

# An Analysis of the Influencing Factors and Efficiency of Chinese Foreign Direct Investment in Africa

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## Abstract

Since the reform and opening up, Chinese Foreign Direct Investment has grown rapidly, especially in Africa. Based on Stochastic Frontier Models, this paper analyzes the economic and political factors of Chinese Foreign Direct Investment in Africa and explores the distribution of investment efficiency in 27 African countries from 2010 to 2016. The results show that population, GDP per capita, economic freedom, and natural resources are all important factors affecting Chinese investment in African countries. However, at present, market seeking has become the main motivation of Chinese investment. And the degree of corruption control and government efficiency in African countries will have different effects on Chinese investment distribution efficiency in Africa.

## Keywords

China, foreign direct investment, Africa, efficiency.

## 1. INTRODUCTION

For a long time, Foreign Direct Investment (FDI) has been widely concerned by the international community. Most scholars believe that FDI can reflect the preference of the investor countries and the advantage of the recipient countries. Therefore, it is very important to explore the efficiency of FDI.

As the largest developing country in the world, Chinese FDI is increasing every year. In the 1980s, China carried out the national policy of opening up to the outside world. While introducing foreign capital, it also stepped out the pace of "Going Global" for Chinese enterprises. Influenced by the dual international and domestic environment at that time, most of the enterprises invested abroad by China were state-owned enterprises. Naturally, most of the enterprises invested in Africa were controlled by the state, which reflected the will of the state to a certain extent. In the early stage, there was research and analysis finding that the multinational enterprises of Chinese FDI in Africa had non-market behavior, which also reflected the deviation of the investment preference of Chinese multinational enterprises from the traditional theory of FDI. After China's accession to the WTO in 2001, the pace of Chinese "Going Out" has accelerated, and more and more enterprises have gone to the continent of Africa. Among them, the proportion of non-state-owned enterprises' investment in Africa has increased, and the composition of investment industry flow has also changed greatly. After the impact of the global financial crisis, China took the lead in getting out of the mire and accelerating the transformation of economic development mode, which will inevitably affect the motivation and direction of Chinese FDI. Chinese FDI in Africa is special, and the progress of China Africa investment relationship is worth exploring. First of all, the cooperative relationship between China and African countries is a step-by-step process, that is, from some countries to

the whole African continent. According to Chinese FDI bulletin in 2016, Chinese investment stock in Africa in 2010 was 7.8 billion dollars, and the investment stock in 2016 was 39.9 billion dollars, with an average annual growth rate of 11.5%; the investment coverage of Chinese transnational investment enterprises in Africa has reached 90%. Secondly, most of Chinese investors in Africa were state-owned enterprises, which may lead to their investment serving the country's diplomatic and political purposes; now, with the increase of the proportion of non-state-owned enterprises and the improvement of Chinese marketization, Chinese investors are also more and more marketized in Africa.

This paper mainly discusses Chinese FDI in Africa under the current national conditions, and pays attention to the investment motivation and location choice of Chinese enterprises in Africa. Using the Stochastic Frontier Model and the method of estimating the efficiency value, this paper analyzes the traditional economic and political factors that affect the distribution of Chinese FDI in Africa. To some extent, this paper hopes to help to clarify the investment motivation and direction of Chinese multinational enterprises in Africa, improve investment efficiency, and provide suggestions for African countries to attract Chinese investment.

The rest of the paper is organized as follows. In the next section we review related literatures. Section 3 illustrates the method and model we employ, variables, and the sources of data. Section 4 presents our empirical findings. Section 5 gives conclusion and policy suggestion.

## **2. LITERATURE REVIEW**

### **2.1. Chinese Investment Motivation in Africa**

According to the eclectic theory of international production, there are three types of motivations for FDI: market seeking, efficiency seeking, and resource seeking (including strategic assets) [1]. Because its theory of FDI is based on industrialized countries, it can not be fully applied to countries like China, which have their own particularity and are emerging markets. Among them, the purpose of strategic asset seeking FDI is to obtain the brand, technology and other resources of the host country. Therefore, Chinese investment in developed countries will have obvious strategic asset seeking motivation [2]. However, the development level of strategic assets of African countries lags behind that of China, so Chinese FDI in African countries generally has no such motivation.

Buckley et al. provides a good perspective for the analysis of Chinese investment motivation in Africa [3]. First of all, with the transformation of Chinese economic development mode and the continuous promotion of capacity reduction, inventory reduction and cost reduction, it is an important way to resolve domestic overcapacity and realize industrial upgrading to actively carry out FDI and expand foreign markets in developing countries. Market seeking FDI is one of the ways for MNCs in emerging economies to promote the export of domestic products to other large-scale and fast-growing markets [3]. With the expansion of market scale, opportunities for effective utilization of resources and seeking economies of scale would also increase [4]. It also has been pointed out that aggressive market seeking motivation drives Chinese multinational enterprises to invest overseas, and it is assumed that such investment behavior directly points to the large market [5-7]. Secondly, in order to ensure domestic economic growth and people's living needs, Chinese government needs to ensure the supply of scarce resources through FDI [8-9]. Important resources include ore, oil, wood and agricultural products [10-11]. Buckley et al. shows that Chinese FDI is positively related to the resource endowment of the host countries [3]. Finally, efficiency seeking FDI, also known as cost seeking FDI, is a means for multinational enterprises to allocate resources globally in order to reduce production costs. In view of Chinese national conditions at that time, Buckley et al. believes that efficiency seeking motivation would not happen to Chinese enterprises [3]. Similarly, Deng thinks that the motivation of efficiency seeking in Chinese initial investment stage is not strong [2]. However, Cai Fang believes that

Chinese working age population has reached its peak in 2010, and will turn into a negative dividend after that, which means that Chinese labor cost will rise, and efficiency seeking may exist in the investment motivation of Chinese multinational enterprises. Whether efficiency seeking FDI can be used as the motivation of Chinese FDI in Africa remains to be verified.

## 2.2. "Attraction" and "Exclusion" of African Countries

Africa receives FDI from all over the world. According to UNCTAD, before 2000, the most important investment countries of African countries were France, Germany, the United Kingdom and the United States; however, as emerging market countries such as China, India and Malaysia increased their investment in African countries, the investment amount of developed countries in Africa has been less than that of emerging market countries.

Some scholars think that the general factor that African countries attract investors from all countries is the natural resources to be developed [12-13]. But its research suggests that African countries have other attractions in recent years, three of which are labor cost, trade openness, and economic growth rate. There are three main reasons for the low labor cost in African countries: the low cost of training, the low cost of social security, and the high supply of labor [14-15]. For some labor-intensive multinational manufacturing enterprises, the attraction of low labor cost is particularly important. In addition, some researchers show that market openness is positively correlated with FDI inflow [16-17]. For example, African countries' policies on tariffs, subsidies and so on will potentially affect the transaction costs of investment, thus encouraging or hindering the inflow of FDI. Finally, a high economic growth rate in the host countries means a high return on investment. Therefore, a high economic growth rate is one of the important ways for African countries to attract FDI [18].

However, some defects of African countries exclude or destroy the inflow of FDI. According to the research of Naudé and Krugel, two major defects criticized by investors are social and political instability, corruption and grey economy [19]. Social and political instability in African countries includes conflicts between countries, internal conflicts and policy changes caused by changes in leadership, such as similar events that increase the risk of investment, undermine the continuity and willingness of FDI. Corruption and grey economy will increase the investment cost of multinational enterprises and reduce the confidence of investors.

## 3. EMPIRICAL STRATEGY AND DATA

### 3.1. Model

In this paper, based on Stochastic Frontier Model of Chinese FDI in Africa, I explore a number of economic and political factors that influence Chinese FDI in Africa and estimate the efficiency of each sample. This article uses panel data,  $i$  for an African country, and  $t$  for a year. The Stochastic Frontier Model of Chinese FDI in African countries can be expressed as follows [20]:

$$FDI_{it} = f(x_{it}; \beta) \exp\{v_{it}\} TE_{it} \quad (1)$$

$FDI_{it}$  measures Chinese FDI received by an African country  $i$  in year  $t$ .  $f(\cdot)$  is the Chinese FDI frontier.  $x_{it}$  is the vector of economic and political factors of Chinese FDI observed for country  $i$  in year  $t$  and  $\beta$  is the vector of the technology parameters to be estimated. The stochastic frontier consists of  $f(\cdot)$  that affects all samples and country-specific  $\exp\{v_{it}\}$ .  $TE_{it}$  is denoted as the technical efficiency of each African country  $i$  in year  $t$ . Re-arranging equation (1) we can get:

$$TE_{it} = \frac{FDI_{it}}{f(x_{it}; \beta) \exp\{v_{it}\}} \quad (2)$$

According to Cullinane and Song (2006), if  $f(\cdot)$  is in the form of linear Cobb Douglas, the model can be expressed as follows:

$$\ln FDI_{it} = \beta_0 + \sum_n \beta_n \ln x_{nit} + vit - uit \quad (3)$$

It is assumed that  $vit \sim N(0, \sigma_v^2)$  is independent of  $uit$  and  $uit$  is a non-negative inefficiency term of African country  $i$ , and  $uit \sim N(0, \sigma_u^2)$ . According to equation (3), Chinese FDI in African country  $i$  in year  $t$  depends on constant  $\beta_0$ ,  $n$  explanatory variables, non-negative inefficiency term  $uit$  and random error term  $vit$ .

### 3.2. Data

The sample countries include Algeria, Angola, Botswana, Cameroon, Congo D.R, Congo, Cote d'Ivoire, Egypt, Ethiopia, Ghana, Kenya, Madagascar, Mali, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Senegal, Seychelles, South Africa, Tanzania, Togo, Uganda, Zambia, Zimbabwe, a total of 27 countries, with a time span of 2010 to 2016. Index selection and data sources are as follows.

#### 3.2.1 Variable

In this paper, the dependent variable of this model is Chinese FDI in African countries, using annual flow data. The explanatory variables are divided into two parts: one is economic factors, which affect the flow of FDI; the other is political system factors, which affect the efficiency of investment allocation. Among them, the explanatory variable  $x_{it}$  represents the factors that affect FDI flow. The following indicators are taken as economic explanatory variables: population, GDP per capita, inflation rate, index of economic freedom, proportion of minerals and metals in commodity exports.

This paper selects economic explanatory variables according to investment motivation. First of all, market seeking can be measured by absolute market size, per capita market size, market growth speed and market stability. On the one hand, population is used to measure the absolute size of host country market. On the other hand, it is used to measure the supply of labor. GDP per capita is an important indicator of a country's development level, and also a measure of national purchasing power. GDP per capita is included in the explanatory variable because it can measure the market size per capita, and its annual increment size and stability can reflect the market growth speed and the stability of national economic development to a certain extent. Inflation rate is an index to measure the stability of the market, which reflects the level of price change and the degree of currency devaluation. Moderate inflation will promote the stable development of national economy and attract foreign investment. The index of economic freedom is one of the authoritative evaluation indexes of economic freedom in the world. It can be divided into ten categories: trade policy, government financial expenditure, government intervention in the economy, monetary policy, capital flow and foreign investment, banking and financial industry, wages and prices, property rights, regulation, and informal market activities. This paper uses the index of economic freedom to measure the economic freedom of African countries. The floating space of the index value is 0-100. The larger the index value is, the higher the economic freedom is, the stronger the attraction to foreign investment is. Secondly, resource seeking can be measured by a country's resource endowment index. In this paper, the proportion of minerals and metals in commodity exports is used to represent the natural resource richness of a country. The reason is that China generally imports oil and gas fuel resources from the Middle East, Arabia, Russia and other regions, and China and Africa are far

away, with high transportation costs. Therefore, the natural resources that African countries attract China are mainly metal ores.

In addition, the factors that affect the efficiency of Chinese FDI in African countries are represented by political variable  $z$  (the determinant of efficiency value), which is composed of the following indicators: government effectiveness, control of corruption, political stability, and regulatory quality. Government effectiveness is associated with a high quality of public services in a given country. Control of corruption “reflects perceptions of the extent to which public power is exercised for private gain,” according to the source. Political stability measures perceptions of the likelihood that political agents (governments and parliamentary forces) cannot be changed by unconstitutional means. Regulatory quality is associated with the ability of governments to clearly legislate.

Some studies suggest that some political factors affecting the investment environment may be more significant than traditional factors. Some studies suggest that a stable political system can maximize the attractiveness of most direct investment [21-22]. On the contrary, political conflicts and frequent changes of leadership will significantly reduce the possibility of obtaining FDI. From the perspective of investors, the host country with a clear set of laws and regulations will reduce the operating time cost of investment, increase the speed of capital turnover and profits; and the fuzzy legal boundaries will undoubtedly increase the additional investment cost, significantly damage the investment opportunities, leading to the withdrawal of investment. More effective investment is often accompanied by a healthy political system. On the one hand, a healthy political system can reduce the costs associated with corruption. Compared with countries with low level of corruption, the same investment has a heavier tax burden in countries with high level of corruption [23]. On the other hand, government efficiency itself is a strong signal for overseas investors. The government can attract foreign direct investment by improving efficiency. Therefore, this paper uses these four indicators to constitute the political variables that affect the efficiency value.

**Table 1.** Data sources

Variable	Source
China OFDI	Bulletin of China OFDI (2016)
Population	WDI
GDP per capita	WDI
Inflation rate	IMF
Index of economic freedom	American Heritage Foundation
Proportion of minerals and metals in commodity exports	WDI
Government effectiveness	WGI
Control of corruption	WGI
Political stability	WGI
Regulatory quality	WGI

### 3.2.2 Data sources

The data sources are the Bulletin of China OFDI (2016), the World Development Indicators, the Worldwide Governance Indicators, International Monetary Fund (IMF) database, and American Heritage Foundation. Table 1 gives specific sources of variable data. Table 2 reports the descriptive statistics for the variables used to estimate our system of equations. From the

perspective of data availability, this paper has three main limitations. First, no matter how robust the method is, the new data can get different results; second, selecting other variables that affect FDI will produce different efficiency values; finally, under the given technology setting, other methods of estimating efficiency values (such as DEA) may also produce different estimates.

**Table 2.** Descriptive statistics

Variable	Mean	Standard deviation	Minimum	Maximum	N
China OFDI (log)	11.59	0.18	9.8	12.1	189
Population(log)	7.45	1.55	2.2	9.8	189
GDP per capita(log)	7.41	1.04	5.8	9.7	189
Inflation rate(log)	1.42	1.02	-2.3	3.5	179
Index of economic freedom(log)	4.00	0.18	3.1	4.3	188
Proportion of minerals and metals in commodity exports(log)	1.26	2.27	-4.6	4.5	159
Government effectiveness(log)	0.62	0.30	0.1	1.3	189
Control of corruption(log)	0.61	0.32	-0.3	1.3	189
Political stability(log)	0.54	0.58	-1.2	1.3	189
Regulatory quality(log)	0.63	0.35	-0.8	1.3	189

#### 4. RESULTS AND DISCUSSION

Table 3 shows the maximum likelihood estimates of stochastic frontier parameters of Chinese FDI in 27 African countries from 2010 to 2016. In Table 3, the significance level of population variable is very high and its coefficient is positive, indicating that the larger the total population in an African country, the more Chinese FDI in this country. This is in line with previous expectations for the effect of demographic variables. With the expansion of absolute market scale, the demand for goods and services produced by investment will increase. Moreover, for African countries, a larger population means a more sufficient supply of labor force, which will undoubtedly reduce labor cost, which is also an incentive for Chinese investment in Africa.

Compared with the population variable, the GDP per capita variable is not only very significant, but also has a greater positive effect on Chinese FDI in Africa. With the adjustment of Chinese domestic industrial structure, the composition of Chinese FDI is bound to be affected, and the proportion of investors in Chinese non-state-owned enterprises is growing. The goal of non-state-owned enterprises is to maximize profits. It is necessary to pay more attention to the per capita income of the host country. The higher the GDP per capita means the stronger the per capita consumption capacity, so the investment profit space will increase. So a higher GDP per capita means more investment.

**Table 3.** Maximum-likelihood estimates of parameters of the stochastic frontier for Chinese FDI on African countries

	China OFDI (log)
Population(log)	0.065*** (0.000)
GDP per capita(log)	0.166*** (0.000)
Inflation rate(log)	0.007*** (0.000)
Index of economic freedom(log)	-0.214*** (0.000)
Proportion of minerals and metals in commodity exports(log)	0.017*** (0.000)
Government effectiveness(log)	-3.223*** (0.776)
Control of corruption(log)	4.213*** (0.830)
Political stability(log)	-0.130 (0.268)
Regulatory quality(log)	0.041 (0.522)
Constant	-2.850*** (0.267)
N	151

\*\*\* Significance level: 1%.

\*\* Significance level: 5%.

\* Significance level: 10%.

It can be seen from the table that a higher inflation rate will not reduce Chinese FDI in African countries, but will be attractive to investment to some extent. The inflation caused by demand side pressure means that the economy is full of vitality and the probability of investment return is greater, so it will attract investment. However, although the inflation rate coefficient is positive and significant, the value is too small, and its effect can be ignored.

Interestingly, the index coefficient of economic freedom is very significant and negative. According to the traditional theory of foreign investment, given other conditions, compared with countries with low economic freedom index, countries with high economic freedom index are more attractive to foreign direct investment. This is the opposite in Africa. The reason may be that the backwardness of economic development in African countries will lead to the failure of some industries to form, and Chinese investors will prefer such countries. Once Chinese investors invest in these industries, African governments will surely vigorously protect and protect their development, which is conducive to Chinese investors to enhance their competitiveness in these industries, or even to form monopolies.

The coefficient of the variable of the proportion of minerals and metals to commodity exports is positive and significant, but its value is small, which shows that at present, China has a resource seeking motivation for FDI in Africa, but it is not the main reason that affects the scale of investment. According to the report of the International Monetary Fund in 2011, Chinese FDI

to African countries accounts for only 29% of the mining industry. With the increase of Chinese non-state-owned enterprise investors, the proportion of investment and service industry in Africa is gradually increasing.

Now we will discuss the political factors that affect the efficiency of Chinese FDI in Africa. An efficient situation does not mean that an African country can attract more Chinese FDI in absolute quantity. Instead, it means that efficient countries will receive more direct investment from China given the same other factors. .

In Table 3, the variables of political stability index and management quality index are not significant, while the variables of government efficiency index and corruption control index are significant, and the coefficient of government efficiency index is positive, while the coefficient of corruption control index is negative. This shows that the higher the level of corruption control, the more conducive to promoting Chinese FDI. This is in line with the previous expectation that controlling the growth of corruption will reduce the operating cost and time cost of foreign investors, and attract more foreign direct investment. But the coefficient of government efficiency index is positive, which means that the higher the government efficiency is, the higher the inefficiency parameter is, the lower the efficiency value is. This shows that African countries with more efficient government will reduce Chinese FDI in this country, even if population and natural resources are not significant factors affecting FDI.

According to table 3, the efficiency value of Chinese FDI received by each African sample country from 2010 to 2016 can be obtained. In Table 4, the average efficiency values of each sample country are listed. As can be seen from table 4, the average efficiency value is only 0.2622, which indicates that potential Chinese FDI in African countries is far from realized. In other words, given these variables, we can think that although Chinese investors have found the benefits of investing in Africa, they are far from maximizing investment efficiency. In addition, the average efficiency value has two extremes. For example, Uganda's average efficiency is only 0.1041, which is closely related to its domestic political environment. As a BRICs country, South Africa has an average efficiency of 0.8533. There is no doubt that the control of corruption and political stability play a role in promoting this extremely high efficiency.

## 5. CONCLUSION AND POLICY SUGGESTION

Based on the data of Chinese FDI panel data in 27 African countries from 2010 to 2016, this paper analyzes the economic and political factors affecting the distribution of Chinese FDI in African countries based on the stochastic frontier model. The purpose of this paper is to clarify the determinants and efficiency distribution of Chinese FDI in Africa under the current national conditions, so as to provide a clearer understanding of Chinese investors' investment in the African continent.

The results of this study show that from the perspective of the main influencing factors, investment has shifted from resource seeking motivation to market seeking motivation in the past, and the attraction of natural resources of African countries to Chinese investors is not as good as that of market scale. Resource seeking investment in China is only a factor, not a main purpose. Given other conditions, African countries with market advantages will attract more direct investment from China than those with natural resource advantages. Secondly, the inflation rate has no significant impact on Chinese FDI in African countries. Finally, in terms of the index variables of economic freedom, the findings of this paper are contrary to the conclusions of previous studies, which may be due to the different time span of sample data, or the fact that China is in a period of rapid transformation and the change of investor structure.

**Table 4.** Average efficiency scores for the 27 African countries

African countries	Average efficiency score (2010–2016)
Algeria	0.2966
Angola	0.4417
Botswana	0.3491
Cameroon	0.2984
Congo D.R	0.1597
Congo	0.1990
Cote d'Ivoire	0.2466
Egypt	0.4677
Ethiopia	0.1120
Ghana	0.2338
Kenya	0.1553
Madagascar	0.1117
Mali	0.1493
Mauritius	0.2834
Morocco	0.4461
Mozambique	0.1506
Namibia	0.3963
Niger	0.1143
Nigeria	0.3317
Senegal	0.2185
Seychelles	0.2306
South Africa	0.8533
Tanzania	0.2000
Togo	0.1041
Uganda	0.1692
Zambia	0.1461
Zimbabwe	0.2147
Mean	0.2622
Standard deviation	0.1601
Maximum	0.8533
Minimum	0.1041

Through the analysis of political influence factors, this paper further finds that corruption control and political stability have significant positive effects on efficiency. High corruption control index and political stability index will improve the efficiency of China's direct investment. This shows that investors in China pay more attention to the degree of corruption and political stability of the host country, especially the degree of corruption. This is also reflected in the efficiency value. The previous literature either analyzed the economic and political factors, but did not specifically estimate the efficiency value of China's investment distribution in African countries, or estimated the efficiency value, but the sample data used is incomplete, and the time is far away from the present. The innovation of this paper is to use the latest data (2010-2016) to analyze the economic and political factors affecting China's direct investment in Africa, and calculate the specific efficiency value. Through the statistical analysis of efficiency value, we find that the total average value of efficiency value is very low, which shows that Chinese FDI in the African continent is far from the peak. However, the low efficiency

value is due to the efficiency of government and the quality of management, which weakens the attraction of African countries to investment from the perspective of investors.

In order to help Chinese investors clear their investment direction in Africa and promote the maximization of investment efficiency, this paper gives policy suggestions from two perspectives: From the perspective of Chinese investors, we should pay close attention to Chinese national conditions and the changes in the development of African countries, and adjust our strategies and directions in a timely manner. China's economic development is in the process of high-speed transformation. Domestic industrial transfer is the general trend. More enterprises will go global, so Chinese FDI in Africa will inevitably change from resource seeking to market seeking. On the other hand, African countries' economy is also improving, but geopolitical turmoil will not be eliminated in a short time. For Chinese investors, it is necessary to adjust the investment layout and improve the investment efficiency according to the specific situation. From the perspective of African countries, the following three suggestions can be considered to attract Chinese investment. First, we should strive to develop the economy, improve people's livelihood and increase GDP per capita. The growth of population and GDP per capita means the expansion of market scale and the enhancement of consumption capacity, which is the most important factor for Chinese investors at this stage. Second, African countries without economic advantages can attract FDI by controlling corruption and improving political stability, because political factors have a special impact on investment efficiency. Third, due to the strong heterogeneity among African countries, the deep cooperation among countries in regional policies can promote the inflow and rational distribution of foreign investment.

Due to the restriction of objective conditions and the imperfection of database statistics, the data used in this paper is incomplete. Future research can mine this problem more accurately from this perspective. In addition, this paper only analyzes the impact of Chinese FDI on African countries from the perspective of the host country's politics and economy. Future research can expand the impact factors and analyze the impact factors from a more comprehensive perspective.

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