The Effect of Foreign Direct Investment on Economic Growth in African Countries:

Investments from China versus Investments from the Western World

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ABSTRACT

The purpose of this thesis is to investigate if there is a difference in the effect of foreign direct investment (FDI) on economic growth depending on whether the FDI comes from China or the Western world. This study investigates the effect of FDI on economic growth in 44 African countries from 2003 to 2017, based on panel data. According to growth theory, an increase in investments leads to an increase in economic growth. The results of the analysis show that FDI from China and FDI from the Western world are not significant for economic growth in African countries. However, when including an interaction variable between FDI and political stability, FDI from the Western world becomes significant, which implies a difference between FDI from China and FDI from the Western world.

Keywords: FDI, Economic growth, Africa, China, The Western world

Table of Contents

Figures:

Tables:

1. INTRODUCTION

This introduction will first present the background of investments in Africa along with an explanation of foreign direct investments. In the background, there will also be an explanation of why FDI is divided between FDI from China and FDI from the Western world. Further, the purpose of this research will be given together with a disposition of this study.

1.1 Background

1.1.1 Africa, FDI, and investments in Africa

Africa is a region with some of the poorest countries in the world. It is a continent shaped by decades of internal oppression, as well as from European countries. Decades of conflicts and poverty have also shaped the continent. African countries are behind the developed countries both in technology and welfare. However, it is not only a continent associated with poverty and disasters; the continent is also known for its richness in natural resources. In recent years the development has been going forward along with an increase in economic growth. One explanation behind the progress could be Foreign Direct Investment (FDI).

Foreign direct investments are investments made in one country by investors in another country. The reason for the investor to invest cross-border is to create a lasting relationship and be able to control the enterprise of the investment (OECD, 2008). According to OECD (2008), an investment counts as an FDI if the foreign investor owns at least ten percent of the voting power. Further, OECD (2008) explains two groups of FDI, mergers and acquisitions (M&A) and Greenfield investments. Greenfield investment means investment from abroad with new capital leading to job opportunities. M&A, on the other hand, is a change in ownership of an already existing corporate asset.

UNCTAD (2019) analyzes investments around the world. According to UNCTAD (2019), FDI flows in general are on a decline, however, FDI to developing countries is rising and especially FDI inflows to Africa. According to the organization, FDI to Africa increased by eleven percent in the year 2018 and the same year, the share of developing countries' inflow of FDI rose to 54 percent. This rise is owed to the decline in developed countries' FDI inflows and the constant growth of FDI inflows in developing countries.

FDI is important for developing countries in Africa for many reasons according to Asiedu (2002). In her study, she points out that FDI, first of all, brings capital to the country which is needed for investments. Secondly, FDI brings workers and management. She explains that FDI is needed because the level of savings in countries in Africa is low and therefore capital from abroad is necessary to spur economic growth. The ways of getting capital into the country are by FDI, aid, or loans from other actors, e.g. the World Bank. To get foreign investments, the country must be of interest to the investor.

Furthermore, FDI could help to get the domestic market and the international market more connected, which according to the World Bank (2019a.), would help the developing countries increase their economic growth. The World Bank believes that if the local market is linked to the world market, the export could increase, leading to new job opportunities. Further, the World Bank argues that more FDI leads to new technology and better ways of doing business.

How much the economy grows because of FDI depends on the ability to absorb the spillover effects. When a foreign investor invests in an entity in another country, they usually bring with them new technology. According to Demena & Murshed (2018), foreign investors bring both knowledge and allocative efficiency. With new technology, knowledge and allocative efficiency, the domestic market will also benefit to some extent, depending on the technology gap. If the technology gap is big the domestic market will not benefit from new technology because they do not have the knowledge to use it in their industry. On the other hand, if the technology gap is small, the domestic market learns from foreign investors and can make their industry more efficient. The transferred knowledge is called the spillover effect (Demena & Murshed, 2018).

1.1.2 Africa, China, and the Western world

According to UNCTAD (2019), the five top recipients of FDI inflows to Africa in 2018 were Egypt, South Africa, Congo, Morocco, and Ethiopia. They also compared FDI outflows from different countries to Africa and between the years 2013 and 2017 as can be seen in figure 1.1. As seen in the figure, China is a country with a noticeable increase in their FDI outflow to Africa. China has experienced rapid economic growth during the last decades and simultaneously increased its outward FDI (OECD, 2019b.). The countries in the continent of Africa are recipients for an increasing part of the outward FDI from China.
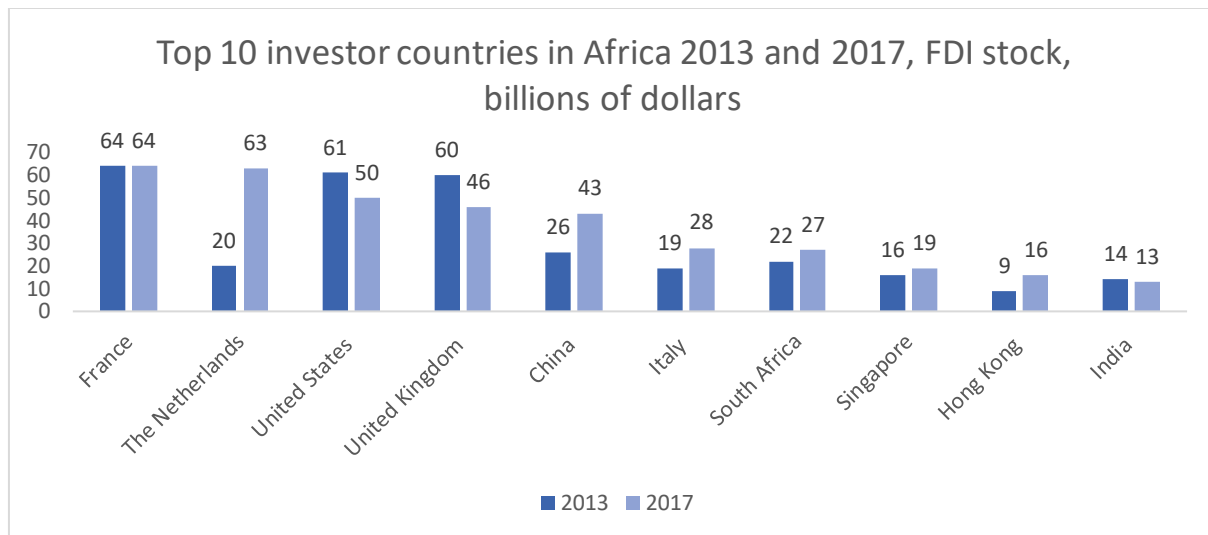
Figure 1.1 Top ten investors in Africa. Source: UNCTAD, (2019).

There are different theories on why China's interest in Africa has grown in the last decades. According to Koomson-Abekah and Chinweokwu (2018), China's interest in the continent is first and foremost of economic character and less about the political situations in the countries. They state that China is a country that experienced a boom in its economic growth, is rich in human capital and in need of natural resources to maintain economic growth. Africa, on the other hand, is a continent rich in natural resources and has potential to experience growth in the economy. Nevertheless, many countries in Africa lack technical knowledge, a financial system, and working infrastructure, which China is willing to help with, according to Koomson-Abekah and Chinweokwu (2018). According to them, China invests in infrastructure and gives loans with a fair interest rate and without conditions, in contrary to loans from the World Bank or International Monetary Fund. However, they believe the disadvantage of the partnership with China is the way China also exploits the natural resources of Africa.

Soumaré, Gohou, and Kouadio (2016) have done a similar study on the characteristics of FDI from China to Africa and FDI from what they call developed countries to Africa. They examine if there are different reasons for China to invest versus reasons for developing countries to invest. The result in their study is that coal and minerals are what attract Chinese FDI and for the developed countries good governance and political stability are most important.

The West, and in particular countries in Europe have been involved in Africa since the colonial time. The West is suspicious of China's increasing role in Africa and there are many studies on the determinants of China's involvement in Africa because of the fear of China exploiting natural resources. On the one hand, China's role in Africa is helping the countries effectively improve their infrastructure by providing technology, capital, and human resources. On the other hand, China invests in Africa because of economic interest and with little interest in domestic situations. If the Chinese way is better than the Western way depends on the effect it has on economic growth. It also depends on if the government in the country takes the money from the growth, due to corruption, or if the money is given back to the population by investing in education and means to reduce poverty. The Western world might care more about the initial conditions of a country, which could benefit, or hurt, the population if it means the country gets less FDI from the Western world.

1.2 Purpose

The purpose of this study is to investigate if there is a difference in economic growth if FDI comes from China or the countries of the Development Assistance Committee (the DAC). The DAC consists of several countries including the EU, the US, and Australia amongst others (see appendix A for a complete list of the countries). This study only examines the effect FDI has on countries in Africa, not how outwards FDI from Africa affects China and the DAC-countries. The interest in finding out if FDI from DAC-countries and FDI from China affects economic growth differently is because studies are saying there are different reasons for countries to invest, or not to invest, in Africa. Reasons to invest could be because of market size and natural resources while reasons for not wanting to invest could be political instability.

There have been several studies before explaining economic growth from different perspectives, including FDI as a reason for growth. There has also been conducted research on the same topic with a focus on African countries. However, there is no previous study dividing FDI between countries in the Western world and China to see if the origin of the FDI has a smaller or greater impact on the economy in African countries. This study will therefore contribute to filling the gap in the field of research.

The research question is as follows:

- Is there a difference in the effect of FDI on economic growth depending on whether the FDI comes from China or the DAC-countries?

The question will be answered based on previous studies, a theoretical model and a panel data analysis.

1.3 Disposition

This paper is conducted such as to get an understanding of the research within the area, previous empirical studies and reports will be presented in chapter two. The third chapter will present the underlying theory of economic growth. In chapter four the concerned variables will be introduced and explained together with a description of the data. In the fifth chapter, the data will be tested using an econometric methodology. The results of the empirical study will be analyzed and presented in chapter six. In the last chapter, number seven, there will be a discussion of the results and an answer to the research question.

2. PREVIOUS RESEARCH

The impact of FDI on economic growth has been researched in several studies and likewise Chinese FDI in Africa. On the determinants for Chinese FDI in Africa, a study by Shan et al. (2018) concluded that most important for Chinese investors is the market size of African countries and not the amount of natural resources. Moreover, they noted that the matter of political stability, control of corruption, and the rule of law is not significant for Chinese investors. Another empirical study by Ross (2015) also investigates Chinese FDI in Africa. His study consists of eight African countries between the years 2003 to 2012. The author aims to find out what drives Chinese FDI and his conclusion is that natural resources along with the quality of infrastructure are most important.

Another perspective on China's increased interest in African countries is a study by Jude (2019). According to him, the Chinese increase in FDI is helping the continent with new capital, and with more capital, there will be an increase in economic growth, leading to reduced poverty in Africa. He also argues that FDI from China has increased the conditions of the infrastructure in Africa. Another point of view of the involvement of China in Africa is that China is a market-seeking and natural resource-seeking country (Blomqvist & Drogendijk, 2013). Several studies have researched why countries invest in Africa and according to Blomqvist and Drogendijk (2013), countries with lower political stability are more likely to attract investments from China. Also, Buckley et al. (2007) concluded from their research that China's motives for investing in Africa are resource-seeking and market-seeking. They believe that China does not fear a risky political environment in contrast to developed countries.

Furthermore, Doku, Akuma, and Owusu-Afriyie (2017) have examined the effect of FDI from China on economic growth in Africa. They found out in their study that Chinese FDI has a significant effect on economic growth. They used a panel data with fixed effects and a Granger causality test to do their research. However, their data only consists of twenty countries in Africa over ten years from 2003 to 2012.

Another paper by Rodríguez and Cols (2017) also investigates the determinants of FDI, not only FDI from China but FDI in general to sub-Saharan Africa. The study is focused on the conditions of the local institutions and whether they affect FDI inflows. The conclusion of their study is that political stability, control of corruption, and the rule of law matter for the inflow of FDI. Asiedu (2006) conducted a study similar to the one above, researching the

determinants of FDI through a study of 22 countries between the years of 1984-2000. She concludes that several aspects matter for attracting FDI, among them a big domestic market and natural resources, but also a well-functioning legal system as well as working infrastructure. Additionally, she also says corruption and political instability do not attract FDI.

A study made by Gui-Diby (2014) examines how FDI affects economic growth in Africa. His study is based on panel data over the years 1980 to 2009 and includes 50 countries on the continent. The result from his study is that over the thirty years included in the study, FDI has had a significant effect on economic growth. However, he notes that between 1980 to 1994 the effect was negative and between 1995 to 2009 the impact of FDI on economic growth was positive. According to Gui-Diby (2014), the positive effect is due to positive change in the business environment and a possible reason for the negative impact is the low capacity of domestic firms to manage their resources for production.

Another economist, de Mello (1999), researched FDIs impact on output growth. de Mello conducted a paper including 32 countries in the years of 1970 to 1990 with both time series data and panel data. The conclusion of his paper is that the extent of the output growth depends on the technology gap and if the FDI substitute or complement the domestic market. Borensztein, de Gregorio, and Lee (1994) have done research on a similar topic, namely how FDI affects economic growth. In the study, both developed and developing countries are included over twenty years. The conclusion of their paper is that FDI has a greater impact on economic growth than domestic investment although the conclusion only holds when the country has a minimum stock of human capital to absorb the new technology.

For FDI to increase, as well as the economy to grow, economic freedom is important according to Barro (1994). In his study, he concludes that economic freedom, meaning working economic systems, free markets, and property rights, is important for economic growth. According to Barro (1994), economic freedom is more important than having a Western, democratic, political system. He also believes a more democratic political system will gradually be implemented on its own after the conditions for economic freedom have been implemented. Ayal and Karras (1998), agree with Barro (1994) and they point out that economic freedom is positively correlated with economic growth in a country. They state that most important is access for the population to connect with foreigners along with a working monetary environment, and limited participation by the government. These three freedoms lead to easier access to capital and increased productivity. Economic freedom makes it easier for the population to find capital abroad and is the foundation to find FDI. Also, Azman-Saini,

Baharumshah, and Law (2010) have made a study on how FDI and economic freedom affect economic growth. Their study is based on panel data from 85 countries. The conclusion from their investigation is that FDI, by itself, has no direct effect on economic growth but together with economic freedom it does.

To summarize the findings from previous studies, Chinese investors are interested in the market size along with natural resources and they are less interested in political stability as well as control of corruption. Investors from the more developed countries in the West are on the other hand more interested in good government and local institutions in the country of interest. There are different opinions on whether FDI has a positive significant effect on economic growth. Some studies argue it depends on for example the business environment and economic freedom. How much the economy grows depends on the conditions in the country and how well they can absorb the spillover effects from new technology. To conclude, there are different results whether FDI has an impact on economic growth or not. However, most of the results indicate FDI has a positive effect on economic growth, although they have different views on what requirements are needed, more than FDI, to reach it.

3. THEORETICAL DISCUSSION

This chapter will present the theoretical model used for analyzing the data. The theory explains why FDI could have an impact on economic growth. The model is selected based on previous studies and economic growth literature.

3.1 The Solow growth model

The theoretical model in this paper is the Solow growth model. The Solow model is a model describing economic growth by changes in the amount of output in an economy. The output changes because of changes in technology, the savings rate, and the population growth rate. Robert Solow invented the Solow model in 1956, which is a simplification of the real world with only one homogenous good, no international trade, and technology as an exogenous variable (Jones, 1998, pp. 20-40). Output in the model could stand for GDP for example.

The production function of the model is built by capital represented by K, labor represented by L and Y stands for output. The production function is assumed to have the form of a Cobb-Douglas function, $Y=F(K,L)=K^{\alpha}L^{1-\alpha}$ (Jones, 1998, pp. 20-40). With more capital per worker, the output per worker increases, at a diminishing rate. In this model, all variables are divided by the labor force to get the equations in per capita. The variables are divided by L, k=K/L and y=Y/L, to see the changes in output per capita. The production function divided by L is then: $y=k^{\alpha}$.

In the Solow model, there is an accumulation equation explaining what happens when there is a change in the capital stock, every period the capital stock also depreciates (Jones, 1998, pp. 20-40). The accumulation equation is as follows: $\dot{K}=sY-dK$ (Jones, 1998, pp. 20-40), the change in the capital stock per period is denoted by $\dot{K}$. In a closed economy savings (s) equals investments, s is a fraction of Y, which is the total wage and rental income. Every period the capital stock depreciates with dK. The population in the Solow model is the same as the labor force and when the population grows, the labor force grows as well. The growth rate of the labor force is $\dot{L}/L$, the population growth is n and therefore $\dot{L}/L$ is the same as n (Jones, 1998, pp. 20-40). The capital accumulation in per laborer is $\dot{k}=sy–(n+d)k$.

With the production function and the accumulation equation, it is possible to see what happens when there are changes in the model. Capital per worker changes when investment per worker changes, the depreciation rate changes or the population grows. If the investment rate increases, it will mean a higher per capita output and the economy becomes richer than before. When the population rate grows, the capital per worker is going to be lower than before. When capital per worker is equal to the new investments per capita needed to hold capital per worker constant, it is called the steady state (Jones, 1998, pp. 20-40). There is no output per person growth in the steady state, thus total output is only growing with the population growth. The economy can grow for a shorter period, but only until it reaches its steady state.

To have lasting output growth in the Solow model, technological progress needs to be included. Technological progress happens when progress increases over time. If there are new technological improvements, labor or capital will be more productive, leading to a higher output per person (Jones, 1998, pp. 20-40). According to Solow, the key to have a lasting output per capita growth is new technology.

To apply the Solow model on FDI inflows to developing countries some modifications are needed to be done. In this case K=K(D)+K(F) where K(D) is domestic capital and K(F) is foreign capital. The Solow model states that capital, as well as technology, is important for the output growth in a country since it helps the economy to grow at a constant rate.

4. DATA

To answer the research question, if there is a difference in the effect of FDI on economic growth depending on whether the FDI comes from China or the DAC-countries, a multiple regression model will be used. A multiple regression analysis will be used since the empirical study needs more than one explanatory variable. The general multiple regression model looks like this:

$$Y_i = \beta_1 + \beta_2 x_{2i} + \beta_3 x_{3i} + ... + \beta_k x_{k_i} + \varepsilon_i$$

The dependent variable is Y_i and the explanatory variables are $x_{2i} + x_{3i} + ... + x_{k_i}$,

β_1 is the intercept and ε_i is the error term. In front of the explanatory variable is the coefficient β_k, an increase or a decrease with one unit in the X-variable increases or decreases the dependent variable with the beta-variable, with the condition that all other variables remain constant (Dougherty, 2011, pp.153-155).

Since the dataset consists of data between the years of 2003 to 2017, from 44 different countries in Africa, the data will be treated as panel data. The reason for using panel data is because it is then possible to compare different countries over time. In this dataset, there are many observations over a short time. By using panel data, the issue of heterogeneity is addressed (Dougherty, 2011, pp. 514-517). There might be heterogeneity since there are individual differences between the countries in the region. In this panel data model, T stands for time, N for observations and observations are countries. The general panel data model can be described by:

$$Y_{it} = \beta_{1it} + \beta_{2it} x_{2i_t} + \beta_{3it} x_{3i_t} + ... + \beta_{kit} x_{ki_t} + \varepsilon_{it}, \text{ i=[1,N] and t=[1,T]}.$$

Most of the data are collected from the World Bank and OECD. For a more specific list of the sources see appendix 3. The data is divided into four periods, the first three periods are averages of four years and the last period is an average over the last three years. To get as many periods as possible over the fifteen years of data without too short periods, this was the preferred way to do it. The reason for dividing it into periods is to avoid short-term cyclical fluctuations. It is also likely that the effect of certain variables will not show in one year.

4.1 Countries included

There are 44 countries in Africa included in the dataset. The reason for not including all of the countries in Africa is because of the limitation of data for some countries. A list of countries included can be seen in appendix 2.

4.2 Dependent variable

The dependent variable in this study is the annual GDP per capita growth for each country. The data is gathered from the World Bank database and is measured in percent. The data is based on constant 2010 U.S dollars.

4.3 Explanatory variables

The two explanatory variables are FDI from China and FDI from the DAC-countries. FDI from both China and the DAC-countries is counted as the yearly inflow of FDI as a percentage of GDP. According to the Solow growth model, an increase in investment would lead to a higher output per capita. To see if FDI from the DAC-countries together with FDI from China affect GDP growth there will also be one variable with those two variables added together.

4.4 Control variables

Control variables used in this study are variables that in previous studies have shown to have impacted economic growth and are included to reduce the problem with missing variables.

Initial GDP per capita – logarithmic

GDP per capita is measured in constant US dollars with the base year 2010. It is the first year of each period that is included as the initial value of GDP. This variable measures the income level of the country. In the study made by Borensztein, de Gregorio, and Lee (1994), initial GDP has a negative coefficient when the dependent variable is economic growth. With a lower initial GDP and farther away from Solow's steady state, economic growth is expected to be greater.

Population growth

Population growth is the yearly growth of the population measured in percent. The variable population growth is expected to be negative since, according to Solow, population growth means less capital per worker, thus less output per worker.

Openness to trade

Trade openness is included in the regression to measure the effect of how open to trade countries are and is calculated as export plus import over GDP. The openness of a country is expected to be positive. Research made by Brueckner and Lederman (2015) concluded that trade has a positive effect on economic growth. With easier access to international trade flows FDI will become more available.

Infrastructure

To measure the level of infrastructure, mobile cellular subscription per 100 people is used. How well the infrastructure is developed is important to determine how business-friendly a country is. In previous research, for example by Soumaré, Gohou, and Kouadio (2016), the number of phone lines has been used to measure infrastructure. The number of phone lines is not increasing anymore because of new technology and wireless phones, therefore the number of phone lines is not the best way to measure infrastructure anymore. A well-functioning infrastructure is expected to have a positive effect on economic growth (Soumaré, Gohou, & Kouadio, 2016), therefore the variable mobile is predicted to be positive.

Domestic investment

Domestic investment, also called gross capital formation, is investments in fixed assets and net changes in the level of inventories, in the economy (The World Bank, 2019b.). Domestic investment is measured as a percentage of GDP. An increase in investments leads to an increase in output per capita according to Solow. Domestic investment should according to the Solow growth model have a positive effect on economic growth.

Government consumption

General government final consumption expenditure measures all government expenditure during a year, as a percentage of GDP. According to Borensztein, de Gregorio, and Lee (1994), government consumption is expected to be negative. Likewise, Barro (1991) in his study also observed government consumption to be negative. He explains it as an increase in government expenditures will reduce the saving rate because of taxation. The reason for government consumption to be positive would be if the government invested in education and

human capital stock. Nevertheless, the negative effects on economic growth outweigh the positive effects.

Political stability and absence of violence
The variable, political stability and absence of violence, is measured in values between approximately −2.5 to +2.5, where −2.5 is the worst and +2.5 is the best on the scale. Political stability and absence of violence measures the estimated likelihood of violence and terrorism motivated by politics as well as political instability (The World Bank, 2019 c.). It is likely that with more stability, economic growth can increase. As seen in the section about previous research, political stability is something that attracts FDI from the Western world.

Aid
Another variable that can influence the dependent variable is the inflow of aid, or more accurate official development assistance (ODA). ODA targets developing countries and is given as government aid to stimulate the economic development, it is not only given by DAC countries, also by other countries, organizations, and foundations (OECD, 2019a.). In this study, aid is measured as a percentage of GDP. In a study by Cai et al. (2018), aid had a significant positive effect on economic growth with the condition of political stability in the country.

Schooling

As a measurement of human capital, education is used and more precisely, mean years of schooling. The data is from UNDP and consists of combined material from UNESCO, Barro and Lee, ICF Macro Demographic and Health Surveys, UNICEF, and OECD. Mean years of schooling is the average years of education of people older than 25 (UNDP, n.d.). Human capital is related to technology since there is evidence that higher human capital leads to a higher ability to absorb new technology (Barro & Lee, 2013). As seen in the Solow growth model, technology is important to maintain economic growth in the long run. Also, research by Borensztein, de Gregorio, and Lee (1994) supports that education has a positive impact on economic growth.

4.5 Descriptive statistics

Table 4.1 shows descriptive statistics over the included variables in the panel data. There are big differences between countries. One example is the difference between the highest value of FDI from DAC-countries, 9.84 percent, which was in South Africa (2003-2006) and the lowest value in Gabon (2015-2017) with a value of −0.864 percent. FDI inflow can take a negative value if there are disinvestments, if all shares, or part of the shares, of the enterprise are sold to a third party (OECD, 2008).

Also, between domestic investment, there are variations between the countries and periods. The country with the highest domestic investment was Mauritania (2011-2014), they invested 52.6 percent of its GDP. Zimbabwe had the lowest domestic investment (2003-2006), they invested 3.9 percent of its GDP. Most countries have a population growth between one and three percent, Mauritius has a lower than average population growth over the fifteen years of data with growth between 0.01 percent and 0.6 percent. The difference in the data makes it important to consider country-specific effects.

Table 4.1 Descriptive statistics

Variable	Mean	Max.	Min.	Std. Dev	Obs.
GDP/capita growth (%)	1.924	14.002	−11.082	2.945	176
FDIChina (%)	0.068	2.105	−0.323	0.192	176
FDIDAC (%)	0.524	9.836	−0.864	1.404	176
FDI China & DAC (%)	0.5915	9.8787	−0.7972	1.4797	176
Aid (%)	7.58	63.501	0.051	8.217	176
Dom. Investment (%)	23.089	52.618	3.901	8.526	176
Gov. Consumption (%)	14.49	39.323	3.852	5.458	176
Log initial GDP	7.177	9.812	5.406	1.097	176
Mobile	56.068	162.75	1.6947	40.802	176
Openness (%)	75.078	227.48	20.988	35.699	176
Political stability	−0.565	1.071	−2.54	0.825	176
Pop. Growth (%)	2.449	4.618	0.097	0.892	176
Schooling	4.864	10.167	1.275	2.137	176

5. METHOD

The aim of this study is to find out how FDI from different countries, China and the DAC-countries, affects economic growth in the countries of Africa. To answers the research question in the best way, several economic terms have been considered and discussed. This section explains the choices made for the regression model.

5.1 The Hausman test

To see whether random or fixed effects should be used, a Hausman test is performed. The null hypothesis is H_0: the individual-specific effects are random. Thus, H_0 is rejected if the difference between the random effect estimator and the fixed effects estimator is significantly different from zero. If the null-hypothesis is rejected, it is better to use fixed effects (Dougherty, 2011, pp. 525-526). In this regression analysis, the difference between the random effect estimator and the fixed effects estimator is significantly differenced from zero, the p-value is less than 0,05 and therefore the fixed effects estimator is going to be used during this study.

5.1.1 Fixed effects

The fixed effects estimator is best to use if there are country-specific factors. The individual-specific effects include factors that are specific to each country and are not included as an explanatory variable (Dougherty, 2011, pp. 521). It could, for example, be the geographical location, for instance, if a country is landlocked. If the individual specific effect is correlated with an explanatory variable it is called a fixed effect. The way the fixed estimator works is that each country gets an individual intercept by adding dummy variables to the regression (Dougherty, 2011, pp. 521).

The new regression with fixed effect looks like this:

$Y_{it} = \beta_1 + \alpha_i + \beta_{2it} x_{2i_t} + \beta_{3it} x_{3i_t} + \ldots + \beta_{kit} x_{ki_t} + \varepsilon_{it}$, where α_i is a dummy variable for each country, the individual-specific effect.

Since time effects also need to be considered, an additional dummy variable will be included. This means the effect is going to be the same for all countries every year but different from year to year.

$Y_{it} = \beta_1 + \alpha_i + \gamma_t + \beta_{2it} x_{2i_t} + \beta_{3it} x_{3i_t} + \ldots + \beta_{kit} x_{ki_t} + \varepsilon_{it}$, γ_t represents the dummy variable for time.

The disadvantage with the fixed effect estimator, contrary to the random effect estimator, is that it decreases the efficiency of the beta parameters since several new parameters are included in the model.

5.3 Balanced and unbalanced data

The dataset consists of 44 out of 54 countries in Africa. The dataset is balanced, meaning no observations are missing (Dougherty, 2011, pp. 515). The reason why all 54 countries are not included is that data are missing for several variables and periods for the countries not included. The issue with not including every country is that the data used in the study might not be representative of the whole continent.

5.4 Multicollinearity

A regression suffers from multicollinearity if the correlation between two explanatory variables is high. A high correlation could lead to poor estimates of the coefficients, which could give a misleading result (Dougherty, 2011, pp. 165-166). Multicollinearity is not necessarily a problem, it is only a problem when the correlation affects the regression too much (Dougherty, 2011, pp. 165-166). To investigate if there is multicollinearity causing problems in the regression a matrix analysis of the variables is performed, see table 5.1.

Table 5.1 Correlation matrix

	GDP/c growth	FDI China	FDI DAC	FDI DAC China	Aid	Dom. Invest.	Gov. Cons.	Initial GDP	Mobile	Openness	Pol. stability	Pop. Growth	Schooling
GDP/c growth	1.0000												
FDI China	0.0057	1.0000											
FDI DAC	0.0436	0.3358	1.0000										
FDI DAC China	0.0421	0.4485	0.9925	1.0000									
Aid	−0.0318	−0.1721	−0.2842	−0.2921	1.0000								
Dom. Invest.	0.2090	0.0444	0.0308	0.0350	−0.2548	1.0000							
Gov. Cons.	−0.0426	0.0009	0.00647	0.0063	−0.0768	0.2834	1.0000						
Initial GDP	−0.0081	0.1634	0.3316	0.3299	−0.6940	0.2977	0.3295	1.0000					
Mobile	−0.0353	0.2066	0.1954	0.2123	−0.4187	0.2580	0.3330	0.5424	1.0000				
Openness	−0.0179	−0.0651	−0.0639	−0.0690	−0.0786	0.3145	0.3723	0.4430	0.2506	1.0000			
Pol. stability	0.1086	−0.0604	−0.0112	−0.0184	−0.1771	0.2081	0.3999	0.4248	0.2795	0.3762	1.0000		
Pop. Growth	−0.0130	−0.0758	−0.2272	−0.2254	0.3130	0.1497	−0.2729	−0.3929	−0.3430	−0.2023	−0.2038	1.0000	
Schooling	−0.0122	0.3034	0.3696	0.3901	0.4859	0.1014	0.2035	0.7173	0.5622	0.3411	0.3297	−0.4853	1.0000

None of the observations in the analysis has a correlation above 0.8 and thus there is no serious problem of multicollinearity in the dataset. The only exception is FDI DAC China and FDI DAC, but they are never used in the same regression.

5.5 Heteroscedasticity

According to Dougherty (2011, pp. 280-284), the meaning of heteroscedasticity is that the error terms do not have a constant variance, the variance changes depending on changes in the explanatory variables. He also states that if there is heteroscedasticity in the regression it can impact the variance of the coefficients so they are not as small as possible, and if they are not, the coefficients are not as specific as with homoscedasticity. Further, he says heteroscedastic data makes the standard error of the coefficients incorrect, and as a consequence, the p-value will be inaccurate. Heteroscedasticity might be a problem in this study since there is data from many countries of different sizes. To avoid that the outcome of the regression is impacted by heteroscedasticity, White's estimator with cross-section is used when doing the regression. When using White's cross-section method it is assumed that the errors are cross-sectional.

5.6 Endogeneity

If there is a simultaneous problem, not only does the explanatory variable explain the dependent variable, it is also the other way around (Dougherty, 2011, pp. 330). In the case of this study, it might be that FDI, as well as domestic investment, also increases with a higher GDP per capita. Instrumental variables can be used to control for this issue. To get the wanted effect of an instrumental variable it has to be strong, meaning it is highly correlated with the variable it is acting for, if it is a weak instrumental variable, the effect might be misleading (Dougherty, 2011, pp. 341). In this study, instrumental variables will not be used because of the difficulty of finding instruments that fit with the periods and are highly correlated with the variables likely to be endogenous.

5.7 Autocorrelation

Autocorrelation means the error terms in one period are correlated with the error terms in another period (Dougherty, 2011, pp. 430). To test for autocorrelation, the Durbin-Watson test is performed. The Durbin-Watson is testing for AR(1) autocorrelation and if the value is close to two there is no positive or negative autocorrelation (Dougherty, 2011, pp. 436). In the regression of this study, the result of the Durbin-Watson test is close to two and thus there is no autocorrelation.

6. RESULTS

The purpose of this study is to analyze the effects of FDI on economic growth in African countries depending on if the FDI comes from China or the DAC-countries. In this chapter, the results from the regressions of this study will be presented.

6.1 Empirical analysis: the impact of FDI from China and the DAC-countries on economic growth

The first regression will include FDI from China, the DAC-countries and education. The second regression will include the same variables and also population growth. Then more variables will be added until all control variables are included. In the sixth regression FDI from China and FDI from the DAC-countries will be added together. To see if there is a relationship between schooling and FDI, interaction variables will be added in regression seven. Also, to determine if there is a relationship between FDI and political stability other interaction variables will be added in the last regression. Economic growth will be the dependent variable in all regressions.

Table 6.1 shows the results from the first six regressions. FDI in neither of the models is significant for the dependent variable economic growth. In the sixth model, FDI from China and FDI from the DAC-countries are added together to see if it makes a difference and if the variable will be significant. Not even added together it made a difference for the significance of economic growth. Reasons for why FDI is not significant could be because of limitations in the data, it only reaches over fifteen years and it could take time before the economic effects of FDI are noticeable in the economy.

FDI from China has a positive coefficient, but not significant. According to previous research, FDI from China to Africa has a positive and significant effect on economic growth. The reason why it is not significant might be because of the difference between years and countries included in this study and the previous study. FDI from the DAC-countries has a positive coefficient in all regressions, although not significant. FDI in most studies has a positive impact on economic growth as seen in chapter two. On the other hand, no other studies

with only FDI from the DAC-countries have been found which makes it difficult to compare the result.

Mean years of schooling is significant in all regressions, although, with all variables added it loses some of its impacts but is still significant at a five percent level. This is in line with the expected result. Population growth is likewise significant and positive, however, the positive sign is the opposite of what is expected. It could be because some countries experience relatively high population growth during some years. Domestic investment is highly significant and positive as expected based on the Solow growth model. Government consumption follows the expectation, which is negative and significant, even when adding variables to the regression. The level of trade openness has a negative effect which is a surprise, but it is nonetheless insignificant.

Aid is positive but does not have a significant effect which is not a surprise since the amount is relatively small in comparison to GDP. The number of mobile phone subscriptions per 100 people is significant and positive, as predicted, since infrastructure appears to be important for economic growth. Additionally, political stability is positive and significant at a ten percent level. Initial GDP has a negative sign, as expected, since in previous studies the coefficient is negative because in theory, with a low level of initial income the effect on economic growth will be greater. Initial GDP is also highly significant.

The R-squared measures how much the variance in the dependent variable is explained by the explanatory variables. With all variables included the R-squared is 54.47 percent, which means GDP growth is somewhat explained by the explanatory variables but not completely. Considering the results of previous studies are in some ways different, and the limitations of this study, the exact effects of the regressions are not concluded here. Only significance and the sign on the effect on GDP growth is determined in this study.

Table 6.1 FDI from China & FDI from DAC, impact on economic growth

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
FDI China	0.1531	0.4107	0.2231	0.6558	0.6139	
	(0.6937)	(0.5824)	(0.6394)	(0.5179)	(0.4631)	
FDI DAC	0.1282	0.1573	0.0961	0.1773	0.1496	
	(0.1600)	(0.1747)	(0.1956)	(0.2160)	(0.2366)	
FDI China&DAC						0.1658
						(0.2191)
Schooling	2.1547 ***	1.2569 ***	1.1007 ***	1.4336 ***	1.0027 **	1.0396 ***
	(0.7295)	(2.8196)	(0.2981)	(0.4792)	(0.3889)	(0.3900)
Pop. Growth		2.8196 ***	2.5873 ***	2.5627 ***	2.1007 ***	2.0847 ***
		(0.5918)	(0.3441)	(0.7421)	(0.7592)	(0.7418)
Dom. Investment			0.1631 ***	0.1893 ***	0.1730 ***	0.1741 ***
			(0.0318)	(0.0236)	(0.0251)	(0.0244)
Gov. Consumption			−0.0845 **	−0.1167 ***	−0.1122 ***	−0.1113 ***
			(0.0338)	(0.0444)	(0.0367)	(0.0389)
Openness				−0.0010	−0.0047	−0.0051
				(0.0269)	(0.0213)	(0.0207)
Log initial GDP				−13.0148 ***	−13.4016 ***	−13.3507 ***
				(3.2599)	(2.8041)	(2.8166)
Mobile					0.0480 ***	0.0481 ***
					(0.0106)	(0.0104)
Aid					0.0169	0.0161
					(0.0613)	(0.0617)
Political stability					1.4468 *	1.4437 *
					(0.8380)	(0.8302)
R^2	0.2787	0.3342	0.3901	0.4997	0.5447	0.5441
Observations	176	176	176	176	176	176
Values without parenthesis: coefficients						
Values in parenthesis: robust standard errors						
Level of significance: *p<0.1, **p<0.05, ***p<0.01						

6.2 Empirical analysis: the impact of FDI from China and the DAC-countries on economic growth with interaction terms

To see if schooling together with FDI has an impact on economic growth, an interaction term between FDI from China and schooling is added in the regression and likewise one between FDI from DAC and schooling. Table 6.2 shows the results from the regression with schooling and FDI as interaction terms. The regression showed that not much happened with the control variables when the interaction variables are added. The coefficients for FDI from both areas changed, however, none of them are significant. Both interaction variables are negative. The interaction variable between FDI from China and schooling is not significant but the interaction variable with FDI from DAC and schooling is significant at a ten percent level. The purpose of adding the interaction variables with schooling into the regression is to see if a country with higher education can absorb more of the benefits from FDI than a country with less education. In this study the interaction terms are negative, meaning more schooling would decrease the effect of FDI on economic growth, which is not in line with previous research by Borensztein, de Gregorio, and Lee (1994) saying there is a strong positive relationship between human capital and FDI.

*Table 6.2 FDI from China & FDI from DAC, impact on economic growth, FDI*schooling*

Independent variables	Model 7
FDI China	4.0352
	(2.4844)
FDI DAC	0.8039
	(0.5535)
FDI China&DAC	
Schooling	1.1316 ***
	(0.3441)
Pop. Growth	2.0810 ***
	(0.7933)
Dom. Investment	0.1712 ***
	(0.0223)
Gov. Consumption	−0.1117 ***
	(0.0363)
Openness	−0.0052
	(0.0209)
Log initial GDP	−13.4215 ***
	(2.9434)
Mobile	0.0476 ***
	(0.0099)
Aid	0.0178
	(0.0644)
Political stability	1.4120 *
	(0.8174)
China FDI*Schooling	−0.3696
	(0.2637)
DAC FDI*Schooling	−0.0938 *
	(0.0555)
R²	0.5469
Observations	176
Values without parenthesis: coefficients	
Values in parenthesis: robust standard errors	
Level of significance: *p<0.1, **p<0.05, ***p<0.01	

To see if political stability together with FDI has an impact on economic growth, an interaction term between FDI from China and political stability is added, as well as one between FDI from DAC and political stability, seen in table 6.3. As with the interaction variables above, the control variables do not change much. However, the FDI-variables changed. FDI from DAC changed the most and is now statistically significant at a five percent level. The interaction variable with FDI from China and political stability is significant at a five percent level and the coefficient is negative. The interaction variable with FDI from DAC is significant at a one percent level and is positive. The interaction term implies that the effect of FDI on growth also depends on the political stability in the country. In the case of FDI from China and political stability, the interpretation of the result is, with more political stability, the effect of FDI on economic growth will be lower. On the other hand, with FDI from DAC and with more political stability the effect of FDI on economic growth will be greater.

*Table 6.3 FDI from China & FDI from DAC, impact on economic growth, FDI*political stability*

Independent variables	Model 8
FDI China	0.0444
	(0.3144)
FDI DAC	0.4369 **
	(0.2120)
FDI China&DAC	
Schooling	1.1697 **
	(0.4754)
Pop. Growth	2.1132 ***
	(0.7881)
Dom. Investment	0.1633 ***
	(0.0146)
Gov. Consumption	−0.1126 ***
	(0.0391)
Openness	−0.0044
	(0.0198)
Log initial GDP	−12.7992 ***
	(2.9830)
Mobile	0.0493 ***
	(0.0100)
Aid	0.0279
	(0.0622)
Political stability	1.4048 *
	(0.8277)
China FDI*Pol.Stab.	−1.7978 **
	(0.8485)
DAC FDI*Pol.Stab.	0.5393 ***
	(0.1667)
R^2	0.5582
Observations	176
Values without parenthesis: coefficients	
Values in parenthesis: robust standard errors	
Level of significance: *p<0.1, **p<0.05, ***p<0.01	

7. DISCUSSION

Foreign investment inflows to Africa have increased in the last decades, in particular, FDI from China to Africa. According to Solow's growth theory, new capital investments and technology are good for economic growth. Population growth, on the other hand, is reducing the output per person in the economy. Given the growth theory, a rise in investment increases the economic growth in a country, therefore, FDI is expected to be good for the economy. The reason for China being of interest in this study is because according to previous research, China is more interested in investing in countries with lower conditions of political stability. China is also more likely to choose countries with more natural resources compared to why the West wants to invest in African countries.

The purpose of this study is to investigate if FDI from China and FDI from the DAC-countries have different effects on economic growth in African countries. As seen from the previous research, the impact of FDI on economic growth is positive in most studies. In this study, FDI from neither China nor the DAC-countries is significant in the first regressions without interaction variables. This study only covers fifteen years of data which is important to keep in mind. It is important because it might be that the periods used in this study are too short to see the effects of FDI. To control for the issue of limited periods, lagged FDI could be used, but because of the limited amount of years this is not controlled for. There are two arguments for why FDI is good for the economy. The first argument is because increased capital increases output per capita and thus economic growth. The second reason is that with FDI, new technology comes to the country and makes the production more efficient. With only fifteen years of data and the periods of three to four years, the spillover effects of FDI might not be noticeable yet. Because of the insignificant result, it is not possible to answer the research question based on the first regressions.

However, when adding the interaction terms for FDI and political stability, the beta coefficient for FDI from the DAC-countries becomes significant. Thus, political stability is important for FDI to have an impact on economic growth in African countries. Also, the coefficient for the interaction variable itself is positive. It is important with political stability for the DAC-countries when investing in African countries, as seen in previous research. It is reasonable that Western countries prefer to invest where there is less likely to be conflicts or a collapse of the government. Not only is political stability a condition for the Western countries

to invest but so is less corruption and economic freedom. Countries with political stability most often do also have less corruption and economic freedom to a greater extent, which increases economic growth because of a better business environment.

FDI from China together with political stability is on the contrary negative. China, as seen in previous research, prefers to invest in countries with lower political stability. The reason for the negative interaction variable is difficult to determine. The best explanation is that lower political stability means a riskier environment to invest in, which seems to be positive for economic growth. Chinese FDI in countries with less political stability also has less competition from the Western world because the West prefers to invest where there is higher political stability. More research is needed to find out more precisely why, with more political stability, the effect of FDI from China has a lower impact on economic growth.

Furthermore, when including the two interaction variables for schooling*FDI, both of the interaction variables become negative and only the interaction variable DAC FDI*Schooling becomes significant. This result means the inflow of FDI has a negative correlation with human capital which is questionable since, first of all, it is the opposite of the Solow model and secondly it is also not in line with previous research. On the contrary, no other found study has divided FDI as in this study which makes it difficult to compare with studies using FDI inflow from the whole world.

Nevertheless, the interaction terms with FDI and political stability affect the variable FDI from the DAC-countries which implies there are differences between FDI from the DAC-countries and FDI from China. Because of the results, more research is needed to understand when FDI is positive for economic growth. More extensive research on what makes FDI affect economic growth, more or less, in different countries depending on the origin of the FDI is of interest. Further studies could investigate more about how a country is affected by China's lack of interest in political stability and its increasing interest in Africa's natural resources. This study did not give a thorough answer to the research question but there are ways to expand future studies.

More research needs to be done on the impacts of FDI whether it comes from DAC-countries and China. First and foremost, a bigger timeframe would give a broader view of the topic as well as comparison to other continents. It is most likely that China's increase in foreign investments will continue and research in the future, when more data can be collected, will explain more of the economic growth in African countries. It would also be interesting to

find out if FDI from China crowds out domestic investment more than FDI from the Western world, or the other way around.

Furthermore, in this study, there is no focus on how FDI affects, for example, the employment rate in the countries or if FDI drains the natural resources, thus has a negative impact in the long run. Neither is there a focus, on the difference between the forms of FDI. FDI in the form of Greenfield investment means new capital inflow into the country which leads to new job opportunities, whereas M&A means a change of ownership. These two types of FDI, Greenfield investments and M&A, are likely to impact the economic growth in different ways. The difference between the two types of FDI is something to consider for future and more extensive studies.

There are weaknesses in this empirical model. One example is the measurement of human capital which is the variable education in this study. Education does not cover all aspects of human capital and is therefore not perfect as an estimate. Furthermore, some African countries did not have data for every year and every variable. With the aim to have a balanced dataset several countries were excluded which decreased the observations and thus the study is limited to selected countries in Africa.

To sum up, the results from the regressions without interaction variables do not say if there is a difference in the effect of FDI on economic growth depending on whether the FDI comes from China or the DAC-countries. When adding the interaction variables for school and FDI, neither of the coefficients for FDI from China or the DAC becomes significant. However, when adding the interaction variables for political stability and FDI, the coefficient for FDI from the DAC-countries becomes significant. Nevertheless, there are ways to improve the model and further research is needed to get a thorough conclusion.

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9. APPENDIX

9.1 Appendix A

The DAC-countries

Australia	Austria	Belgium	Canada	Czech Republic	Denmark
The EU	Finland	France	Germany	Greece	Hungary
Iceland	Ireland	Italy	Japan	Korea	Luxembourg
The Netherlands	New Zealand	Norway	Poland	Portugal	Slovak Republic
Slovenia	Spain	Sweden	Switzerland	The UK	The US

9.2 Appendix B

African Countries included

Angola	Algeria	Benin
Botswana	Burkina Faso	Burundi
Cameroon	The Central African Republic	Chad
Comoros	Congo	Côte d'Ivoire
Democratic Republic Congo	Egypt	Equatorial Guinea
Eswatini	Gabon	The Gambia
Ghana	Guinea	Guinea-Bissau
Kenya	Liberia	Madagascar
Malawi	Mali	Mauritania
Mauritius	Mozambique	Morocco
Namibia	Niger	Nigeria
Rwanda	Senegal	Seychelles
Sierra Leone	South Africa	Sudan
Tanzania	Togo	Tunisia
Uganda	Zimbabwe	

9.3 Appendix C

Data description

Variables	Definition	Data source
GDP/c growth	GDP per capita growth annually in percent	The World Bank
FDI China	The yearly inflow of FDI from China as a percentage of GDP	UNCTAD, National Bureau of Statistics of China, MOFCOM
FDI DAC	The yearly inflow of FDI from the DAC-countries as a percentage of GDP	The Organisation for Economic Co-operation and Development
Schooling	Mean years of schooling of people older than 25	United Nations Development Programme
Pop. Growth	The yearly population growth in percent	The World Bank
Dom. Invest	Domestic investment as a percentage of GDP	The World Bank
Gov. Cons	Government consumption as a percentage of GDP	The World Bank
Openness	Openness to trade measured as import plus export over GDP	The World Bank
Initial GDP	GDP per capita measured in constant US dollars, base year 2010. It is the first year of every period included in the logarithmic form.	The World Bank
Mobile	Mobile cellular subscription per 100 people as a measurement of infrastructure	The World Bank
Aid	ODA as a percentage of GDP	The Organisation for Economic Co-operation and Development
Pol. Stability	Political stability measured in values between approximately −2.5 to +2.5	Worldwide Governance Indicators