreign aid and economic growth and between infrastructure and economic growth. However, the possibility that foreign aid may spur infrastructure investment and drive economic growth has been seldom noticed. This paper aims to verify this mechanism theoretically and empirically.

2.2 Explanation of the Theoretical Mechanism

Foreign aid made up for the shortage of capital for infrastructure investment in recipient countries.

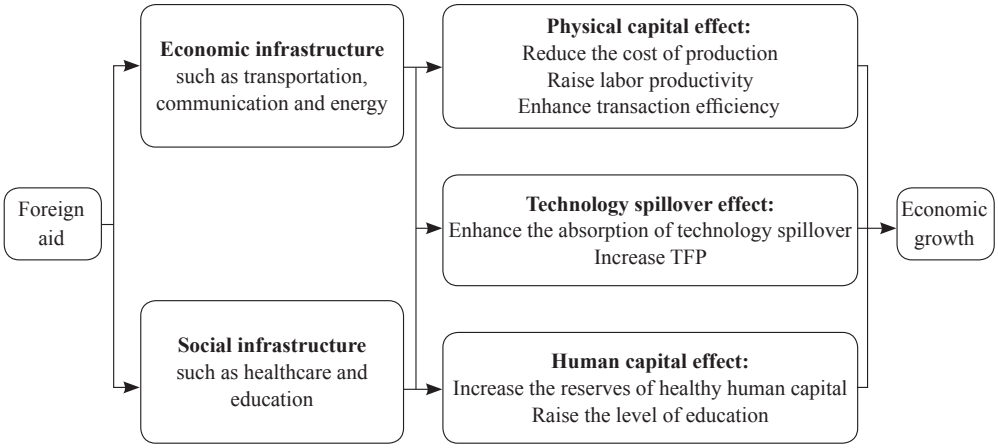

Figure 2: Illustration of How Foreign Aid Promotes Economic Growth via Infrastructure

Source: Drafted by the authors.

While some aid funds went to transportation, telecom, energy, and other economic infrastructure, others were used to help recipient countries improve healthcare, education, and other social infrastructure. Aid funds for infrastructure may bolster economic growth via the following conduits.

(i) Physical capital effect: Many developing countries are plagued by underfunded economic infrastructure, such as transportation, telecom, and energy supply, which presents a roadblock to their economic development. Aid funds for economic infrastructure are aimed to improve energy supply, transportation efficiency, communications, and information technology application in recipient countries. As physical capital, economic infrastructure serves as an input of economic activity and contributes to economic growth by facilitating accounting and legal services, reducing corporate costs, and enhancing labor productivity and transaction efficiency. Aid from China has helped recipient countries overcome infrastructure bottlenecks in water conservation, electric power, land and air transportation, and telecom sectors (Lin and Wang, 2016), with positive effects for economic development in recipient countries.

(ii) Human capital effect: Aid for healthcare infrastructure allows recipient countries to build more and better-equipped hospitals to improve healthcare, raise life expectancy and labor participation, and thus increase the reserves of healthy human capital. Aid for educational infrastructure helps recipient countries build more schools and train teachers to improve education, human capital, and local development capabilities. Li et al. (2010) also demonstrated that China's foreign aid for education enhanced local development capabilities.

(iii) Technology spillover effect. After incorporating infrastructure into the production function, Duggal et al. (1999) showed that infrastructure had spurred long-term economic growth by increasing total factor productivity (TFP). Using India's data, Hulten (2006) verified that spillover effect of infrastructure drived economic growth by raising TFP. While improving the level of local infrastructure, foreign aid increases the recipient country's absorption of spillovers from advanced technology, boosts TFP, and promotes local economic development.

3. Empirical Model and Variable Selection

3.1 Empirical Model Specification

This paper aims to investigate the economic growth effects of foreign aid for recipient countries

from an infrastructure perspective. Hence, it defines economic growth as the explained variable (ln*GDPp*), the amount of aid provided by China to various countries (ln*Aid*) as the core independent variable, and infrastructure as the mediator (ln*Infra*). Based on previous research, we also define a set of control variables, including fixed cost, fiscal spending, natural resources, foreign direct investment, trade openness, and institutional strength. Hence, we define the basic regression model as follows:

$$\ln GDPp_{it}=\alpha \ln Aid_{it}+\varphi C_{it}+\lambda_i+\mu_{it} \quad (1)$$

where i is country, t is year, $\ln GDPp_{it}$ is the logarithm of GDP per capita as the proxy variable of economic growth, Aid_{it} is the total amount of aid received from China by recipient countries, and C_{it} is all control variables, including fixed capital investment ($\ln Capitalp_{it}$), fiscal spending ($\ln Governp_{it}$), natural resources ($\ln Plantp_{it}$), labor force ($\ln Population_{it}$), foreign direct investment ($\ln FDI_{it}$), trade openness ($Open_{it}$), and institutional systems (WGI_{it}). λ_i is the individual fixed effect, and μ_{it} is the model's error term.

In addition, this study will employ the stepwise regression approach developed by Wen and Ye (2014) to assess whether there is a mediating mechanism by which foreign aid promotes economic growth via infrastructure development. Hence, equations (2) and (3) are also included.

$$\ln Infra_{it}=\beta \ln Aid_{it}+\varphi' C_{it}+\lambda'_i+\mu'_{it} \quad (2)$$

$$\ln GDPp_{it}=\alpha' \ln Aid_{it}+\gamma \ln Infra_{it}+\varphi'' C_{it}+\lambda''_i+\mu''_{it} \quad (3)$$

where $\ln Infra_{it}$ is the infrastructure index created with the principal component analysis (PCA) method, and the variables are the same as defined in equation (1).

3.2 Data Source and Variable Selection

Given data availability, this study uses the panel data of countries to which China provided international aid from 2003 to 2014. Data employed in this paper are primarily from the World Bank's World Development Indicators (WDI), the Worldwide Governance Indicators (WGI), and AidData, which is compiled by the College of William & Mary, based on data from over 5,000 international aid projects in 141 countries and regions across the world from 2000 to 2014.

The variables used in this paper include the following types: Explained variable, core independent variable, mediator variable, and control variable.

Explained variable: Following Zhu and Huang (2018) this study measures economic growth by the actual GDP per capita of recipient countries. Nominal GDP per capita employed here is from the WDI database and converted using the GDP deflator into real GDP per capita by the constant US dollar of 2010. The GDP deflator is also from the WDI database.

Core independent variable: The core independent variable is the amount of aid provided by China to various countries, and its nominal value is from AidData converted to the constant US dollar value of 2010.

Mediator variable: This paper aims to verify whether the mechanism in which foreign aid induces economic growth via infrastructure development. As such, we select the level of infrastructure as the mediator. The principal component analysis (PCA) method is employed to create an infrastructure index to measure the level of infrastructure in various countries.

Control variables: As mentioned before, this paper selects fixed capital investment, fiscal spending, and outbound direct investment as control variables.

(i) Fixed capital investment: This paper uses per capita fixed capital formation as the proxy variable of fixed capital investment, and the nominal value is from the WDI database and converted with the GDP deflator into the actual value.

(ii) Fiscal spending: Denoted by per capita government consumption spending with the nominal value from the WDI database and converted into the actual value.

(iii) Natural resources: Referring to Zhu and Huang (2018), this paper adopts per capita arable land area

Table 1: Variable Definitions and Data Sources

Variable	Sign	Definition	Data source
Explained variable			
Economic growth	ln*GDPp*	Logarithm of real GDP per capita	WDI database
Core independent variable			
Aid	ln*Aid*	Logarithm of foreign aid received by the country from China	AidData database
Mediator variable			
Infrastructure index	ln*Infra*	Logarithm of infrastructure index	Created for this paper
Control variables			
Fixed capital investment	ln*Capitalp*	Logarithm of per capita fixed capital formation	WDI database
Fiscal spending	ln*Governp*	Logarithm of per capita government consumption spending	WDI database
Natural resources	ln*Plantp*	Logarithm of per capita arable land area	WDI database
Labor force	ln*Population*	Logarithm of total population	WDI database
Foreign direct investment (FDI)	ln*FDI*	Logarithm of foreign direct investment	WDI database
Trade openness	*Open*	Percentage of total import and export volume in GDP	WDI database
Institutional strength	*WGI*	Mean value of the six Global Governance Indicators (GGI)	WDI database

Source: Compiled by authors.

of recipient countries as the proxy variable of natural resource endowment with data from the WDI database.

(iv) Human capital: Measured by the total population of recipient countries (Zhu and Huang, 2018).

(v) Foreign direct investment (FDI): Actual amount of FDI converted by deflation from nominal values from the WDI database.

(vi) Trade openness: Trade openness of recipient countries is a key factor of aid effectiveness (Teboul and Moustier, 2001). As such, this paper includes trade openness indicator as a control variable, which is measured by the percentage of total import and export volume in GDP, and the nominal value is from the WDI database and converted into actual value.

(vii) Institutional strength: Referencing Zhu et al. (2018), this paper adopts the mean value of the six indicators of the World Bank's World Governance Indicators (WGI) as the proxy variable of the institutional quality of host countries. WGI includes six dimensions, i.e. "voice and accountability", "political stability and absence of violence", "government effectiveness", "regulatory quality", "rule of law", and "control of corruption", which are from the World Bank's WGI database.

3.3 Descriptive Statistics of Variables

Statistical characteristics of variables (except for the infrastructure index) are shown in Table 2.

China's foreign aid increased slowly before 2008 and dipped a bit during the global financial crisis. Since 2009, aid from China has increased exponentially, staying at a plateau after peaking in 2010, as shown in Figure 3. Barring a few years like 2004 and 2007, China's aid to countries involved in the Belt and Road Initiative (BRI)[1] accounted for over 50% of total aid received by those countries. In some

[1] We follow the designation of BRI and non-BRI countries according to the BRI's official website, which identifies 71 BRI countries. OOF account for a higher share of aid to BRI countries. Furthermore, aid is more concentrated in the infrastructure and production sectors of BRI countries. In non-BRI countries, aid is provided mainly in other forms.

Table 2: Descriptive Statistics of Variables

Variables	Measurement unit	Mean	Standard deviation	Min.	Max.
ln*GDPp*	USD	7.507	1.146	4.881	10.613
ln*Aid*	USD	17.854	2.768	6.966	24.245
ln*Capitalp*	USD	5.947	1.294	2.281	9.102
ln*Governp*	USD	5.487	1.484	1.917	9.371
ln*Plantp*	m^2	7.308	1.035	2.547	9.853
ln*Population*	Person	16.073	1.792	11.325	20.981
ln*FDI*	USD	20.010	2.161	10.426	25.320
Open	——	0.760	0.343	0.157	3.024
WGI	——	-0.546	0.628	-1.902	1.834

Source: Compiled by the authors.

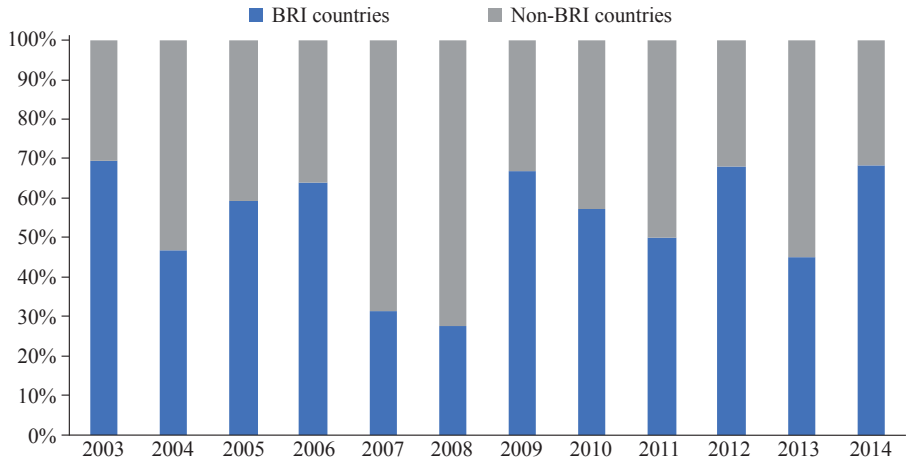

Figure 3: Change in the Distribution of China's Foreign Aid for BRI and Non-BRI Countries in 2003-2014

Source: AidData.

cases, it made up for as much as 70% of aid received by relevant BRI countries.

In terms of the income level of recipient countries, China has shifted its focus of aid programs to low-income and upper-middle-income countries, reversing the situation that middle- and low-income countries were its primary aid recipients in 2006 and before. In recent years, China has also provided humanitarian assistance to some high-income countries.[2] As shown in Figure 4, China's aid to countries with different levels of income steadily increased.

As for the types of foreign aid, OOF overtook official development aid (ODA) as a share of foreign aid to become the backbone of China's foreign aid. Since 2007, the share of China's OOF has been greater than that of ODA. In 2014, China's OOF was as much as 9.8 times larger than its ODA. Although OOF features a smaller proportion of gratuitous donations and is less favorable than ODA, its market-based operation creates an incentive for recipient countries to wean from dependence on donor

[2] Tags from the World Bank's database are used to classify countries into low-income, lower-middle-income, upper-middle-income and high-income countries.

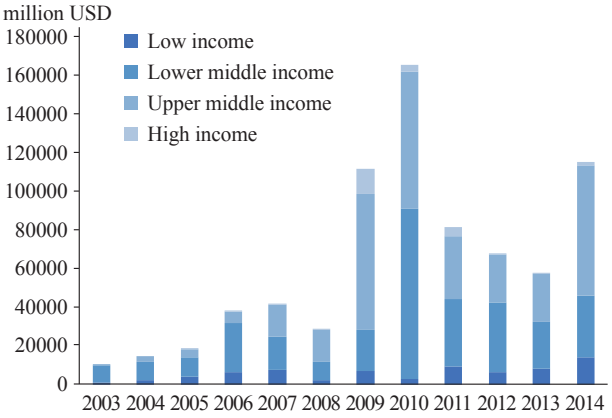

Figure 4: Distribution of China's Foreign Aid for Countries with Different Levels of Income in 2003-2014

Source: AidData.

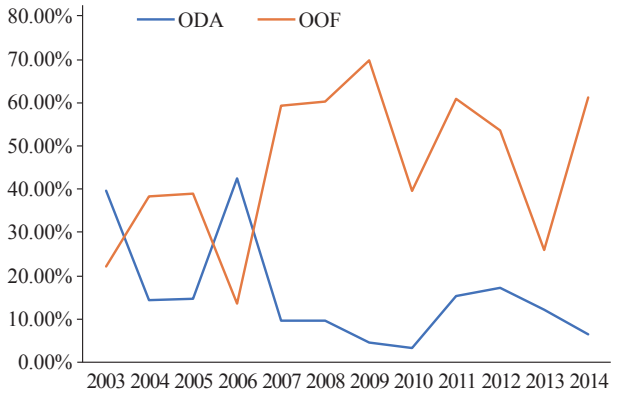

Figure 5: Categories of China's Foreign Aid in 2003-2014

Source: AidData.

countries and seek independent development. On the other hand, OOF may also benefit donor countries economically, attract more funds for foreign aid, and encourage enterprises from donor countries to develop their global presence.

4. Empirical Analysis

4.1 Creation of Infrastructure Index

Infrastructure refers to physical facilities that provide public services for socio-economic activities and people's daily life. Following the World Bank's classification, infrastructure includes economic infrastructure such as transportation, communication, and energy, as well as social infrastructure, such as healthcare and education. In previous research, the number of mobile and landline telephones per 100 people or the average length of railway per capita was used as the proxy variable for infrastructure, but in addition to transportation and communication, infrastructure also includes sectors such as energy, healthcare, and sanitation. Zhang et al. (2007) investigated the level of China's infrastructure from four dimensions, including transportation, energy, communication, and urban infrastructure. Using the PCA method, Sui et al. (2017) also created an infrastructure evaluation index that consisted of transportation, communication, energy, and urban infrastructure indicators.

Under data availability considerations, this study employs the PCA method to create an infrastructure index based on data of transportation, communication, energy, and healthcare dimensions, covering social and economic infrastructure, for a comprehensive measurement of the infrastructure development of recipient countries. Specifically, transportation is measured by air flights per 10,000 persons; communication is measured by mobile phone and internet subscribers; energy is measured by per capita power consumption and per capita oil consumption; healthcare is measured by the share of population with access to basic sanitation in cities and rural areas. All indicators are from the WDI database with statistical characteristics of the seven indicators shown in Table 3.

The Kaiser-Meyer-Olkin (KMO) and the Squared Multiple Correlation (SMC) test results are shown in Table 4. Overall KMO is 0.7281, which is greater than 0.7 and indicates a significant commonality among the variables. The SMC values of the variables are also large, indicating a strong linear relationship among variables. The seven indicators selected are thus suitable for performing a PCA.

Table 5 shows the characteristic root, variance contribution, and cumulative contribution of each principal component. To retain as much raw data as possible, we selected the first three principal components to create the infrastructure index. At this moment, the cumulative contribution rate is 88.1%,

which is higher than 85% and basically reflects information in raw data.[3]

The component loading matrix is shown in Table 6. Principal component 1 reflects internet users, power consumption, and oil consumption indicators. Principal component 2 reflects air flights and access to basic sanitation. Principal component 3 indicates the availability of mobile phones.

Based on their variance contributions, the principal components are consolidated into one indicator and converted logarithmically to create a new indicator, i.e. infrastructure (ln*Infra*)[4], whose descriptive statistics are shown in Table 7. On average, countries with higher incomes boast better infrastructure with a smaller coefficient of variation and a more balanced level of infrastructure development. Similarly, BRI countries boast a higher average level and more balanced distribution of infrastructure compared with non-BRI countries.

Table 3: Descriptive Statistics of Indicators Based on the PCA Method

Dimensions	Indicator	Unit of measurement	Mean	Standard deviation	Min.	Max.
Transportation	Air flights per 10,000 persons	Flight	83.35	378.67	0.06	5,374.14
Communication	Mobile telephones per 100 persons	Set	56.64	43.19	0.07	183.88
	Internet subscribers per 100 persons	Person	15.24	17.16	0.02	85
Energy	Per capita power consumption	kWh	1,431.79	1,571.24	28.48	10,698.22
	Per capita oil consumption	kg of petroleum equivalent	1,091.06	1,317.67	9.59	14,608.01
Healthcare	Share of rural population with access to basic sanitation facilities	%	48.34	33.56	1.69	100
	Share of urban population with access to basic sanitation facilities	%	66.20	26.91	11.27	100

Source: Calculated based on the compilation of the WDI database.

Table 4: KMO Test and SMC Test Results

Indicators	KMO	SMC
Air flights per 10,000 persons	0.6751	0.4988
Internet users per 100 persons	0.7840	0.7256
Mobile telephones per 100 persons	0.7461	0.6172
Per capita power consumption	0.7208	0.8859
Per capita energy consumption	0.6883	0.7994
Share of rural population with access to basic sanitation facilities	0.7457	0.8169
Share of urban population with access to basic sanitation facilities	0.7198	0.8158
Total	0.7281	——

Source: Compiled by the authors.

[3] As mentioned before, when the PCA method is employed to select principal components, a general criterion is that characteristic root exceeds one or cumulative contribution rate reaches 85%. The cumulative contribution rate of the three principal components selected in this study is 88.1%, and the characteristic root of the third principal component is close to one.

[4] Many studies have standardized the synthesized indicator, but in panel data, the common practice is to take logarithms rather than standardize data. Standardizing data aims to remove the impact of dimensionality, and this effect may also be achieved by taking logarithms. Since the consolidated data contain negative values, minimum values are subtracted from the data set, which is then added with 1 before logarithmic conversion.

Table 5: Characteristic Roots and Contribution Rates of Principal Components

Principal components	Characteristic root	Variance contribution rate	Cumulative contribution rate
Principal component 1	4.314	0.616	0.616
Principal component 2	1.031	0.147	0.763
Principal component 3	0.824	0.118	0.881
Principal component 4	0.499	0.071	0.953
Principal component 5	0.167	0.024	0.976
Principal component 6	0.096	0.014	0.990
Principal component 7	0.070	0.010	1.000

Source: Compiled by the authors.

Table 6: Component Loading Matrix

Indicators	Principal component 1	Principal component 2	Principal component 3
Air flights per 10,000 persons	0.331	-0.476	-0.243
Number of Internet subscribers per 100 persons	0.408	-0.059	0.424
Number of mobile phones per 100 persons	0.330	-0.001	0.750
Per capita power consumption	0.440	-0.256	-0.185
Per capita energy consumption	0.379	-0.305	-0.284
Share of rural population with access to basic sanitation facilities	0.382	0.519	-0.214
Share of urban population with access to basic sanitation facilities	0.363	0.584	-0.192

Source: Compiled by the authors.

Table 7: Grouped Descriptive Statistics of the Infrastructure Index

Group	Mean	Standard deviation	Min.	Max.	Coefficient of variation
High-income countries	1.618	0.363	1.193	2.290	0.224
Upper-middle-income countries	1.238	0.246	0.605	1.816	0.199
Lower-middle-income countries	0.728	0.318	0.039	1.472	0.437
Low-income countries	0.462	0.299	0	1.053	0.648
BRI countries	1.003	0.426	0	2.290	0.425
Non-BRI countries	0.772	0.419	0.032	1.906	0.543
Overall	0.905	0.438	0	2.290	0.484

Source: Compiled by the authors.

4.2 Economic Growth Effect of Foreign Aid via Infrastructure and Path Verification

We firstly performed a total sample regression to find out whether the mechanism in which foreign aid promotes economic growth via infrastructure development exists; this regression results are reported in Table 8. Since a great deal of heterogeneity may exist between countries, our estimation was performed using the fixed effect model, and the Hausmann test also indicated that the fixed effect model should be employed for estimation. In performing regression, we selected a lag term of foreign aid as the core independent variable to minimize the impact of endogeneity on the results (Sui et al., 2017; Zhu and

Huang, 2018) and considered the lag effect of aid influence in economic growth (Zhang, 2018b). As for the selection of lag phases, Zhang (2018b) found that the effect of aid normally comes with a two-phase lag. In performing the total sample regression, therefore, we prioritized the use of a two-phase lag.

Column (1) of Table 8 lists the results of regression performed based on equation (1). Results in Column (1) suggest that without considering the level of infrastructure development and with other variables under control, the coefficient of foreign aid (corresponding to α in equation (4)) is significantly positive at the 5% statistical level, which indicates that China's foreign aid to other countries has indeed induced economic growth in recipient countries, i.e. aid from China is effective. Specifically, an increase in aid from China by 1% will raise GDP per capita by 0.009%. In observing the coefficients of other control variables, we may arrive at the following conclusions:

(i) Coefficients of per capita fixed capital investment and government consumption are significantly positive, indicating that fixed capital investment and fiscal spending may sharply increase GDP per capita, and their economic effects on recipient countries are much greater than those of foreign aid, which is consistent with classical economic growth theories.

(ii) Coefficient of natural resources is negative but not significantly, which explains that an increase in natural resources may not cause growth in GDP per capita. On the contrary, abundant natural resources may even impede economic development in what is known as the "resource curse".

(iii) Coefficient of total population is positive, i.e. the amount of labor force is a key factor of economic growth.

(iv) Similar to Baldé (2009), coefficients of FDI and trade openness are both insignificant. A

Table 8: Total Sample Regression Results

	(1)	(2)	(3)
Variables	ln*GDPp*	ln*Infra*	ln*GDPp*
L2.ln*Aid*	0.00898**	0.00530***	0.00434**
	(0.00341)	(0.00172)	(0.00214)
ln*Infra*			0.937***
			(0.204)
ln*Capitalp*	0.197***	0.0173	0.221***
	(0.0559)	(0.0294)	(0.0522)
ln*Governp*	0.332***	0.0723*	0.225***
	(0.0813)	(0.0421)	(0.0652)
ln*Plantp*	-0.0963	-0.0495	-0.0962
	(0.117)	(0.0700)	(0.132)
ln*Population*	0.683***	0.915***	-0.0684
	(0.233)	(0.208)	(0.245)
ln*FDI*	0.00657	0.00529	0.00271
	(0.00701)	(0.00685)	(0.00968)
Open	-0.0251	0.0635	-0.120
	(0.0672)	(0.0494)	(0.0735)
WGI	0.0857	0.151**	-0.0237
	(0.0794)	(0.0596)	(0.111)
Constant	-6.257*	-14.86***	6.053
	(3.683)	(3.466)	(3.917)
N	483	336	336
R-squared	0.819	0.717	0.884
Country	89	60	60
Country FE	YES	YES	YES
Year FE	YES	YES	YES

Note: *** p<0.01, ** p<0.05, * p<0.1, and numbers in parentheses are robust standard errors.

Source: Calculated by the authors.

possible reason is that recipient countries have a relatively low level of economic development and easily succumb to competition from multinational companies, leading to the unimportant role of foreign capital and economic openness in economic development.

(v) Coefficient of institutional systems is insignificant, which is consistent with the finding of Zhu and Huang (2018).

This study performs regressions based on equations (2) and (3) to further analyze whether infrastructure is one of the conduits in which foreign aid influences economic growth; the results are reported in Columns (2) and (3) of Table 8. As shown in the results of Column (2), the effect of foreign aid as the core independent variable is significantly positive, indicating that aid from China may ramp up infrastructure development in recipient countries; this effect is represented by coefficient β in equation (5).

In addition to regression, Column (3) also introduces foreign aid as the core independent variable and infrastructure as the mediator, and the coefficient of foreign aid (corresponding to α in equation (6)) remains significantly positive despite a dip in its value, while the coefficient of infrastructure (corresponding to γ in equation (6)) is significantly positive. Judging by the regression results in Columns (1) through (3), α, β, and γ are all significantly positive, and so is α', which explains a significant partial mediation of infrastructure. Not only is foreign aid directly conducive to economic growth, but it may also induce economic growth in recipient countries by elevating the level of infrastructure, which takes 55.3% of the total effect.

4.3 Heterogeneity Analysis of Foreign Aid of Different Types

4.3.1 Comparison of financial aid of different types

China provides various types of foreign aid to other countries, including ODA and OOF. These two types of aid are different in terms of the form of aid, financing sources and preferential policies. Their economic growth effects for recipient countries could be heterogeneous. To further analyze how their differences potentially influence the way in which foreign aid induces economic growth via infrastructure development, we perform a regression of ODA and OOF, respectively, and the categorized regression results are reported in Table 9.

Regression results of ODA are reported in Columns (1)-(3). Coefficient of foreign aid in Column (1) is insignificant, indicating that ODA with a two-phase lag has no significant effect on economic growth in recipient countries, which is consistent with the conclusions of Zhang (2018b). Considering the diversity in ODA's lag effect, we use the current phase through the fifth-phase lag of ODA, and find no significant effect of it on the economic growth of recipient countries.

According to Wen et al. (2014), we proceed to perform a mediating effect test with results reported in Columns (2) and (3). In Column (3), the coefficient of infrastructure index is also significantly positive, but the coefficient of foreign aid is insignificant and negative. Based on the results of Columns (1)-(3), China's ODA has an insignificant aggregate effect on the economic growth of recipient countries, but its indirect effect on economic growth via infrastructure still exists, i.e. the suppressor effect exists. That is to say, either the indirect effect is in an opposite direction with ODA's direct effect, or another path of effect with a similar magnitude of infrastructure's indirect effect exists, thus reducing the aggregate effect (Zhao et al., 2010). The reasons are twofold. First, the amount of China's ODA remains modest and more focused on humanitarian assistance and debt relief, making its aggregate economic growth effect even less obvious. Second, a considerable portion of China's ODA went to such sectors as education and healthcare, raising the level of infrastructure development in those sectors. As such, ODA may spur economic growth in recipient countries by raising the level of infrastructure.

Regression results of OOF are reported in Columns (4)-(9). Among them, Columns (4)-(6) are regressions with a two-phase lag of foreign aid as the core independent variable, and Columns (7)-(9) are regressions with a one-phase lag of aid as the core independent variable. In Columns (4) and (5), the

Table 9: Regression Results for Different Types of Aid

Variables	ODA			OOF					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	ln*GDPp*	ln*Infra*	ln*GDPp*	ln*GDPp*	ln*Infra*	ln*GDPp*	ln*GDPp*	ln*Infra*	ln*GDPp*
L2.ln*Aid*	0.00218	0.00386*	-6.03e-06	0.00413	0.00121	0.00196			
	(0.00364)	(0.00215)	(0.00414)	(0.00908)	(0.00489)	(0.00681)			
L.ln*Aid*							0.0199*	0.0122**	0.0120
							(0.0103)	(0.00527)	(0.00756)
ln*Infra*			0.905***			1.639***			1.229***
			(0.268)			(0.156)			(0.248)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	311	198	198	104	92	92	110	95	95
R-squared	0.813	0.742	0.872	0.844	0.827	0.927	0.882	0.754	0.929
Country	78	52	52	47	38	38	46	37	37
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Source: Calculated by the authors.

coefficients of foreign aid are both insignificant.

In this paper, we employ the bootstrap method to test the significance of infrastructure's mediating effect and find that with a two-phase lag, OOF is free from the mediating effect of infrastructure. With a one-phase lag of foreign aid as the core independent variable, our conclusions have changed in the following ways: First, China's OOF has a positive effect on economic growth in recipient countries, which is subject to a one-phase lag. Second, infrastructure is one of the mediating conduits in which OOF exerts a positive effect on economic growth in recipient countries. Aside from its direct growth effect, China's OOF may also strengthen infrastructure in recipient countries and thus induce economic growth indirectly. Those direct and indirect effects will both occur with a one-year lag, and infrastructure's mediating effect makes up for about 75.35% of the aggregate effect. For one thing, China's OOF is large, market-based and often linked with development cooperation, and may motivate recipient countries via business, trade and energy development, thus contributing more to local economic growth (Zhang, 2018b). For another, a large portion of China's OOF was invested in infrastructure projects that could indirectly boost growth in recipient countries.

4.3.2 Effects of aid invested in various domains

The database also records the distribution of aid funds. Referring to Donaubauer et al. (2015), we classify aid funds into the four categories: Aid for economic infrastructure development (Aid1) such as transportation, communication, energy and financial infrastructure; aid for social infrastructure including education, healthcare and water resources (Aid2); aid for production sectors such as agriculture, industry, mining and tourism (Aid3); other aid (Aid4) such as fiscal support, debt relief and others without specific categories, which primarily flowed into the government sector. In 2000-2014, about 80% of aid from China went to economic infrastructure.

As revealed in the regression results of Table 10, aid for economic infrastructure and productive sectors has a significantly positive effect on economic growth. This result verifies the direct and indirect positive effects of aid on economic growth in recipient countries in the benchmark regression. Aid for social infrastructure and government also has a positive yet insignificant effect on the economy. The implication is that the effectiveness of both types of aid has yet to increase.

Table 10: Regression Results by the Types of Aid

	(1)	(2)	(3)	(4)
ln*Aid1*	0.0104*			
	(0.00550)			
ln*Aid2*		0.0002		
		(0.04)		
ln*Aid3*			0.0180**	
			(0.008)	
ln*Aid4*				0.0005
				(0.00455)
Control variables	YES	YES	YES	YES
R-squared	0.7261	0.5850	0.5038	0.5673
Country	71	71	60	59
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Source: Calculated by the authors.

4.4 Sub-Sample Analysis of BRI Countries

China's foreign aid serves as a pillar of the Belt and Road Initiative (BRI). We perform a comparative analysis of the subsamples of BRI and non-BRI countries with results shown in Table 11. As can be seen from the results of Column (1), China's foreign aid is highly effective in promoting economic growth for BRI countries. Furthermore, Columns (2) and (3) test the existence of the mediating effect. Since the coefficients of foreign aid in Column (2) and infrastructure in Column (3) are both significant, China's aid for BRI countries may drive economic growth in recipient countries by improving infrastructure. The indirect path in which foreign aid promotes economic growth via infrastructure development may explain for 42.87% of the aggregate economic growth effect of foreign aid. In non-BRI countries, we find the economic growth effect of aid to be insignificant. As mentioned before, China's aid for non-BRI countries was primarily provided in other forms of aid for humanitarian assistance and debt relief. Empirical results of the preceding section suggest that economic growth effect of this type of aid is insignificant, which chimes with our findings here.

Table 11: Regression Results of Subsamples of BRI and Non-BRI Countries

Variables	BRI countries			Non-BRI countries		
	(1)	(2)	(3)	(4)	(5)	(6)
	ln*GDPp*	ln*Infra*	ln*GDPp*	ln*GDPp*	ln*Infra*	ln*GDPp*
*L*2.ln*Aid*	0.00744***	0.00603***	0.00473***	0.00473	0.00168	0.00470
	(0.00216)	(0.00136)	(0.00128)	(0.00363)	(0.00111)	(0.00314)
ln*Infra*			0.529***			0.620***
			(0.166)			(0.213)
Control variables	YES	YES	YES	YES	YES	YES
N	211	188	188	272	148	148
R-squared	0.944	0.763	0.952	0.816	0.867	0.888
Country	38	33	33	51	27	27
Country FE	YES	YES	YES	YES	YES	YES

4.5 Endogeneity Problem and Robustness Test

There could be a two-way causal relationship between foreign aid and economic growth, which may give rise to endogeneity problem and cause the results to lack robustness. In the preceding section, we have employed the lag term of foreign aid as an explanatory variable to perform a regression to mitigate the endogeneity problem. In this section, we proceed to explain this question theoretically and empirically.

Although Burnside and Dollar (2000) suggest that foreign aid is more likely to flow into poor countries, there is no theoretical evidence that aid donors give preference to countries and regions with lower levels of economic development, i.e. the reverse causality between economic growth and foreign aid may not hold true. First, international aid donors prefer to plough funds into highly effective countries and regions, which are generally not those with low levels of economic development (Swiss, 2016). Second, not all foreign aid programs seek no return. When providing aid, donor countries often consider their economic interests. When determining the flow of funds, donor countries are mindful of the economic and political strategic significance of aid programs and not just the economic development of recipient countries (Marysse et al., 2007). Third, China's foreign aid is increasingly concerned with upper-middle-income countries (Figure 4) and dominated by OOF, which tend to be commercially operated without prioritizing poor countries. As such, the two-way causality generally may not hold true.

With respect to the econometric model, we make the following improvements to reduce the impact of endogeneity problem and test the robustness of results: First, performing a 2SLS regression using the instrumental variable method; second, the infrastructure variable (ln*Infra2*) comprising the first two principal components is employed to substitute the above-mentioned infrastructure index. As for the selection of instrumental variables, we make the following two attempts: First, referencing Nunn and Qian (2014) and Dreher et al. (2017), we use the logarithm of interaction term between China's steel output[5] and the number of aid programs received by recipient countries from China in 2003-2014 as the instrumental variable. Second, following Zhu and Huang's (2017) approach, we attempt to use voting consistency of recipient countries at the UN General Assembly with China in 2003-2014 as the instrumental variable of foreign aid.[6] In their study on how US food aid would influence conflicts in recipient countries, Nunn and Qian (2014) employed the interaction term between US wheat output and the number of aid programs received by recipient countries as the instrumental variable of aid. In a study on the economic growth effects for recipient countries, Dreher et al. (2017) use the interaction term between China's steel output and the possibility for countries to receive aid from China as the instrumental variable of China's foreign aid. China's output of steel as an important aid material may influence the size of its foreign aid, but bears no direct impact on the economic growth of recipient countries.

In examining the trade stimulation effects of China's aid for recipient countries, Zhu and Huang (2017) use voting intimacy between recipient countries and China as the instrumental variable of foreign aid. Burnside and Dollar (2000) believe that donor countries take political factors into consideration when providing aid to recipient countries. Voting consistency at the United Nations General Assembly reflects the political intimacy between two countries, which does not affect the economic growth of recipient countries (Rajan and Subramanian, 2005). In this paper, we use the logarithm of the interaction term between China's steel output and the number of aid programs received by countries from China as the instrumental variable for 2SLS regressions, respectively, with results reported in Table 12.

As shown in Columns (1)-(3) of Table 12, the logarithm of interaction term between China's steel output and the number of aid programs received by countries from China as the instrumental variable

[5] Source: The National Bureau of Statistics (NBS).
[6] Source: The United Nations General Assembly Voting Data.

Table 12: Robustness Test with the Instrumental Variable Method

Variables	Steel output and number of aid programs received			Voting consistency with China		
	(1)	(2)	(3)	(4)	(5)	(6)
	ln*GDPp*	ln*Infra*	ln*GDPp*	ln*GDPp*	ln*Infra*	ln*GDPp*
ln*Aid*	0.144***	0.123***	0.0627***	-0.504	0.113	-0.124
	(0.0342)	(0.0340)	(0.0186)	(2.721)	(0.163)	(0.260)
ln*Infra2*			0.629***			1.014*
			(0.141)			(0.595)
ln*Capitalp*	0.157**	-0.0375	0.233***	0.729	-0.0298	0.347**
	(0.0659)	(0.0713)	(0.0463)	(2.410)	(0.131)	(0.172)
ln*Governp*	0.270***	0.0264	0.220***	0.624	0.0332	0.299**
	(0.0713)	(0.0654)	(0.0548)	(1.468)	(0.117)	(0.126)
ln*Plantp*	0.0990	0.246	0.155	-0.205	0.225	-0.213
	(0.210)	(0.277)	(0.135)	(1.736)	(0.383)	(0.554)
ln*Population*	0.708**	1.060***	0.129	0.168	1.057***	-0.318
	(0.281)	(0.337)	(0.233)	(2.560)	(0.308)	(0.729)
ln*FDI*	-0.00868	0.00214	-0.00375	0.0848	0.00326	0.00996
	(0.0151)	(0.0179)	(0.0117)	(0.405)	(0.0237)	(0.0288)
Open	0.101	0.229**	-0.0340	-0.616	0.216	-0.285
	(0.102)	(0.116)	(0.0624)	(3.042)	(0.218)	(0.361)
WGI	0.0394	0.157	0.0285	-0.232	0.150	-0.121
	(0.108)	(0.157)	(0.0925)	(1.233)	(0.164)	(0.259)
Under-identification test	17.256	11.580	16.958	0.036	0.512	0.305
	[0.0000]	[0.0007]	[0.0000]	[0.8500]	[0.4742]	[0.5809]
Weak identification test	22.746	14.069	17.372	0.030	0.510	0.305
	{8.96}	{8.96}	{8.96}	{8.96}	{8.96}	{8.96}
Davidson-MacKinnon test	266.669	506.1877	47.75421	3.216098	6.98761	3.308931
	[5.7e-50]	[8.3e-74]	[1.8e-11]	[0.0734]	[0.0085]	[0.0696]
N	707	488	488	701	488	488
R-squared	-0.360	-3.188	0.684	-15.197	-2.526	-0.073
Country	90	65	65	89	65	65
Country FE	YES	YES	YES	YES	YES	YES

Note: Statistic for the under-identification test is the Kleibergen-Paap rk LM statistic. Statistic for the weak identification test is Cragg-Donald Wald F statistic 1. Numbers in brackets "[]" are P values of the statistic. Numbers in braces "{}" are the Stock-Yogo weak ID test critical values at the 15% confidence interval.
Source: Calculated by the authors.

has passed the under-identification test, the weak identification test and the explanatory variables endogeneity test (Davidson-MacKinnon test). As such, the logarithm of interaction term between China's steel output and the number of aid programs received is reasonable and valid, and no major change has occurred in the coefficients of the core independent variable, mediator and control variables and their significance, which proves this model to be robust. After the instrumental variable method is employed to further reduce endogeneity, the economic growth effects of foreign aid increase, and the path still exists in which foreign aid promotes economic growth via infrastructure development. Results of Columns (4) to (6) suggest that voting consistency between recipient countries and China as

the instrumental variable fails to pass the under-identification test and the weak identification test, i.e. no correlation exists between instrumental variable and endogenous variable, which further indicates that China's foreign aid is based on the close ties between both countries and are free from any political strings.

5. Conclusions and Policy Recommendations

This paper investigates the economic growth effects of China's foreign aid for recipient countries from 2003 to 2014, as well as the possibility for foreign aid to influence economic growth via infrastructure development. Our findings suggest the following conclusions:

First, China's foreign aid may significantly boost economic growth in those countries, which refutes the argument that "aid from China adds to the economic burden of recipient countries" and offers empirical evidence for the effectiveness of China's foreign aid.

Second, China's foreign aid indirectly drives economic growth in recipient countries by elevating local infrastructure development, and this indirect path explains 55.3% of the aggregate effect of aid on the local economy.

Third, OOF, which are larger, market-based, and often promote business operations, international trade, and energy development level, contribute more significantly to economic growth, whereas official development aid (ODI) involving smaller sums of money and often used for humanitarian assistance or debt relief has an insignificant effect on economic growth.

Fourth, the finding that BRI countries may benefit from the economic growth effects of China's foreign aid both directly and indirectly via infrastructure development provides the theoretical basis for foreign aid to serve as a key pillar of the BRI strategy. To further advance China's foreign aid work and the BRI's implementation, our research conclusions offer the following policy implications:

(i) China's foreign aid may significantly induce economic development in recipient countries. It is advisable that China better defines the criteria of foreign aid within its fiscal affordability. The amount of gratuitous aid should be modest and used as a tool to promote economic cooperation between China and recipient countries for win-win results.

(ii) We should continue increasing the sources of aid funds and improving aid structure by expanding the share OOF. Not only is OOF more effective than ODA in spurring economic growth, but its market-based nature will also benefit recipient countries. Other official flows tend to be invested for development and are uniquely positioned to facilitate two-way trade and economic cooperation.

(iii) Special attention should be given to infrastructure development. By investing more in infrastructure, China should use its aid programs to clear development hurdles for recipient countries and bolster their indigenous development capabilities. Instead of transferring cash donations, it should help these countries generate fiscal revenues and wean themselves from dependence on foreign aid. Some 55% of the economic growth effect of China's foreign aid has been materialized via infrastructure improvement. Economic development hinges upon the quality of infrastructure, the lack of which has stymied local economic development in some countries, especially in Africa. In foreign aid and investment in those countries, therefore, China should focus even more on infrastructure.

(iv) The BRI's implementation should be facilitated by balancing foreign aid with investment and increasing inter-departmental coordination for aid, investment, and trade. Both foreign aid and outbound foreign direct investment (OFDI) are important tools for implementing the BRI strategy. Yet in the absence of top-design and strategic arrangements for foreign aid and OFDI under the more recent BRI, some overlaps exist in terms of their objectives and functions, and mechanisms for inter-departmental cooperation are not in place. As a result, the boundary of departmental rights and responsibilities is vague and coordination inadequate. It is advisable for China to establish a sound mechanism for foreign aid and OFDI coordination at the macroscopic level, identify their respective priorities, and improve the

level of management for foreign aid and OFDI to reinforce each other.

References:

[1] Alden, Chris. 2005. *China in Africa.* Oxfordshire: Routledge Handbook of African Politics.

[2] Aschauer, David A. 1988. "Is Public Expenditure Productive?" *Staff Memoranda*, 23(2):177-200.

[3] Baldé Yéro. 2009. "Remittances and Economic Growth in Sub-Saharan Africa." *World Development*, 33: 1–23.

[4] Burnside, Craig, and David Dollar. 2000. "Aid, Policies, and Growth." *American Economic Review*, 90(4): 847-868.

[5] Dalgaard, Carl-Johan, and Henrik Hansen. 2001. "On Aid, Growth and Good Policies." *Journal of Development Studies,* 37(6): 17-41.

[6] Dalgaard, Carl-Johan, Henrik Hansen, and Finn Tarp. 2002. "On the Empirics of Foreign Aid and Growth." *The Economic Journal*, 114(496):191-216.

[7] Donaubauer, Julian, Birgit Meyer, and Peter Nunnenkamp. 2016. "Aid, infrastructure, and FDI: Assessing the Transmission Channel with a New Index of Infrastructure." *World Development*, 78: 230-245.

[8] Dreher Axel, Andreas Fuchs, Bradley Parks, Austin Strange, and Michael J. Tierney. 2017. "Aid, China, and Growth: Evidence from a New Global Development Finance Dataset." *AidData Working Paper*. Williamsburg, VA: AidData.

[9] Duggal, Vijaya G., Cynthia Saltzman, and Lawrence R. Klein. 1999. "Infrastructure and Productivity: A Nonlinear Approach." *Journal of Econometrics*, 92(1):47-74.

[10] Economides, George, Sarantis Kalyvitis, and Apostolis Philippopoulos. 2008. "Does Foreign Aid Distort Incentives and Hurt Growth? Theory and Evidence from 75 Aid-recipient Countries." *Public Choice*, 134(3):463-488.

[11] Feeny, Simon, and Tim R.L. Fry. 2014. "How Sustainable is the Macroeconomic Impact of Foreign Aid?" *Journal of Policy Modeling*, 36(6):1066-1081.

[12] Finn, Mary G. 1993. "Is All Government Capital Productive?" *FRB Richmond Economic Quarterly*, 79(4): 53-80.

[13] Gomanee, Karuna, Oliver Morrissey, Paul Mosley, and Arjan Verschoor. 2005. "Aid, Government Expenditure, and Aggregate Welfare." *World Development*, 33(3):355-370.

[14] Guillaumont, Patrick, and Lisa Chauvet. 2001. "Aid and Performance: A Reassessment." *Journal of Development Studies*, 37(6):66-92.

[15] Halper, Stefan. 2010. *The Beijing Consensus: How China's Authoritarian Model Will Dominate the Twenty-first Century.* Sydney: ReadHowYouWant.com.

[16] Hansen, Henrik, and Finn Tarp. 2000. "Aid Effectiveness Disputed." *Journal of International Development*, 12(3):375-398.

[17] Hulten, Charles R., Esra Bennathan, and Sylaja Srinivasan. 2006. "Infrastructure, Externalities, and Economic Development: A Study of the Indian Manufacturing Industry." *The World Bank Economic Review*, 20(2):291-308.

[18] Leshoro, Temitope. 2013. "Foreign Aid and Economic Growth in South Africa: An Empirical Analysis Using Bounds Testing." *Journal of Economic and Financial Sciences*, 6(1):55-56.

[19] Levy, Victor. 1988. "Aid and Growth in Sub-Saharan Africa: The Recent Experience." *European Economic Review*, 32(9):1777-1795.

[20] Li, Wei, Jie Huang, Kaijun Wang, Xilong Mao, and Feiyan Chen. 2010. "Education Assistance to Africa: We Can Do More and Better." *Transition Studies Review*, 17(2): 280-296.

[21] Li, Ping, Chunhui Wang, and Guocai Yu. 2011. "Infrastructure and Economic Development: A Literature Survey." *The Journal of World Economy*, 34(05):93-116.

[22] Lin, Yifu, and Yan Wang. 2016. *Going Beyond Aid: Development Cooperation for Structural Transformation*. Cambridge: Cambridge University Press.

[23] Marysse, Stefaan, An Ansoms, and Danny Cassimon. 2007. "The Aid 'Darlings' and 'Orphans' of the Great Lakes Region in Africa." *European Journal of Development Research*, 19(3): 433-458.

[24] Minasyan, Anna. 2015. "Your Development or Mine? Effects of Donor–recipient Cultural Differences on the Aid-growth Nexus." *Journal of Comparative Economics*, 44(2): 309-325.

[25] Minoiu, Camelia, and Sanjay G. Reddy. 2010. Development Aid and Economic Growth: A Positive Long-Run Relation." *The Quarterly Review of Economics and Finance*, 50(1): 27-39.

[26] Munnell, Alicia H. 1990. "Why Has Productivity Growth Declined? Productivity and Public Investment." *New England Economic Review*, 30(1):3-22.

[27] Nunn, Nathan, and Nancy Qian. 2014. "US Food Aid and Civil Conflict." *American Economic Review*, 104(6):1630-66.

[28] Papanek, Gustav F. 1973. “Aid, Foreign Private Investment, Savings, and Growth in Less Developed Countries.” *Journal of Political Economy*, 81(1):120-130.

[29] Rajan, Raghuram G., and Arvind Subramanian. 2008. “Aid and Growth; What Does the Cross-Country Evidence Really Show?” *The Review of Economics and Statistics*, 90(4): 643-665.

[30] Romp, Ward, and Jakob De Haan. 2007. “Public Capital and Economic Growth: A Critical Survey.” *Perspektiven Der Wirtschaftspolitik*, 8(S1):6-52.

[31] Shioji, Etsuro. 2001. “Public Capital and Economic Growth: A Convergence Approach.” *Journal of Economic Growth*, 6(3):205-227

[32] Sui, Guangjun, Liangxiong Huang, and Xing Huang. 2017. “China’s Foreign Direct Investment, Infrastructure Construction and the ‘Belt and Road’ National Economic Growth.” *Journal of Guangdong University of Finance and Economics*, 32(1):32-43.

[33] Svensson, Jakob. 2000. *Foreign Aid and Rent-seeking*. Washington, DC: The World Bank.

[34] Swiss, Liam. 2016. “Foreign Aid Allocation from a Network Perspective: The Effect of Global Ties.” *Social Science Research,* 63:111-123.

[35] Teboul, Rene, and Emmanuelle Moustier. 2001. “Foreign Aid and Economic Growth: The Case of the Countries South of the Mediterranean.” *Applied Economics Letters*, 8(3):187-190.

[36] Tull, Denis M. 2006. “China’s Engagement in Africa: Scope, Significance and Consequences.” *The Journal of Modern African Studies*, 44(3): 459-479.

[37] Wang, Wenqing, and Zhongxiu Zhao. 2014. “Impact of China-Africa Cooperation on Economic Growth of Sub-Saharan African Countries: An Empirical Analysis on Role of Trade, FDI and Aid.” *Journal of International Trade*, 12:68-79.

[38] Wen, Zhonglin, and Baojuan Ye. 2014. “Analyses of Mediating Effects: The Development of Methods and Models.” *Advances in Psychological Science*, 22(5):731-745.

[39] Young, Andrew T., and Kathleen M. Sheehan. 2014. “Foreign Aid, Institutional Quality, and Growth.” *European Journal of Political Economy*, 36:195-208.

[40] Zhao, Xinshu, John G. Lynch Jr, and Qimei Chen. 2010. “Reconsidering Baron and Kenny: Myths and Truths about Mediation Analysis.” *Journal of Consumer Research*, 37(2):197-206.

[41] Zhang, Jun, Yuan Gao, Yong Fu and Hong Zhang. 2007. “Why Does China Enjoy So Much Better Physical Infrastructure?” *Economic Research Journal*, 3:4-19.

[42] Zhang, Yuan. 2018a. “Poverty Reduction Effect of China’s Foreign Aid and Investment in Latin America and the Caribbean since the New Century.” *Pacific Journal*. 26(12):61-73.

[43] Zhang, Yuan. 2018b. “Poverty Reduction Effect of Chinese Aid and OFDI in ‘the Belt and Road’.” *Finance and Trade Economics*, 39(12):111-125.

[44] Zhu, Dan, and Haibo Huang. 2018. “Does China’s Foreign Aid Enhance Recipients’ Economic Growth: Effectiveness of ‘Aid for Trade’.” *China Economic Studies*, 02:24-33.

[45] Zhu, Weiwei, Kangning Xu, and Meichang Wang. 2018. “Does China’s Aid Effectively Promote Africa’s Economic Growth?” *Journal of International Trade*, 07:108-120.