

# **THE INFLUENCE OF CHINESE FDI ON STRUCTURAL CHANGE IN AFRICA**

Written by

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August, 2018



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**Date:** August, 2018



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# THE INFLUENCE OF CHINESE INVESTMENTS ON STRUCTURAL CHANGE IN AFRICA

## I. Abstract

Today China is the world's largest exporter of goods and services. To keep their factories running, China has to import raw materials. This need for natural resources led to an increasing involvement of China in resource-rich African economies. In this explorative research, the aim is to find out how these Chinese investments are related to structural economic changes in African economies.

This research has found that African countries that receive Chinese FDI perform stronger in all terms of structural economic change than countries that do not receive Chinese FDI. Although a causal relation is not found, it appears that China selects better performing economies to invest in. FDI receiving countries show both positive and negative relations between Chinese FDI and employment, and between Chinese FDI and productivity.

Between different sources of FDI, there are some differences found in this research. FDI that originates from other sources than China shows a larger positive effect on productivity in receiving countries than FDI from China. Moreover, total FDI instock and FDI instock from the US and EU appear to be more of an engine for employment in the industry and services sector than FDI instock from China.

Chinese investments have a limited positive effect on structural change in Africa. For the future, it is to be expected that the influence of Chinese money in Africa will increase as China is increasing its share as an investor in Africa.

*Keywords: China, Africa, FDI, structural economic change, productivity and employment, GDP development, development economics.*

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# **1 Introduction**

## **1.1 Reason for doing this research**

Throughout the past decades, China has been developing at a rapid pace. The process of industrialization has brought China more prosperity and provides jobs for many people. Now China is the largest manufacturing country in the world, natural resources have to be imported to keep factories running.

The combination of strong industrialization and a more outward policy have brought China to resource-rich African countries. There is a reason to state that Chinese involvement might be a good development for FDI receiving African countries. Investments of China make developments possible that might not have occurred without foreign help. FDI might lead to an inflow of knowledge and technology and the creation of new companies. Such effects of FDI can be positive for receiving African countries when they lead to increased productivity and higher employment. However, there are voices that claim that China is disproportionately benefitting from getting access to African natural resources and that African countries don't really benefit from Chinese money (Yuan Sun, 2017).

This research is an explorative study on the relation between Chinese FDI in African countries and its effect on productivity and sectoral decomposition. In this research, the aim is to find out if Africa actually economically benefits from Chinese investments, and if there are differences between sources of FDI and the effect on productivity and sectoral decomposition.

## **1.2 Scientific relevance**

The relevance of doing this research can have multiple interpretations. One is that it fills a gap in scientific literature that isn't researched before in this way (the exact research method will be explained in chapter 3). Another reason is that global FDI in- and outflows increase each year. A research like this offers an insight in the macroeconomic effects of FDI.

In scientific research, there is extensive literature on (structural) economic change (Rodrik, 2013; Diao et al., 2017), foreign direct investment (Alfaro et al., 2010; Azman-Saini et al., 2010) and on industrialization (Page, 2012). All these articles provide in-depth information on specific topics, but none of them on the combination of Chinese FDI on structural economic change in Africa. Therefore this research can be seen as additional to the current scientific literature.

## **1.3 Research problem, research goal and research question**

### **1.3.1 Research problem**

In many African countries, the economy is growing. Although there are still countries that show negative growth, the general trend of the past 30 years is positive. Many different reasons can be presented for the shown growth, but the actual impact of foreign investments is hard to recognize as Alfaro (2010) states: "*Do multinational companies generate positive externalities for the host country? The evidence so far is mixed varying from beneficial to detrimental effects of foreign direct investment (FDI) on growth, with many studies that find no effect.*". In figure 1 the GDP development of the past 30 years is shown (EY, 2017).

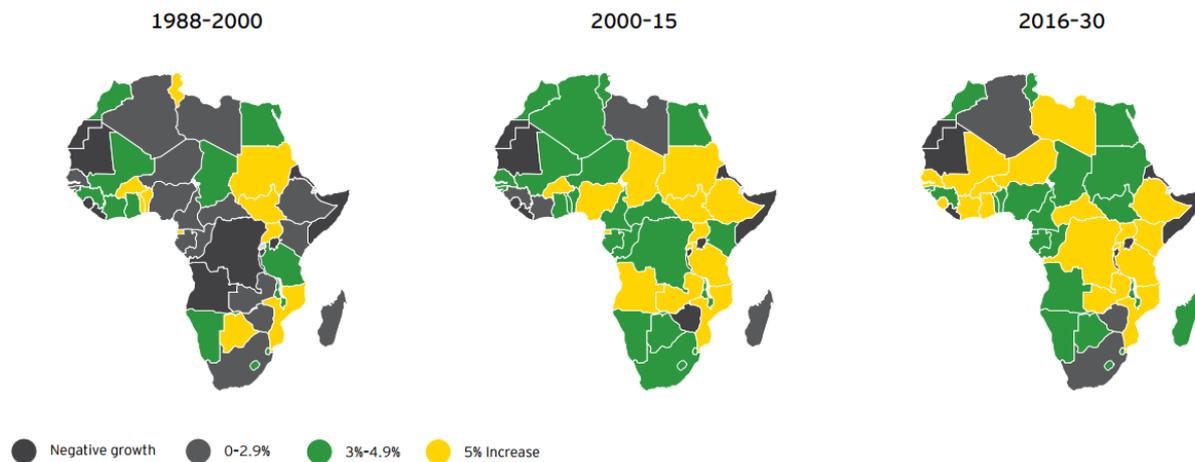


Figure 1: African GDP growth 1990-2030 (EY, 2017)

The main problem in this research is to find out what part of African economic growth can be appointed to FDI, and more specifically: Chinese FDI. Since scientists have previously found ambiguous results in the impact of FDI, impacts may differ per receiving country.

### 1.3.2 Research goal

The goal of this research is to find out if Chinese FDI and structural economic change in African economies are related. If this can be found, it can also be stated if this relation is positive or negative. Here structural economic change is perceived as economic growth or decline. The findings of this research can be useful for policymaking of attracting foreign investments and at what price this comes.

### 1.3.3 Research question

To reach the goal set in the previous paragraph, the central question below is formulated. Additionally, three subquestions are stated, which help to answer the central question.

#### Central question

*How is Chinese FDI related to structural economic change in Africa?*

#### Subquestions

1. *To what extent is economic growth related to structural economic change?*
2. *How does foreign direct investment from China influence structural economic change?*
3. *What are the differences in structural change in Africa between Chinese FDI and other FDI sending countries?*

### 1.4 Reading guide

This research is built up of five chapters. In chapter 2 the theoretical frame will be described. Here a conceptual model will be presented and hypotheses will be formulated. Chapter 3 discusses the methodology of this research. This chapter elaborates on data collection and the analysis of the used data. In chapter 4 the results of the performed analysis will be presented. Based on the results of chapter 4, a conclusion is drawn up in chapter 5.

## **2 Theoretical frame**

The theoretical framework of this research consists of relevant scientific and non-scientific literature on the topics that contribute to answering the central question. In this chapter, five topics will be elaborated on: historical background, structural economic change, foreign direct investment, the economic situation in Africa, and the effects of FDI on an economy. The used non-scientific literature will be from trustworthy sources like the OECD, World Bank or the UN. Together, the found literature forms the basis of the conceptual model in this research (which will be presented in this chapter). In the last paragraph of this chapter, the hypotheses will be described.

### **2.1 Historical background**

The rise of China as a world leading economy took place at a rapid pace. To create a context we have to go back in time to 1949. This was an extremely important and stirring year in China's modern history. In 1949 the Chinese civil war came to an end after which Mao Zedong proclaimed the so-called People's Republic of China (PRC). Zedong was the leader of the Communist Party of China (CPC), the party that is still in charge. The civil war lasted between 1927 and 1949 and experienced a peak intensity between 1945-1949, right after World War II ended. The battle between Chinese Nationalists and Communists was one of the bloodiest wars in the 20<sup>th</sup> century with an estimation of 10.000.000 casualties (Rummel, 1994). On October 1, 1949, communist Mao Zedong proclaimed the PRC and created the base for the current economic success.

Since Mao came to power, the CPC has led China very strictly and with an aggressive planning policy. A package of social and economic reforms was introduced by the name of 'The Great Leap Forward' (Fairbank, MacFarquhar, and Twitchett, 1995). This big push strategy came at the expense of many lives between 1958 and 1962. Estimates of casualties due to famine and violence vary between 18 and 56 million, whereas 45 million is the most common estimation (Dikotter, 2010). The main goal of the Great Leap Forward was to make a transition from an economy driven by agriculture to a more industrialized economy. In line with communist ideology, privately owned land was reclaimed by the government and private farming was prohibited. Industrialization must lead to a more competitive Chinese economy but the actual short-term economic impact was relatively small since the planned amount of harvested grain and rice wasn't even enough to feed the Chinese people. One of the reasons for the bad harvest was a lack of workforce to do the harvesting due to the reallocation of workforce to steel plants. Although overall production decreased, Chinese government officials were pushed to report record harvests to prove the success of the policy. Moreover, during the Great Leap Forward, China continued to be a net exporter of grain to internationally claim success of the program. Internationally, the food shortages were recognized and aid was offered by the Japanese government. China refused to accept foreign aid (Dikotter, 2010).

Mao's Great Leap policy turned out to be destructive to the Chinese economy. For example, it was only in 1964 that the production of iron reached the level of 1958. Moreover, during the Great Leap between 30%-40% of all real estate was destroyed to make place for roads, agriculture or to punish the owning families for not supporting the regime (Dikotter, 2010). It was Mao's successor, Deng Xiaoping (CPC general secretary), who started to re-privatize some agricultural activities to increase food production to a sufficient level again.

Although the Great Leap was a devastating event, it was the foundation for the industrialization of China. In general, Deng Xiaoping (the previously mentioned successor of Mao) is assumed to have set the course that made the Chinese economy competitive on a global scale. Deng was in charge from 1978 until 1989 and was also a member of the CPC. Deng however, had less conservative thoughts about communism than Mao and focused more on free trade (Encyclopedia Britannica, 2018).

Opening up borders led to increasing trade and foreign investments in China. Boeing and Coca-Cola where some of the first large foreign companies to locate in China. Not only did a more outward view led to more foreign investments, China also started to export more manufacturing goods. The key to economic development in China was in manufacturing of light (low-tech) goods. Manufacturing can be

the engine of a growing economy since it is capital intensive and beneficial for labor productivity, many manufacturing jobs are unskilled and offer relatively high wages, manufacturing is scalable (increasing returns to scale), there is global demand and more advanced technologies can be acquired (U.S. Department of Commerce, 2012). Moreover, manufacturing needs suppliers and this also creates jobs (Krugman, 2011).

A Chinese focus on manufacturing and exports brought hundreds of millions of Chinese more prosperity than they had experienced in the foregoing decades (The Economist, 2012). Nowadays China is the world's largest exporter of goods (1,95 tn. USD in 2016) and services (208 bn. USD in 2016) (OECD, 2017). 20% of all manufacturing in the world occurs in China (House of Commons, 2018). To keep factories running, China is the world's second largest importer of goods (1,5 tn. USD in 2016) and services (450 bn. USD in 2016) (OECD, 2017). Around 40 years of industrialization has made China into the factory of the world.

To realize such export figures, many products have to be produced. For this production raw materials as oil, iron ore, and copper are needed. Although China belongs to the world's most active countries in mining, the country has to import raw materials to keep their factories running (Basov, 2018). The need for more supply of raw materials brings China to resource-rich countries (EY, 2014). One of the focus areas is Africa, where China increasingly invests in order to get access to natural resources.

## **2.2 Structural economic change**

One of the core elements in this research is structural economic change. An economy can change (in terms of productivity) within a sector and between sectors. When an economy shows within-sector productivity growth, this is a result of workers increasing productivity but staying in their sector. Structural change, however, takes place between sectors. In this research, the economy is roughly divided into three sectors: agriculture, industry, and services. Of these three sectors agriculture is perceived as the least productive and services as the sector with the highest productivity. Moreover, agriculture is seen as the traditional sector that produces traditional goods whereas industry and the service sector are seen as modern sectors that produce modern goods and services. Structural change occurs when workers reallocate from low- to high-productivity sectors (Diao et al., 2017).

Focusing on within sectoral productivity growth is a neoclassical approach of looking at economic development (Solow, 1956). With within sectoral growth, the assumption is that economic growth is a result of the incentives to accumulate physical and human capital, to save capital, and innovate new technologies and goods (Diao et al., 2017). Such a neoclassical approach is a well-respected way of analyzing economic growth and increasing productivity, especially for developed economies. For developing economies, however, like many African economies, growth is stronger related to between sectoral growth where resources flow from low- to high productivity sectors (Rodrik, 2014; Timmer, De Vries, and De Vries, 2015; Page, 2012).

In their research, Diao et al. (2017) state that during the double-digit growth of China, both within and between sectoral growth took place. This can be seen as one of the reasons for the Asian miracle as Nelson and Pack (1999) describe the development of upcoming Asian economies. In other continents, growth mainly occurred within- or between sectors. Diao et al. (2017) report that in Africa structural change takes place, but that it has a negative impact on overall productivity (see figure 2). Reason for this is that due to increasing income of agricultural goods, demand for modern goods (industrially manufactured goods and/or services) increases. This increase in demand for modern goods attracts people to start businesses in the modern sector in pursuit of higher incomes. The inflow of new (low educated) labor into the modern sector lead to a decline in labor productivity in the modern sectors. Such a (negative) development is called dynamic structural change.

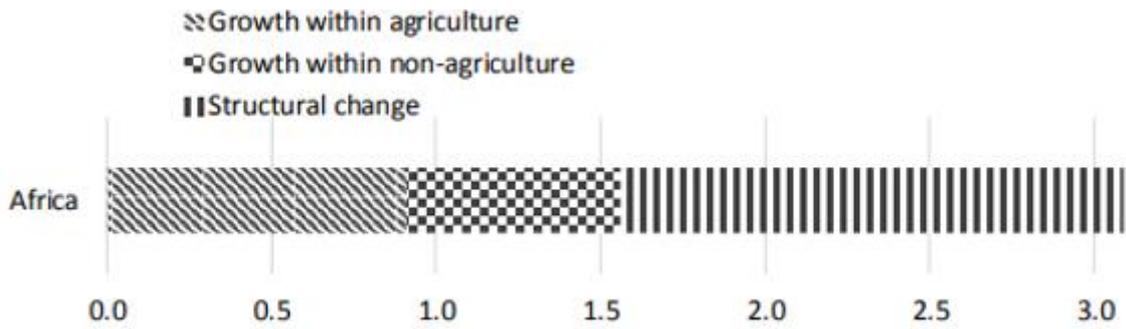


Figure 2: Growth percentages (as percentage points of economy-wide productivity annual growth) within traditional and modern sector, and economy-wide structural change (Diao et al., 2017).

In general, it is an accepted theory that agriculture contributes less to economic development than industry and services do (in terms of employment (see figure 3), and productivity). Growth potential for levels of productivity is higher for industry and services than for agriculture due to higher added value of modern goods and services. However, agriculture is necessary for continuation of economic development as food is needed to feed inhabitants of a country. In the Lewis-Fei-Ranis (LFR) model this is explained with the example of two sectors: agriculture and industry. In the LFR model growth comes through savings and investments in industry and profit in industry depends on the agricultural sector as it delivers food and labor. The basic mechanism here is that work in industry can be more productive than work in agriculture, provided that food production remains at a decent level. In other words; the LFR model shows how agricultural development determines the growth of the industrial sector (Ercolani and Wei, 2011).

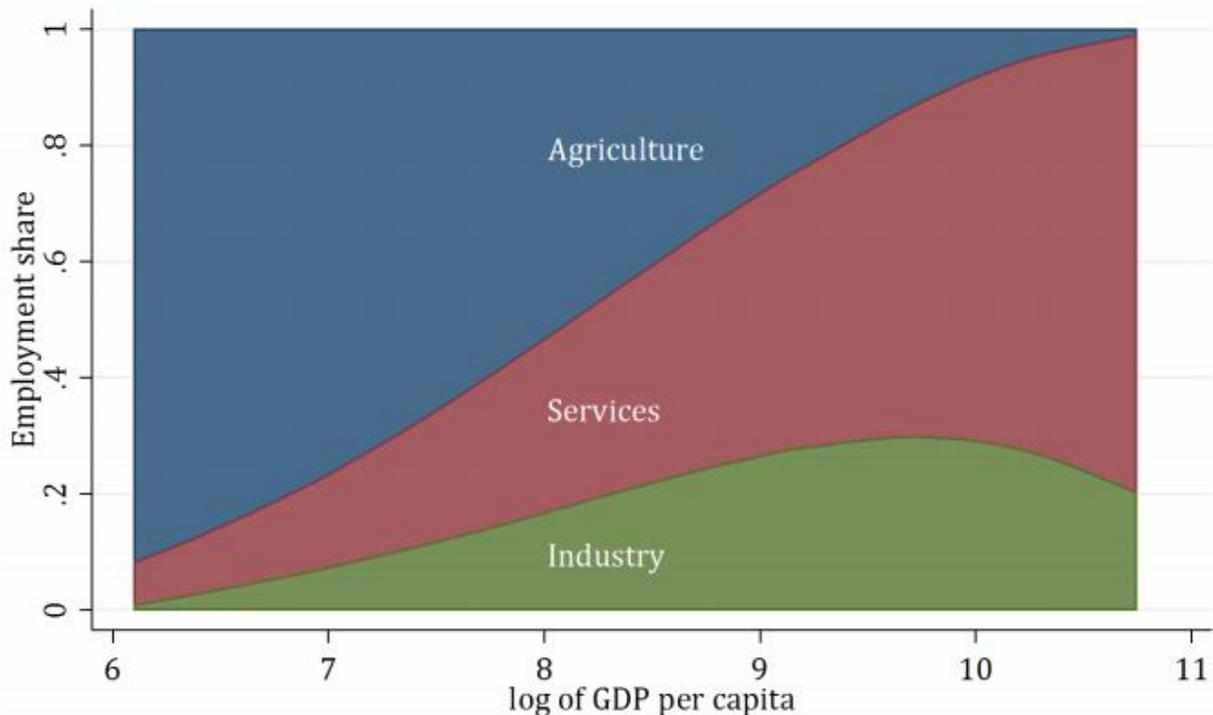


Figure 3: The structure of employment and economic development, based on GGDC 10-sector database (Timmer, De Vries, and De Vries, 2015)

An economy benefits from structural change when the workers that reallocate to the more productive, modern sectors don't have a negative impact on productivity in the modern sector. Moreover, although

developing economies benefit from structural change, it is agriculture that determines the speed of industrialization according to the LFR model (Ercolani and Wei, 2011). In the following part of this paragraph, the focus will be on how to achieve a positive impact of structural change.

According to Diao et al. (2017), structural change can have a positive impact when a positive productivity shock occurs in the modern sector. Such a positive productivity shock draws labor from less-productive (traditional) sectors of the economy. An example of a positive productivity shock is getting access to improved technologies of which businesses benefit significantly. Throughout history (big) shocks like the conveyor belt, telephony, and internet have increased productivity of workers and firms (Schilling, 2015). One of the reasons why Diao et al. (2017) state that African structural change doesn't have a positive impact on overall productivity performance is that such a 'shock' is not the main driver of change. In Africa, a shift of workers towards the modern sector is driven by a positive demand shock of modern goods (due to productivity growth in the traditional sector). This results in a lower productivity in the modern sector since diminishing returns to capital occur and less productive businesses are founded. This is in line with the weak state of the African manufacturing sector nowadays (Page, 2012).

In the analysis on structural change in Africa due to Chinese investments, the following assumptions are kept in mind; demand is non-homothetic (and the budget share of the traditional sector is declining), and modern sector goods are price elastic. Non-homothetic demand means that the demand for substantial goods is inelastic and the demand for modern goods is elastic (Santra, 2014). The analysis on structural change consists of three types of change in productivity and sectoral decomposition: within sectoral productivity changes, static structural changes, and dynamic structural changes.

### **2.2.1 Within sectoral productivity change**

The change of within sectoral productivity has already been elaborated upon previously in this chapter. In this subparagraph, a short definition is provided. When a worker in a specific sector is able to produce more than in a previous year in the same sector, this is called within sectoral productivity change. Such change can take place in each sector of the economy due to innovations in technology or improved human capital.

### **2.2.2 Static structural change**

The reallocation of workers towards more productive sectors is the essence of static structural change. This type of structural change can take place between all sectors in the economy and focusses on the share of a specific sector within an economy as a whole. A high value for static structural change points at increasing importance of a certain sector.

### **2.2.3 Dynamic structural change**

The second form of structural economic change is dynamic structural change. Dynamic structural change is the change in sectoral productivity when workers reallocate towards more productive sectors. Of all three types of change, dynamic structural change is most often a negative form of change. Only when a worker moves towards a sector that shows above-average productivity growth, dynamic structural change can be positive. A way to achieve positive dynamic structural change is by providing education to workers that reallocate to different sectors (De Vries, Timmer, and De Vries, 2015).

## **2.3 Foreign direct investment (FDI)**

Before going in-depth on FDI from China to Africa, it is useful to describe the meaning of FDI in general. The OECD (2008) uses the following definition: *"Foreign direct investment reflects the objective of establishing a lasting interest by a resident enterprise in one economy (direct investor) in an enterprise (direct investment enterprise) that is resident in an economy other than that of the direct investor. The lasting interest implies the existence of a long-term relationship between the direct investor and the direct investment enterprise and a significant degree of influence on the management of the enterprise. The direct or indirect ownership of 10% or more of the voting power of an enterprise resident in one economy by an investor resident in another economy is evidence of such a relationship."* The definition stated above is very precise in what it defines as FDI. In the context of this research, however, it is also

interesting to look at government spending's by the Chinese government in China. As Gu et al. (2016) found, many Chinese enterprises that are active in Africa are state-owned companies. Besides being state-owned companies, these companies employ Chinese workers which have lower wages than their African counterparts (Kaplinsky, 2013; Kaplinsky, McCormick, and Morris, 2007).

As written in chapter 1, China's view on investments has expanded beyond its own borders due to increasing industrialization. During the 1980's there was strict examination before Chinese firms and organizations were allowed to invest in foreign countries. This was in line with the central planning system of the Chinese economy. Together with its economic development, China's policy on outward FDI had become more transparent and flexible. By the mid-1990's the Chinese government encouraged companies to go global and increase outward FDI (UNCTAD, 2007).

As a host economy, China is the second largest receiver of FDI with \$144bn in 2016 (UNCTAD, 2018). Although being perceived as a developing economy, China is increasingly focusing on outward FDI with increasing its foreign investments from \$74,6bn in 2011 to \$183,1bn in 2016 (UNCTAD, 2017). In line with increasing outward FDI of China, Chinese FDI in Africa has doubled in number of projects, making China the third-largest investor in Africa in 2016 (EY, 2017). Both FDI inflows and outflows in China mark the increasingly growing economic power of the country. The reliability of data on Chinese FDI outflow remains questionable since transparency is limited.

Investing in Africa has been not very attractive for a long time. Multiple reasons for this can be named, for example, poor infrastructure, small market size, weak policy power, debt problems and in many countries political instability (UNCTAD, 2007). For many western countries, political instability was one of the main reasons not to invest in specific African countries. Here human rights, child labor, and environmental harm are reasons why these western countries were reluctant to invest in projects or countries. The Chinese government, however, was more willing to invest in countries that are led by questionable politicians, as figure 4 shows (Gu, 2016; Yuan Sun, 2017; Dollar, 2017).

Looking at figures on African host economies, there is a slight decreasing number of FDI projects between 2015 (771) and 2016 (676). The value of these projects, however, has increased from \$71,3bn in 2015 to \$94,1bn. The number of jobs created from these FDI projects has decreased from 148.700 in 2015 to 129.200 in 2016 (EY, 2017). Based on these data, it can be stated that FDI projects have become more expensive and it could be suggested that productivity increases since the number of jobs created have decreased whereas investments have gone up. This image of stagnating FDI inflows is shared by multiple sources (UNCTAD, 2017; OECD, 2018)

Although the general trend on FDI inflows in Africa is stagnating, some countries win and some lose. In their Attractiveness Program Africa 2017, EY (2017) has come up with their so-called African Attractiveness Index (AAI). They present a top-10 of countries which are ranked following six pillars: 1. Macroeconomic resilience, 2. Market size, 3. Business enablement, 4. Investment in infrastructure and logistics, 5. Economic diversification and 6. Governance and human development. In table 1 the AAI 2017 country ranking top-10 is given including the matching FDI inflow. What stands out of this table is that the inflow of FDI in the most attractive African economies is decreasing in most cases.

Table 1: AAI 2017 country ranking top-10 (EY, 2017) including FDI inflow (millions of US dollars) (UNCTAD, 2017)

Rank	Country	FDI inflow 2014	FDI inflow 2015	FDI inflow 2016
1	Morocco	3.561	3.255	2.322
2	Kenya	821	620	394
2	South Africa	5.771	1.729	2.270
4	Ghana	3.357	3.192	3.485
5	Tanzania	1.673	1.605	1.365
6	Uganda	1.059	538	541
7	Cote d'Ivoire	439	494	481
8	Mauritius	418	208	349
9	Senegal	403	409	393
10	Botswana	515	679	10

In this research, the focus will be on FDI instock. This is something else than the in- or outflow of FDI. The UNCTAD (2014) calculates the instock of FDI by cumulating the inflow of FDI into a country or by national statistics bureaus that provide FDI instock. The reason to use FDI instock instead of inflow is that it is less volatile, more long-term and presents an insight in scale differences in FDI between countries. An example could be the purchase of a port by a Chinese company. The ownership of this port endures for many years and is therefore integrated into FDI instock whereas it can only be measured in an FDI inflow for one year.

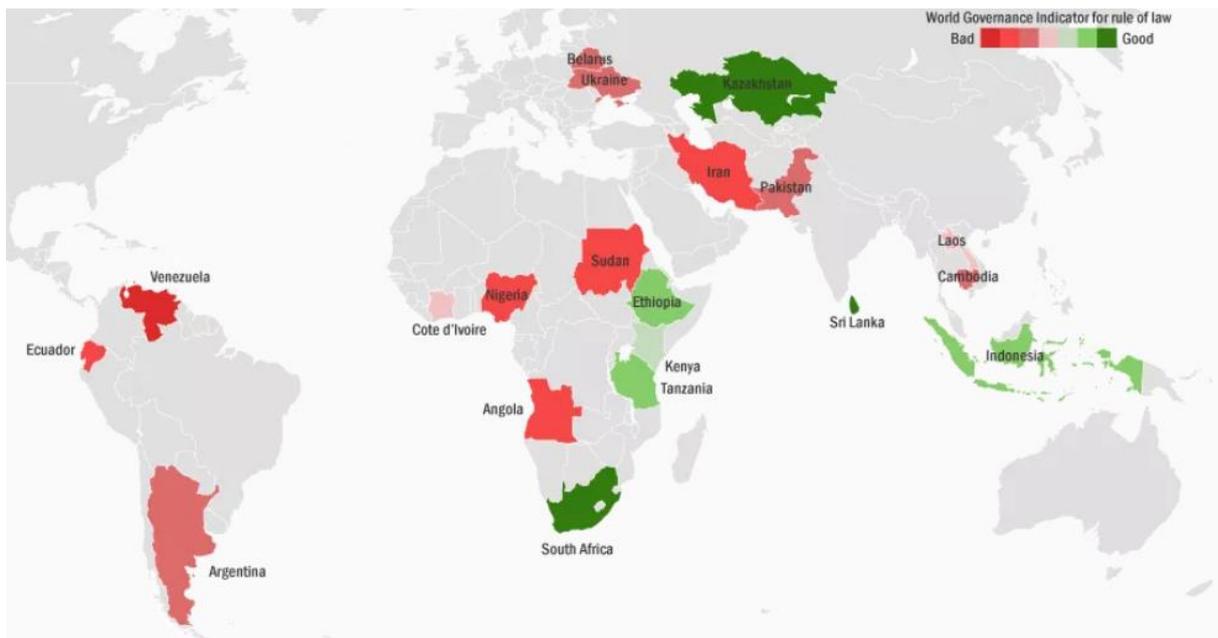


Figure 4: Top 20 borrowers of Chinese money, 2012-2014 differentiated by the World Governance Indicator (Dollar, 2017)

In the previous parts of this paragraph trends in FDI between China and Africa have been discussed. The final part of this paragraph aims at defining scientific theories about FDI. What are the effects of FDI on productivity, GDP-development or employment? Such questions will be answered in the remaining part of this paragraph.

As stated in chapter 1.1, industrialization is inducing economic growth for multiple reasons (U.S. Department of Commerce, 2012). Especially for developing economies industrialization leads to employment for low skilled workers and relatively high wages. In the past decades, African economies have deindustrialized. This has led to the situation that the manufacturing sector in low-income African countries is nowadays smaller than it was in 1985 (Page, 2012). Furthermore, agriculture hasn't taken up the

space created by a smaller manufacturing sector (McMillan and Rodrik, 2011). Nowadays, African countries belong to the least competitive economies in the world according to the Global Competitive Index of the World Economic Forum. To improve the economic performance, Africa could think about industrializing again (Page, 2012), increasing its agro-industry (Humphrey and Memedovic, 2006), and/or invest in tradable services like tourism.

To industrialize again, Africa should focus on overcoming two problems that have occurred with deindustrialization since the middle of the 1980's, namely: the diversity and sophistication of the remaining available industry have declined, and manufacturing as a share of output and employment has become smaller. By focusing on improving so-called special economic zones (SEZ) and export processing zones (EPZ), with help of foreign direct investments, a positive impulse for industrialization can be given (Farole, 2011). Currently, these kinds of zones exist in Africa but there is too little emphasis on creating links to companies outside of these zones. This prevents spillovers from happening.

Another way of benefiting most from attracted FDI is by making sure vertical spillovers take place. Vertical spillovers affect firms upstream and downstream the value chain. This has a more positive effect than horizontal spillovers as Harrison and Rodriguez-Clare (2010) state. Other literature agrees that focusing on vertical spillovers is the most useful way of industrializing within today's highly fragmented global value chain (Timmer et al., 2014; Page, 2012). Other possibilities of benefitting from FDI are that host economies get access to new technology, knowledge (employees of receiving countries often gain education which leads to a higher human capital), and profits of FDI receiving companies are taxed by the host country (IMF, 2001).

In general, it is an accepted way of thinking that opening up trade barriers lead to more trade and increase prosperity within a country (Weil, 2011). There are, however, also some downsides to receiving FDI. Pike, Rodríguez-Pose, and Tomaney (2017) state that receiving FDI increases inequality. Mainly companies in highly urbanized areas receive FDI. For company owners, this might lead to a (strong) increase in income whereas workers receive minimum wages. Exactly this has happened in China during the late 1990s and early 2000s. Deng Xiaoping had already anticipated on this by saying: "let some get rich first" (Pike, Rodríguez-Pose, and Tomaney, 2017). Another downside of receiving FDI is that poorly led countries and companies might sell their most important and valuable companies and resources to the highest foreign bidder. This might have a negative effect on power relations between the receiving and sending country get distorted (Edwards, 2000). Yuan Sun (2017) names that human rights and the environment get harmed because of foreign investments in African mines.

#### **2.4 Economic situation in Africa**

Increasing globalization leads to value chains that get more and more fragmented (Timmer et al., 2014). Countries and firms are able to transfer capital, knowledge, and goods quicker and at lower costs due to increasingly open economies. Previously in this research, the terms 'Asian Miracle' and 'Asian Tigers' have been mentioned. Many Asian companies have already benefitted hugely from globalization, even during the economic crisis of 2008. Although Western economies are still assumed to be world-leading economies, many Asian economies have become competitive with them. One of the main reasons for upcoming Asian economies was that low wages were paid to workers. Nowadays it appears that even in China wages are increasing (due to trade unions and the production of more knowledge-intensive goods) which leads to a decline in competitiveness of the Chinese economy for light manufacturing (Page, 2012). This might create opportunities for African countries to take up the space for manufacturing of low-tech goods and to increase industrialization on the continent. Many African countries will have to react to such opportunities since their economy isn't competitive in comparison to other economies. In this paragraph, a more in-depth analysis on the African economy will be given. Countries that will be analyzed are those that are available in the GGDC 10-sector database (Timmer, De Vries, and De Vries, 2015), exact reasons for this decision will be described in the next chapter.

**2.4.1 General economic performance**

The general trend in Africa shows economic growth, see figure 5. Within this growth, Nigeria has a strong positive contribution due to a strong oil and mining industry and a growing services sector (African Development Bank, 2014). Although there has been a decrease in growth in 2016 from 3,4% in 2015 to 2,2% in 2016, economic growth has increased again to a predicted 4,3% growth of in 2017. Reasons for this deceleration are low commodity prices (lower oil prices), slower economic growth in China and negative effects of the Arab Spring. The OECD (2017) names increasing domestic markets, improved macroeconomic policy and a so-called ‘friendlier’ business environment as reasons for the growing economy. With a friendlier business environment, the OECD aims at stabilizing regimes (in some countries), digitalization, and a higher educated population.

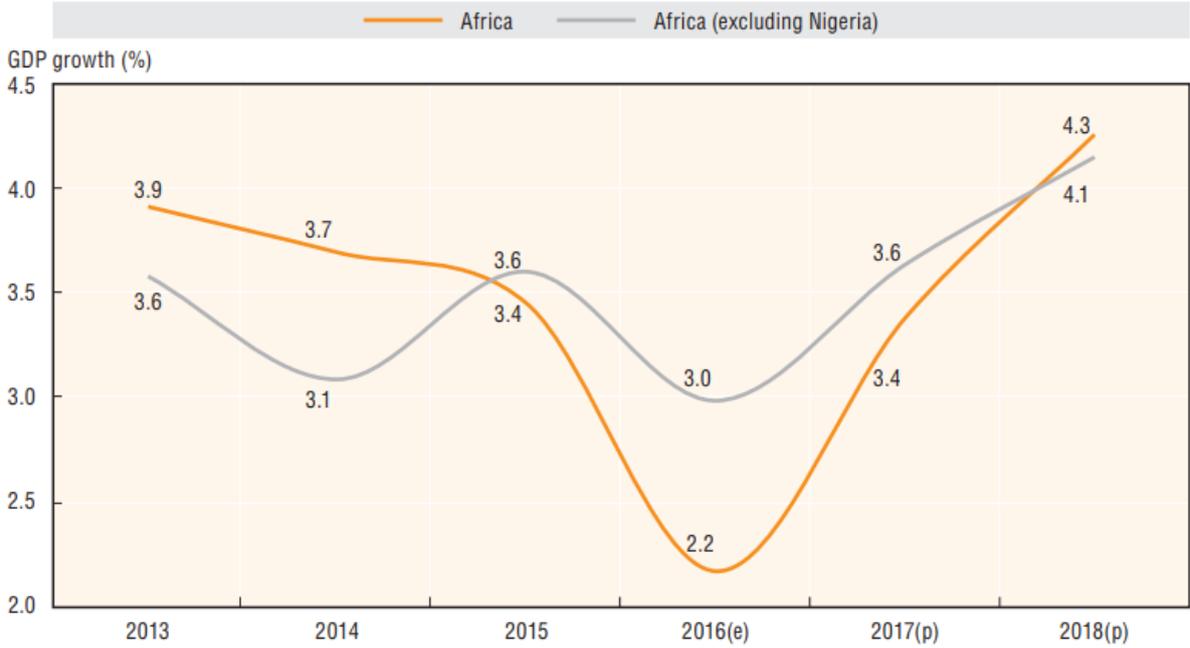


Figure 5: Africa’s economic growth, 2013-2018 (OECD, 2017)

In their African Economic Outlook, the OECD (2017) states that Africa’s domestic market is increasing. Worldwide, it is expected that the largest population growth will take place in Africa (UN, 2018). This is one for the reasons why domestic markets will grow and exposure to influences of foreign economies become smaller. For Africa, this is beneficial since currently there is a heavy reliance on exports to foreign countries. Of the export destinations, China is the biggest since it is responsible for 27% of the total exports of Africa. Moreover, of these exports to China, 83% is represented by so-called commodity goods (products that are extracted directly from the earth) (Pigato and Tang, 2015).

Within Africa, regions show different performance levels. East African countries perform better than North African countries do, as table 2 shows. The main reason for this difference is political instability, but also the risk of terrorist activity (World Bank, 2016). To put these figures in perspective, in 2016 the GDP growth in the EU was 1,9%, and in North America 1,4%.

Table 2: GDP growth (per region) in Africa, 2008-2018 (OECD, 2017)

	2008-12	2013	2014	2015	2016(e)	2017(p)	2018(p)
<b>Real GDP growth (%)</b>							
Central Africa	4.9	4.0	6.0	3.6	0.8	2.2	3.8
East Africa	5.6	7.2	5.9	6.5	5.3	5.7	6.0
North Africa	4.4	1.7	1.5	3.3	3.0	3.4	3.7
Southern Africa	3.1	3.7	2.8	1.9	1.1	1.9	2.6
West Africa	6.2	5.7	6.1	3.3	0.4	3.5	5.5
<b>Africa</b>	<b>4.7</b>	<b>3.9</b>	<b>3.7</b>	<b>3.4</b>	<b>2.2</b>	<b>3.4</b>	<b>4.3</b>

## 2.4.2 Industry

As written in paragraph 2.4.1, the population of Africa is expected to grow. In line with this expectation is the forecast that between 2015 and 2030 almost 30 million new workers will enter the labor market. This increase in the supply of labor leads to the fact that many African countries design policy to promote industrialization. In their Agenda 2063, the African Union (AU) (2015) writes that industrialization is one of the key elements in the aim to increase prosperity. Together, the AU and the OECD agree on an STI-driven skills revolution (science, technology, and innovation) that would lead to high-quality jobs for the growing labor force. Another goal of African governments is to induce structural change by increasing the number of workers that currently work in agriculture to move to more productive sectors (OECD, 2017). The OECD has measured structural change that has occurred in Africa between 2000 and 2010, based on the GGDC 10-sector database, see figure 6 (OECD, 2017).

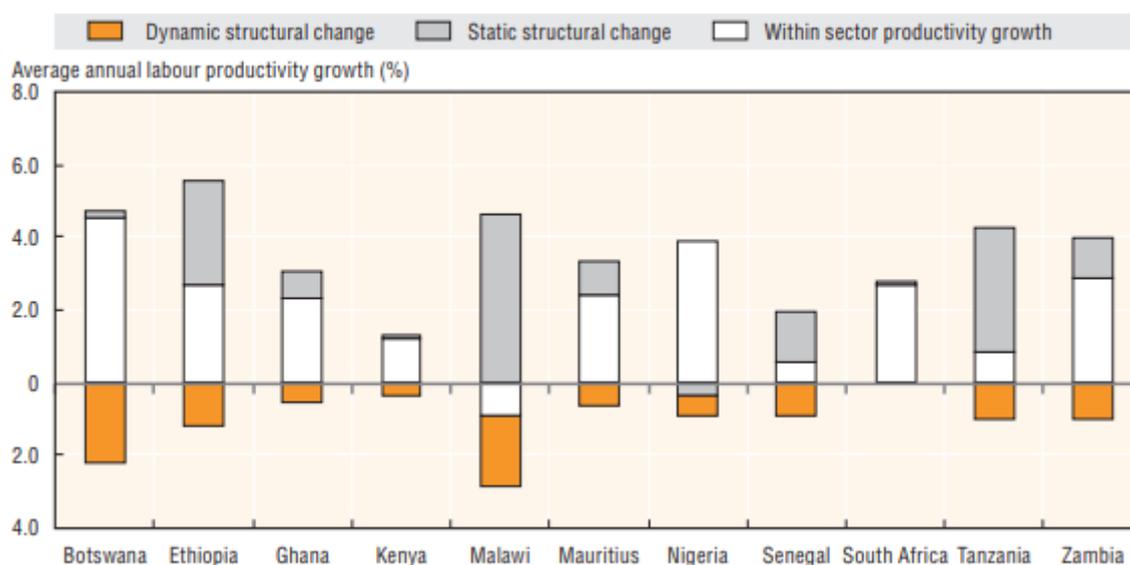


Figure 6: Structural change and productivity growth for 11 sub-Saharan countries, 2000-2010 (OECD, 2017)

In figure 6, static structural change is structural change as described in paragraph 2.2.2, the reallocation of workers from a less-productive sector to a more productive sector. Dynamic structural change refers to the change in sectoral productivity due to the labor reallocation of static structural change, as explained in paragraph 2.2.3. Within sector productivity growth points at productivity improvements within sectors (see paragraph 2.2.1).

According to the reports of the OECD (2017) and the AU (2015), the ambition and potential to industrialize is high in Africa. The current state of the manufacturing sector is rather poor as Page (2012) notes. Currently, Africa is the continent with the lowest contribution of manufacturing to GDP (see figure 7).

(%)

	Agriculture	Manufacturing	Services
Africa	16	11	54
European Union	2	15	74
East Asia and the Pacific	5	23	60
South Asia	18	16	53
Latin America and the Caribbean	5	14	67
North America	1	12	80

Figure 7: Shares per sector of GDP, 2014-2015\* (OECD, 2017)

\*Note that sectors (quarrying, mining, and construction) are left out of the table and therefore the shares don't add up to 100%.

### 2.4.3 Agriculture

In the Agenda 2063 (African Union, 2015) sets the goal to radically transform its agriculture sector to become a net food exporter. The goal is that African agriculture should be capable to feed the whole continent. To achieve this, agriculture should be scaled up in production, and productivity has to be increased. Working on educating farmers by starting up education programs is one of the ways to achieve this goal. An example of such an educational program is the Comprehensive Africa Agriculture Development Programme (CAADP) that supports farmers with running their business.

As can be seen in figure 7, in comparison to more developed continents, agriculture is of relatively large size in Africa. However, this share is falling as Diao et al. (2017) write about Ethiopia, Malawi, and Tanzania. The share of agriculture is falling in these countries whereas the productivity within this sector is increasing in Ethiopia and Tanzania (as can be seen in figure 6). According to Diao et al. (2017), this implies that the labor productivity in agriculture is growing at a higher pace than in nonagricultural sectors.

Although productivity is increasing and policies aim at increasing scale benefits, many farmers fulfill their job out of necessity. 33% of all African entrepreneurs fulfill their job because they are necessity driven. Many of these entrepreneurs are producing products for their own subsistence. In fact, the agricultural sector is dominated by subsistence farming (OECD, 2017; Lowder, Skoet, and Raney, 2016). In the Africa Agriculture Status Report 2017 (AGRA, 2017) it is argued that commercial farming is of essential importance for the production and sales of agricultural products (figure 8).

Importance of farm sales (Agricultural sales/total agricultural income)		
Low	Medium	High
Subsistence farms	Pre-commercial farms	Specialized commercial farms
Transitioning farms		Diversified commercial farms

Figure 8: Importance of farm sales per farm typology (AGRA, 2017)

#### 2.4.4 Services

In 2014-2015, the average share of the service sector in Africa's GDP was 54% (figure 7). This means that services is the dominant sector, albeit less dominant than in other continents. Although services is the dominant sector, Africa is a net importer of services. These imports mainly come from continents with developed economies. The general trend of exports of African services is positive, whereas the imports decline. According to the OECD (2017), the combination of this positive trend and a growing, young population that gets better educated might lead to a healthy service sector. Total trade in services has almost doubled to \$270bn. between 2005 and 2015.

Within the service sector, tourism is of big importance for African economic performance. Throughout recent decades tourism has increased massively as contributing sector. The number of visitors has increased from 24mln. in 1995-1998 to 48mln. in 2005-2008, and this has increased to 56mln. in 2011-2014. Expenditures per tourist have increased from \$580 in 1995-1998 to \$850 in 2011-2014, and overall revenue has grown from \$14bn. in 1995-1998 to \$47bn. in 2011-2014 (UNCTAD, 2017b).

Especially in small island developing states (SIDS) tourism is of key importance. Within the continent, Mauritius belongs to the three economies that rely heaviest on this sector. For Mauritius, 27% of its total GDP is generated by tourism. Although tourism is not as volatile as FDI or remittances, such reliance on one sector increases vulnerability of a country (USITC, 2017).

Within Africa, like in other continents, most developed economies (Nigeria and South Africa) are dominated by the service sector. The contrary is true for the least developed economies (Chad, or Sierra Leone), where agriculture is most dominant. Looking at the regional trade agreements for services around the world (figure 9), Africa stays behind as an economically poor developed continent.

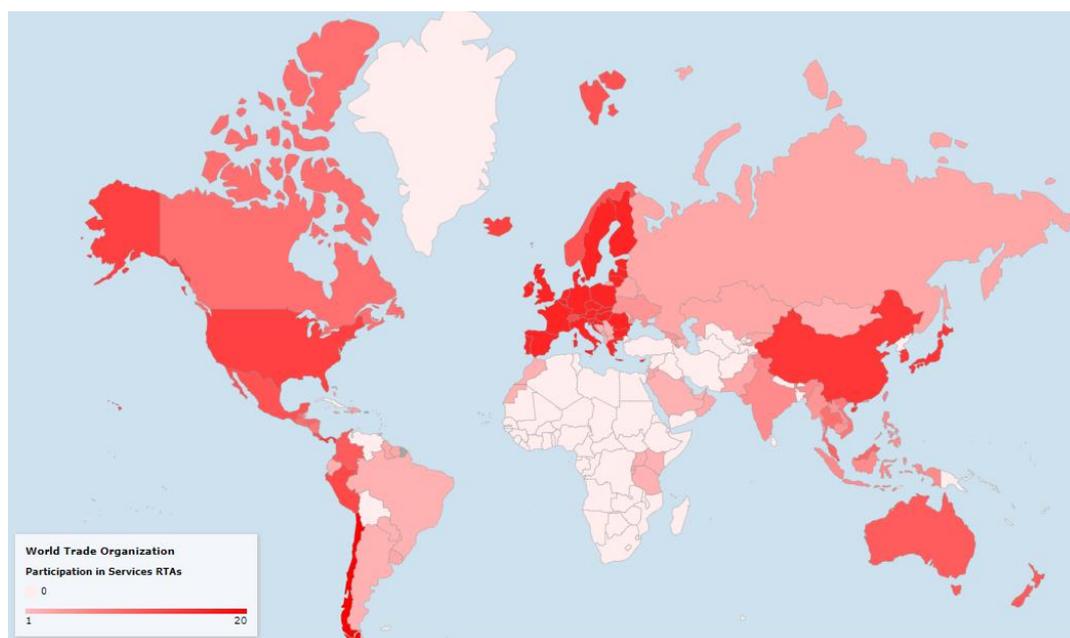


Figure 9: Participation in regional trade agreements on services (WTO, 2018)

#### 2.5 Economic impact of FDI

This paragraph discusses the impact of FDI on an economy. In this paragraph, the focus is on FDI in general and not FDI from a specific sending country or to a specific host economy.

Kahouli and Maktouf (2015) found several effects that occur in a host economy because of incoming FDI. First, they mention, FDI increases the national income of the host country. Secondly, FDI has positive effects on labor productivity and employment. A third effect they mention are the spillovers

that follow from foreign investments: technology transfer, new management, and access to new production methods. Such spillovers might be catalysts for structural economic change as increasing productivity leads to the need for fewer workers for an equal amount of output (De Vries, Timmer, and De Vries, 2015).

In a globalizing world, Kahouli and Maktouf (2015) see FDI as a way to create linkages between cities, ports, and airports. Such infrastructure projects require knowledge, capital, and skills to be completed. These aspects are missing (to some extent) in developing economies. Foreign investments might lead to successful completion of such projects. Shan et al. (2018) state that especially Africa should focus on attracting FDI to improve its outdated infrastructure network.

The economic impact of FDI comes with a causality problem: does a growing economy attract more FDI or does an economy grow because of FDI? The direction of this causality is also discussed in literature. Shan et al. (2018) write that the impact of FDI depends on the market size of a host economy. They state that the larger a host economy is, the more FDI it will receive. Johnson (2006) writes about differences of this causality depending on the level of economic development of a host country. In his research, Johnson (2006) writes that FDI positively contributes to economic growth and that both FDI and economic growth strengthen each other. For developing countries, Johnson (2006) finds that economic growth follows FDI inflows, as economic growth is unlikely to take place because of low-income levels.

Ways of reacting on FDI strongly depend on the structure of the host economy (Shan et al., 2018). If a certain sector is dominant, it will attract more FDI, which is in line with the previously mentioned market size. Especially increasing employment and productivity might induce structural economic change to take place. As Diao et al. (2017) and De Vries, Timmer, and De Vries (2015) find, structural change itself also positively affects economic growth.

## **2.6 Conceptual model**

The conceptual model presented in this paragraph is based on theories that have been discussed previously in this chapter. Topics that have an impact on structural economic change, and are related to Chinese FDI in Africa, are integrated into this model. Arrows can be interpreted as a relation between topics.

In this research, it is the goal to find out if there is a relation between Chinese FDI and structural economic change in Africa. An explanation of all the elements in the conceptual model is given below figure 10.

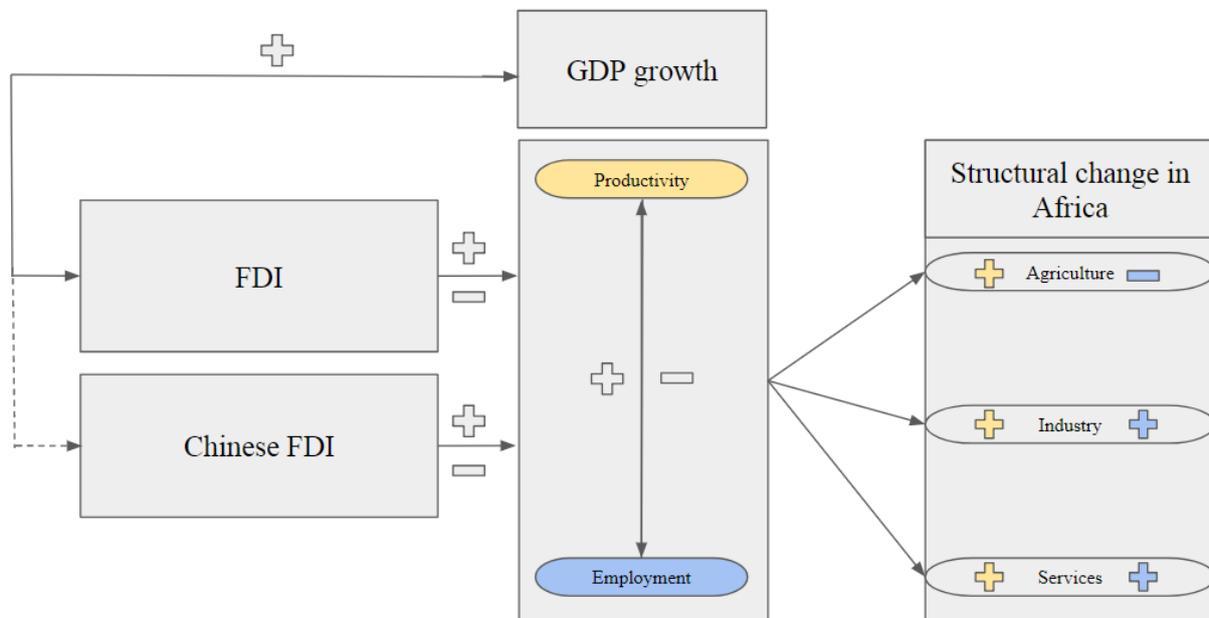


Figure 10: Conceptual model

### **FDI**

African countries receive FDI from various sending countries. In this research, it is assumed that FDI and GDP growth strengthen each other (Johnson, 2006; Shan et al., 2018). Therefore an arrow and a plus-sign are placed between FDI and GDP growth. Within the conceptual model, FDI is the total FDI instock within a country in a certain year. Looking at the effects of total FDI instock within a country can be used as a reference for the effects of Chinese FDI.

Kahouli and Maktouf (2015) find that FDI leads to spillovers in the receiving country. These spillovers might (positively and/or negatively) affect productivity and employment within the receiving country. Therefore the topics FDI and productivity and employment are linked with an arrow and a plus-sign, as well as a minus-sign.

### **Chinese FDI**

The topic of Chinese FDI is one of the central themes in this research. As mentioned with the topic 'FDI', literature suggests that GDP growth is positively affected by FDI inflows (Johnson, 2006). Shan et al. (2018) and Johnson (2006) also find that, in general, FDI and GDP growth strengthen each other. Since both topics reinforce each other, an arrow and plus-sign from GDP growth towards Chinese FDI are drawn.

By extracting Chinese FDI from total FDI instock, differences in impact of FDI on productivity and sectoral decomposition can be compared. Just like total FDI, Chinese FDI will probably lead to vertical spillovers that increase productivity and employment. Therefore Chinese FDI is linked to the combined topics of productivity and employment.

### **GDP growth**

A partial explanation for the position of GDP growth within this conceptual model is already given above. GDP growth is a determinant of the level of FDI. Since this research focuses on investigating a possible relation between Chinese FDI and structural economic change, it is useful to find out if the amount of FDI inflow and instock can be explained when looking at GDP developments. Following Shan et al. (2018) and Johnson (2006), it is assumed that GDP growth has a positive effect on the amount of (Chinese) FDI within an economy. This explains the arrows and plus-sign between GDP growth and (Chinese) FDI.

### ***Productivity and employment***

The concept of structural change consists of changes in productivity and employment. These two topics strongly relate and are therefore combined into one single topic (De Vries, Timmer, and De Vries, 2015). In theory, a higher productivity will lead to less employment within a certain sector, therefore a minus-sign is placed between productivity and employment. However, there is also a positive relation between both topics. When there is more employment in more productive sectors, productivity of an economy increases. This explains the plus-sign that is also drawn between productivity and employment.

Another linkage is placed between (Chinese) FDI and the combined topics of productivity and employment. Due to spillovers that follow from foreign investments, changes might occur in productivity and employment. These changes can be positive as well as negative, which explains the plus- and minus sign.

### ***Structural change in Africa***

Changes in productivity and employment are the basis of structural economic change. Therefore the combined topics in productivity and employment are linked with an arrow to structural change in Africa. As changes can occur in both productivity and employment, each of the subtopics is colored differently (productivity = orange, employment = blue).

In this research, an economy is divided into three sectors: agriculture, industry, and services. Based on Diao et al. (2017) certain changes in sectoral employment and productivity are expected. These changes are visualized with a minus or a plus in the color that corresponds with the color of productivity or employment earlier in the model. In line with the theory of Diao et al. (2017), it is expected that productivity in agriculture will increase, whereas employment decreases. For industry and services, the expectation is that FDI positively influences productivity and employment.

The general thought behind this model is that structural economic change is determined by changes in productivity and employment. Chinese FDI strengthens these changes in productivity and employment that cause structural economic change to happen. The amount of FDI is affected by GDP developments, just like FDI inflow and instock has an impact on GDP growth.

## **2.7 Hypotheses**

Based on the literature research in this chapter, the following hypotheses are formulated about the effect of Chinese investments in Africa on positive or negative structural change in African countries.

*H1: There is a positive relation between Chinese FDI on structural change in Africa.*

*H2: Chinese investments have a positive effect on employment in more productive sectors.*

*H3: Chinese investments have a positive effect on demand for consumer goods in the modern sector.*

### **3 Methodology**

This chapter discusses the practical aspects of answering the central question in this research. Here will be explained how the used data is collected and how it will be analyzed. The first paragraph will focus on the research method, containing information on quantitative research and the population that is represented by the data. The second paragraph discusses the data collection and is followed by an explanation of how the variables will be measured in the third paragraph. In the fourth paragraph, the data analysis in this research will be elaborated on. The fifth and final paragraph of this chapter contains information on possible spurious correlations.

#### **3.1 Research methods**

##### **3.1.1 Quantitative research**

The goal of this research is to find out what the relation is between Chinese FDI and structural economic change in FDI receiving African countries. This explorative research offers an insight into the possible effects of Chinese FDI. This insight might be useful for African policymakers on attracting FDI. To realize this goal, both quantitative and qualitative research methods have been considered.

Relevant literature on FDI (Kahouli and Maktouf, 2015; Alfaro et al., 2010) and structural change (Diao et al., 2017; Timmer, De Vries, and De Vries, 2015; De Vries, Timmer, and De Vries, 2015) are widely available. The above-mentioned literature is all based on quantitative data. Moreover, Edmondson and McManus (2007) state in their framework on research methodology that quantitative research is more applicable in a developed (mature) field of research, whereas qualitative research methods are more relevant in fields of research that are nascent or intermediately developed. As current research on FDI and structural change can be seen as mature, quantitative research offers the opportunity to discover new relations between current theories.

According to Edmondson and McManus (2007), qualitative research methods are more relevant when the field of research is still nascent. Qualitative research aims at studying phenomena that are still relatively new or where only little research has been conducted (Barley, 1990). With qualitative research, small samples are taken to find in-depth information that doesn't necessarily represent a larger group (Reid, 1996). As the main goal in this research is to find out what the relation is between Chinese FDI and economic growth and structural change in Africa, the focus is more on recognizing trends instead of finding the in-depth reasoning behind these trends. If the focus of this research would be on finding out why China invests in specific African projects, a more qualitative approach was justifiable. As this is not the case, a solely quantitative research is more in line with relevant literature.

The basis for this thesis is previous research on structural change. Two key articles (Diao et al. 2017; Timmer, De Vries, and De Vries, 2015) form this basis and are using the GGDC 10-sector database, which is a quantitative dataset constructed and updated by Timmer, De Vries, and De Vries (2015).

Besides the GGDC 10-sector database, other important data sources are also quantitative by nature. Bilateral FDI statistics (UNCTAD, 2014) and GDP figures (World Bank, 2018) are examples of quantitative sources that are used in this research. The use of the above-mentioned sources advocates for a quantitative methodology in this research.

##### **3.1.2 Population**

One of the main sources of data in this research is the GGDC 10-sector database (Timmer, De Vries, and De Vries, 2015). In this longitudinal database, thirteen African countries are measured in terms of productivity and employment. Unfortunately, this number couldn't be bigger due to a lack of reliable data in African countries. The thirteen countries in this database form the population of this research, and are listed below:

1. Botswana (BWA)
2. Egypt (EGY)
3. Ethiopia (ETH)

4. Ghana (GHA)
5. Kenya (KEN)
6. Morocco (MOR)
7. Mauritius (MUS)
8. Malawi (MWI)
9. Nigeria (NGA)
10. Senegal (SEN)
11. Tanzania (TZA)
12. South Africa (ZAF)
13. Zambia (ZMB)

Since there is only a limited number of African countries where productivity and employment figures are measured over multiple years, all analyses are based on these thirteen countries. To construct a useful dataset for this research, FDI statistics have to be as complete as possible. Therefore the choice is made to measure the population for the period 2003-2010 as it allows to combine data as complete as possible based on FDI statistics of UNCTAD (2014).

## **3.2 Data collection**

### **3.2.1 Secondary data**

As mentioned in the previous chapter, the Groningen Growth and Development Center provides the primary data for this research: the 10-sector database (Timmer, De Vries, and De Vries, 2015). This dataset allows to do calculations that lead to structural growth statistics. As this is only one part of this research, secondary data is also required for a complete analysis on the relation between FDI and structural economic change in Africa.

Besides productivity and employment figures of the 10-sector database, data on GDP developments is needed. Therefore annual GDP development data is obtained from the World Bank (2018). This data shows year on year changes in percentages based on national accounts. The African countries that are integrated into the GGDC 10-sector database are of all African countries most capable of collecting trustworthy data (Timmer, De Vries, and De Vries, 2015). This is a reason to state that GDP data provided by the World Bank (2018) is of sufficient quality to use in this research.

Another secondary data source is provided by the UNCTAD (2014). This organization annually publishes bilateral FDI statistics for 206 economies. The authors of this report write that they try to provide a dataset that is as complete as possible. However, for some years there is no (reliable) data available on FDI statistics. For this research, FDI instock in African countries is measured of FDI from China, the EU, the US and total FDI instock.

### **3.2.2 Source reliability and data issues**

#### ***GGDC 10-sector database***

Multiple remarks can be made about the available data that is needed for this research. Timmer, De Vries, and De Vries (2015) already mentioned, African countries and China might offer statistics of low quality. According to Devarajan (2013) and Jerven (2013), African data might be subject to measurement error due to a lack of capacity in collecting and managing statistical data, and unclear agreements on which organization is responsible for collecting what data. For China, De Vries et al. (2012) find equal data issues. Timmer, De Vries, and De Vries (2015) agree to a certain extent with the criticisms, but they state that the specific countries that are included into the GGDC 10-sector database have a considerable history in collecting data, and conducting labor and household surveys.

Diao et al. (2017), who also make use of the GGDC 10-sector database, found that the African countries in the GGDC database have the strongest performance in collecting national accounts data. Moreover, they note that the statistical offices of these countries are the most reliable of all African countries. Employment data in the GGDC 10-sector database includes informal workers as much as possible. Timmer, De Vries, and De Vries (2015) mention that they collect data on the number of workers on the

broadest concept of employment which is constructed of self-employed, family workers, and informal workers.

Data on value added productivity has to be transformed to US dollars since they are published in national currencies. Transforming these values to US dollars makes them comparable with FDI instock figures of the UNCTAD. The exchange rate that is used here is of (December) 2005 since the values in this dataset are adjusted for this date.

In a broad perspective, the GGDC 10-sector database is assumed to be reliable. Internationally respected organizations like the United Nations, the World Economic Forum, and the OECD make use of the dataset.

#### ***World Bank GDP growth figures***

GDP growth figures are retained from World Bank statistics. The World Bank publishes GDP growth figures based on national accounts data and national accounts data provided by the OECD. For the same reasons as mentioned with the GGDC 10-sector database, this data can be criticized for not being reliable. Moreover, the African countries in this research are seen as the best developed African countries in terms of collecting and managing data.

Of the GDP figures that are around, World Bank GDP growth figures can be seen as trustworthy.

#### ***UNCTAD bilateral FDI statistics***

As mentioned in paragraph 3.2.1, FDI statistics are missing for some countries. For these specific years, countries haven't published or aren't separately reported by origin of FDI (UNCTAD, 2014). In the case of the African countries in this research, some countries report no, or partial FDI statistics (see appendix 1 for a full overview). When analyzing FDI statistics, cases with missing values are left out.

As the UNCTAD FDI statistics are bilateral, data of both sending and receiving country are included. The authors have used FDI statistics of sending countries to find missing values for years that data was unavailable for receiving countries in specific years.

#### ***Research period***

To create a dataset which is as complete as possible, the choice is made to choose for the period 2003-2010. Based upon FDI data, first Chinese FDI took place in 2003 (UNCTAD, 2014). This marks the beginning of a relevant period for this research. As the GGDC 10-sector database measures productivity- and employment levels until 2010 for most African countries, 2010 is taken as the last year for the research period. The end result is a dataset that consists of 13 countries that each has been analyzed for 8 years.

### **3.3 Measuring variables**

The original GGDC 10-sector database consists of 10 sectors. In this research, the economy is divided into three sectors: agriculture, industry, and services. The 10 sectors in the GGDC database are therefore appointed to one of the three sectors. This leads to the schedule presented in figure 11.

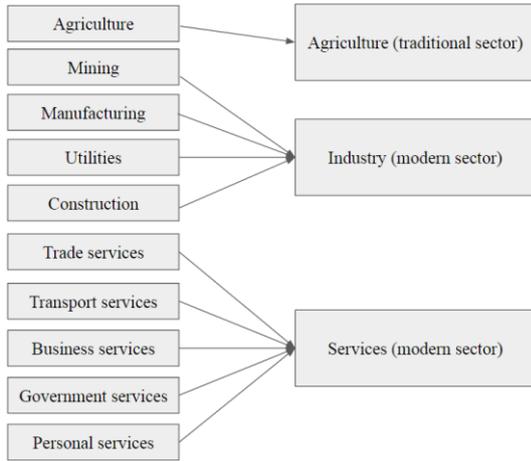


Figure 11: Distribution of 10 GGDC-sectors into three-sector economy

### **Measuring changes in productivity and sectoral decomposition**

The core of this research consists of measuring three types of changes in aggregated productivity. To do this, employment and value-added productivity data of the GGDC 10-sector database is converted into a three-sector database following the distribution figure 11. The three types of change are explained in paragraph 2.2.1 until paragraph 2.2.3. To calculate these types of change, equation 1 is used (Timmer, De Vries, and De Vries, 2015). In this equation the first term represents within sectoral change, the second term represents static structural change and the third term calculates the dynamic structural change. The three terms added up leads to change in aggregated productivity.

Equation 1: Change in aggregate productivity

$$\Delta P = \sum_i (P_i^T - P_i^0) S_i^0 + \sum_i (S_i^T - S_i^0) P_i^0 + \sum_i (P_i^T - P_i^0) * (S_i^T - S_i^0)$$

In this equation, the share of sector  $i$  in overall employment is referred to by  $S_i$ . Labor productivity level of sector  $i$  is  $P_i$  and superscript 0 and T refer to the initial and final period.

Calculating the three terms in equation 1 lead to the following variables (including  $\Delta P$ ):

- Within sectoral productivity change, 2003-2010;
- Dynamic structural change, 2003-2010;
- Static structural change, 2003-2010;
- Change in aggregated productivity, 2003-2010.

As these averages represent the total change during the period 2003-2010, this still has to be boiled down to average annual changes in within sectoral productivity, dynamic structural change, static structural change, and change in aggregated productivity. To do this, the following equations are used:

- $P03$  = aggregated productivity 2003
- $P10$  = aggregated productivity 2010
- $\Delta C$  = total change in aggregated productivity, 2003-2010
- $\Delta A$  = average annual change in aggregated productivity (%)
- $\Delta P$  = change in aggregated productivity

Equation 2: Aggregated productivity

$$P = \text{Employment} \div \text{Value added productivity}$$

Equation 3: Total change in aggregated productivity, 2003-2010

$$\Delta C = P10 \div P03$$

*Equation 4: Average annual change in aggregated productivity (%)*

$$\Delta A = \left( \Delta C \left( \frac{1}{7} \right)^{-1} \right) * 100\%$$

The following steps have to be taken for the calculation of average annual change in within sectoral productivity, dynamic structural change, and static structural change: Set  $\Delta P$  at 100% and make an indexation of the three terms in equation 1. This leads to a share of each term within  $\Delta A$ .  $\Delta A$  and these terms within  $\Delta A$  are the key figures for measuring changes in productivity and sectoral decomposition.

For changes in productivity, a control variable is constructed. To measure if productivity increases faster in a certain country than in other countries, the average of annual productivity is subtracted from country-specific values for annual productivity. This leads to the trend that negative values show productivity levels that are below average for a specific year, whereas positive values point at annual productivity levels that are above average.

### **3.4 Analysis**

The goal of this research is not to find causality but to address relations between structural change and Chinese FDI instock in Africa. A convenient way to detect and analyze relations is the use of correlation matrixes.

The variables that are explained in paragraph 3.3 form the core of the correlation matrixes that will be performed in this research. Changes in productivity or sectoral decomposition can be correlated with many kinds of data like FDI instock or GDP development. Below the analysis per subquestion will be explained.

#### *1. To what extent is economic growth related to structural economic change?*

The basis of answering this question is in empirical research. The key sources in this research (Timmer, De Vries and De Vries, 2015; Diao et al., 2017) provide a theoretical context on positive and negative impacts of structural change on economic development. Once this context is set, it can be related to findings in this research. Here will be looked at productivity changes of each sector per country and its relation GDP developments per country.

The combination of theory and statistical findings in this research will lead to the answer on the subquestion. In this analysis, an interpretation will be given for the general relation between economic growth and structural economic change. The focus will not be on country-specific conclusions but for the set of countries as a whole.

#### *2. How does foreign direct investment from China influence structural economic change?*

The way to conduct research on this question, and analyze the outcomes is as follows. The first thing to do is making a separation between FDI receiving and non-receiving countries has to be made. Making this distinction allows for a comparison between FDI receiving and non-receiving countries. Once this separation is made, the focus will turn to structural economic change. The end goal that would answer this question should be the construction of a figure that shows levels of within sectoral productivity growth, dynamic structural change, static structural change, and aggregated change in productivity for both receiving and non-receiving countries. Before coming to such a figure, some intermediate results are useful to be shown.

These intermediate results and analyses consist of performing correlation matrixes that compare sectoral productivity levels to instock of Chinese FDI and GDP developments. This creates an insight in whether or not there is a relation between Chinese FDI and productivity in a specific sector and if certain sectors are more important for the overall economic performance of a country. When there appears to be a difference between receiving and non-receiving countries of FDI, one might state that these Chinese investments have a positive or negative effect.

In line with African goals to industrialize (African Union, 2015), one might expect a relatively large positive relation between Chinese FDI instock and the industrial sector. This positive relation can be expected for two reasons: first, one of the main goals of China is to improve access to natural resources. Mining is a sector that belongs to the industry and will probably attract relatively much Chinese money and improve in terms of productivity. Secondly, China has a vast experience in manufacturing. When attracting Chinese money, African countries might aim to benefit from the industrial expertise of China in this sector.

3. *What are the differences in structural change in Africa between Chinese FDI and other FDI sending countries?*

Differences in reaction to FDI from other sending countries than China might occur. Therefore FDI instock from other sending countries has to be determined. To do this, the same data source will be used: the bilateral FDI statistics of the UNCTAD (2014). Here total FDI instock per African country will be used, as well as FDI instock that originates from the US and from the European Union.

Besides creating an insight in developments of FDI instock from different sources, differences in economic impact per source can be analyzed. The actual development of Chinese FDI instock compared to that of other sending countries positions the involvement of China in African economies. Is China gaining ground or losing ground compared to other sending countries? This question should be answered with this comparison. Once this is done, differences in impact on productivity and employment per sending country or group of countries can be measured. Moreover, it can be analyzed whether Chinese FDI brings more (dis)benefits with it than FDI from another origin. When looking into possible differences in employment, an image occurs about the relation between FDI that originates from different countries and its effects on sectoral decomposition and structural change. In this analysis, the focus will be on total performance of the combination of all African countries in this research instead of individual countries.

### **3.5 Spurious correlation**

As correlation doesn't imply causation, the results that follow from the analysis in this research can be seen as the exploration of certain trends in FDI and structural economic change that take place. The findings in this research don't prove causality between the compared variables. Besides the fact that there is no proof of causation when measuring for correlation, another statistical bias can occur with performing correlation-matrixes: spurious correlation. Spurious correlations can best be explained when two variables show a certain trend over time. Such a trend suggests that there is a relation between two variables. However, it is very well possible that this trend between the two variables isn't because of the relation between the two measured variables but because of a certain trend that takes place in a third variable that isn't integrated into the correlation.

Many examples can be given for spurious correlations. In this research spurious correlation is something to be aware of as a reader. For example, the relation between FDI instock and GDP development is investigated, but besides FDI instock, there are many other variables that determine GDP development. The tests performed in this research might be subject to spurious correlation. However, the variables that are correlated in this research are chosen because theory suggests that they are linked to some extent.

## 4 Results

In this chapter, the results of the empirical research are presented. First, structural change will be treated. Secondly, the impact of Chinese FDI on structural change will be analyzed. These first and second parts will lead to the answer on the second subquestion: *How does foreign direct investment from China influence structural economic change?* Third, an analysis is done on the relation between overall economic change and its relation to structural change. This part will lead to the answer of the first subquestion: *To what extent is economic growth related to structural economic change?* In the final part of this chapter, a comparison is made between FDI from China and FDI from other origins. This part will answer the third research question: *What are the differences in structural change in Africa between Chinese FDI and other FDI sending countries?*

### 4.1 Results on structural change

The analysis on structural change consists of within sectoral change, static structural change, dynamic structural change, and aggregated productivity change. Based on equation 1, calculations have been made for each country in the sample. These calculations are made for the period 2003-2010, this is the period in which complete bilateral FDI data is available (UNCTAD, 2014).

Based on the outcomes that are visualized in figure 12, it can be stated that for most countries in the sample the largest contribution to change in aggregated productivity is due to within sectoral change. Between countries, there are differences in structural change. In Botswana, static structural change has a negative contribution to change in aggregated productivity. In all other countries in the sample, the contribution of static structural change is positive. For most researched countries dynamic structural change shows a negative impact on change in aggregate productivity. These findings are for a large part in line with those in figure 6 (OECD, 2017).

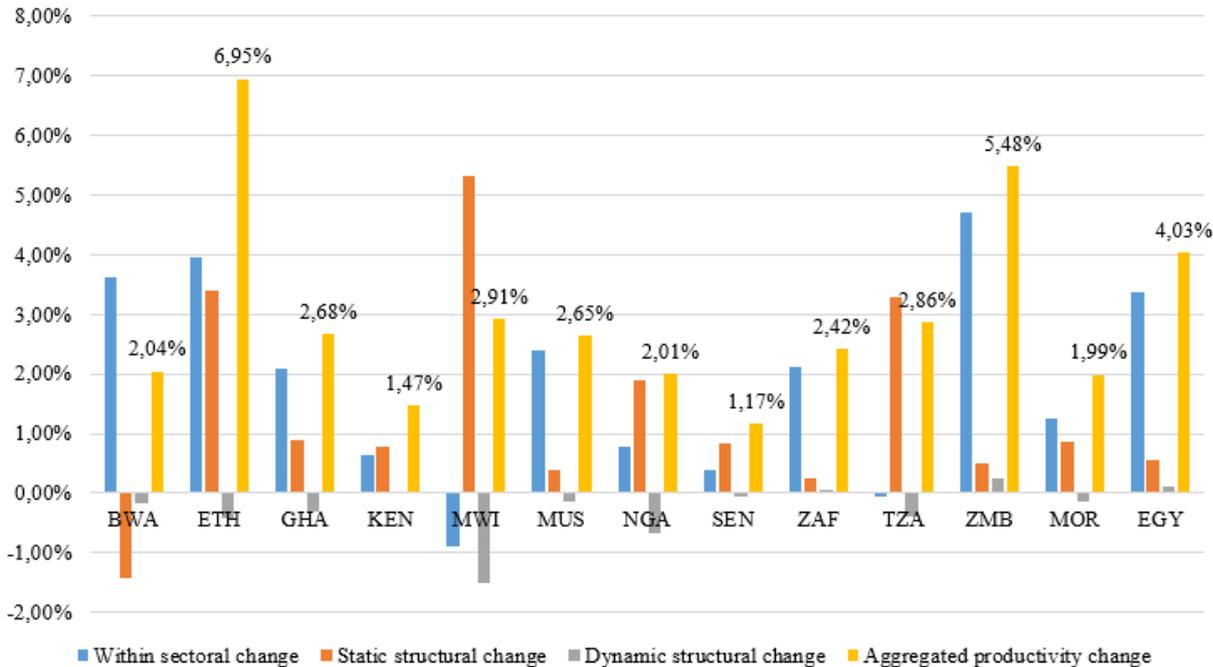


Figure 12: Decomposition of annual aggregated productivity changes in Africa, 2003-2010 (Author's calculations based on Timmer, De Vries, and De Vries, 2015)

Now structural change in African economies is analyzed, the question arises: *how is structural change in Africa correlated to the instock FDI?* Therefore a correlation matrix (table 3) is presented. In this matrix is shown that there appears to be a significant positive correlation between changes in productivity and instock of Chinese FDI.

*Table 3: Correlation matrix productivity and instock of Chinese FDI (N=104, \* = significant at 5% significance level) (Author's calculations based on Timmer, De Vries, and De Vries, 2015; UNCTAD, 2014)*

	<b>Aggregated productivity</b>	<b>Productivity agriculture</b>	<b>Productivity industry</b>	<b>Productivity services</b>
<b>Instock of Chinese FDI</b>	0,2262*	0,0745	0,1384	0,1970*

The correlation between instock of Chinese FDI and changes in productivity doesn't show whether or not there is a difference between FDI receiving countries and non-receiving countries. To find out if this is the case, a separation has to be made between receiving and non-receiving countries within the sample. Here instock of Chinese FDI is taken as a reference for receiving and non-receiving countries. In table 4 the instock of Chinese FDI is shown per country for the period 2003-2010. As mentioned in the previous chapter, for some countries FDI data is missing. If this is the case for a specific year in a specific country, this is noted by using “-” in table 4.

*Table 4: Instock of Chinese FDI (millions USD), 2003-2010 (UNCTAD, 2014)*

<b>Country</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
<b>BWA</b>	0	-	0	0	0	0	0	1
<b>ETH</b>	5	8	30	96	109	126	283	368
<b>GHA</b>	-	-	-	-	-	-	185	-2
<b>KEN</b>	26	28	58	46	55	78	120	222
<b>MWI</b>	6	9	-	-	0	0	0	1
<b>MUS</b>	-	-	-	-	-	-	49	52
<b>NGA</b>	0	0	0	0	0	0	0	7685
<b>SEN</b>	-	-	-	-	-	-	-	-
<b>ZAF</b>	47	77	76	96	100	2926	4667	5710
<b>TZA</b>	51	44	62	53	50	46	48	40
<b>ZMB</b>	-	-	-	214	427	-	520	521
<b>MOR</b>	-	0	0	0	0	0	0	0
<b>EGY</b>	14	14	40	100	132	131	285	337

Based on the figures that are shown in table 4, the following countries are perceived as ‘non-receiving countries’: Botswana, Morocco, and Malawi. Mauritius and Nigeria are also perceived as non-receiving countries since these countries only have an instock of Chinese FDI for two years during the research period. Counting Mauritius and Nigeria as receiving countries would lead to biased results as this isn't a representative period. Ghana and Senegal are left out of analyses on FDI as there is a lack of availability on FDI data for these countries. All other countries in the sample are interpreted as countries that receive Chinese FDI. Figure 13 shows the correlation between instock of Chinese FDI and aggregated productivity of all receiving countries combined (leaving outliers out and corrected for average productivity growth in Africa during 2003-2010). Based on this scatterplot there appears to be a somewhat positive trend. This positive trend is proven by performing the correlation matrix again, resulting in a correlation of 0,2199. Table 5 shows the scatterplots of all individual countries that are combined in figure 13.

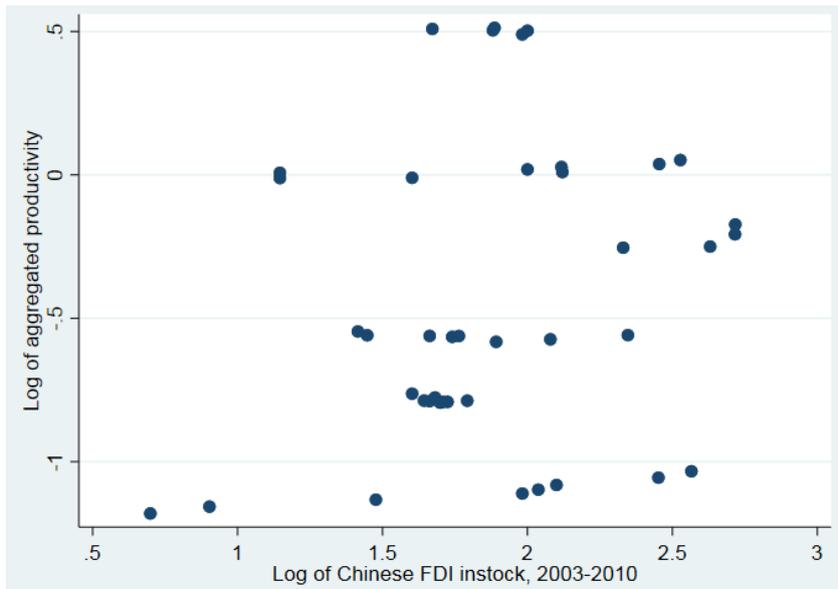
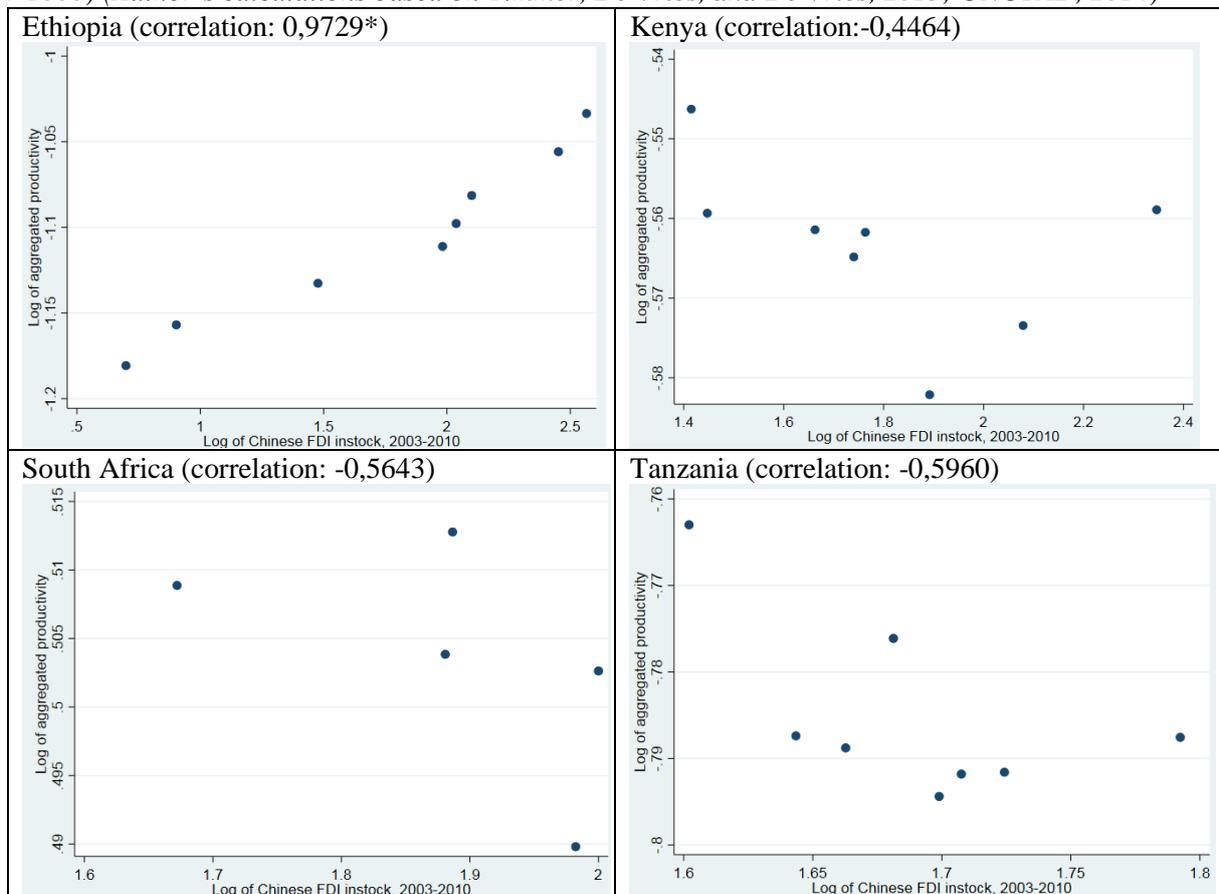
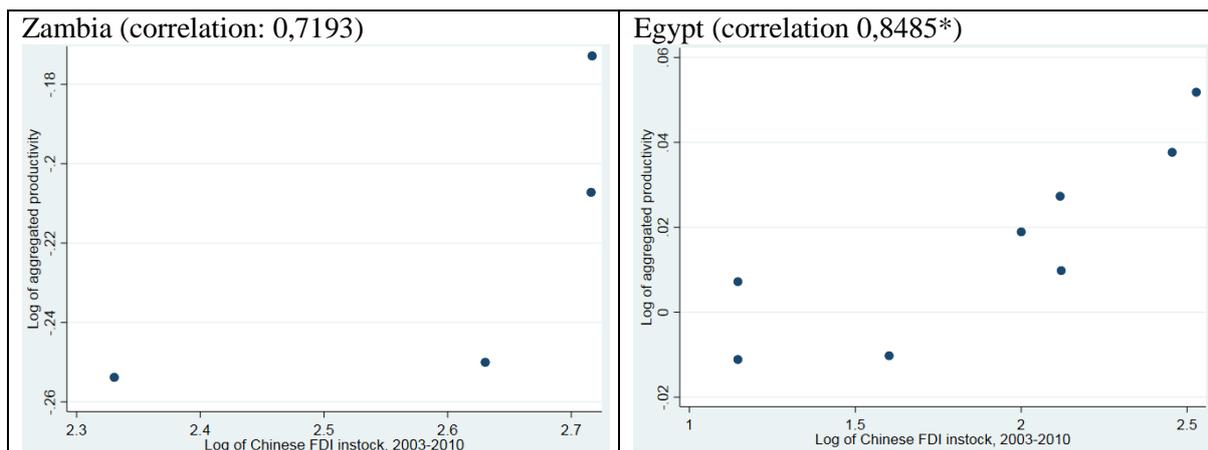


Figure 13: Correlation of the log of Chinese FDI instock and the log of aggregated productivity of all receiving countries, 2003-2010: 0,2199 (N=41, dropped if Chinese FDI instock  $\leq 0$  and  $>1000$ ) (Author's calculations based on Timmer, De Vries, and De Vries, 2015; UNCTAD, 2014)

Table 5: Correlation of the log of Chinese FDI instock and the log of aggregated productivity per receiving country, 2003-2010 (\* = significant at 5% significance level, dropped if FDI instock  $\leq 0$  and  $>1000$ ) (Author's calculations based on Timmer, De Vries, and De Vries, 2015; UNCTAD, 2014)





#### 4.2 The impact of Chinese FDI

To answer the question of how Chinese FDI influences structural economic change in Africa, the focus is on within sectoral change, static structural change, and dynamic structural change. These variables all correlate to some extent with the instock of Chinese FDI within a country in the period 2003-2010. In table 6, a correlation matrix is shown for the relation between the log of productivity per sector and the log of Chinese FDI instock of receiving countries.

Table 6: Correlation matrix of the log of sectoral productivity and the log of Chinese FDI instock per receiving country (N=48, \*=significant at 5% significance level) (Author's calculations based on Timmer, De Vries, and De Vries, 2015; UNCTAD, 2014)

Country	Prod. Agriculture X Chinese FDI instock	Prod. Industry X Chinese FDI instock	Prod. Services X Chinese FDI instock	Receiver of Chinese FDI
ALL countries	0,1673	0,1767	0,1495	-
BWA	-	-	-	No
ETH	0,9847*	-0,9564*	0,9801*	Yes
GHA	-	-	-	-
KEN	0,1832	0,4986	0,7365*	Yes
MWI	-	-	-	No
MUS	-	-	-	No
NGA	-	-	-	No
SEN	-	-	-	-
ZAF	0,7450*	0,4004	0,9175*	Yes
TZA	-0,4234	-0,1831	0,1986	Yes
ZMB	-0,9184	0,8386	0,8490	Yes
MOR	-	-	-	No
EGY	0,9566*	0,7185*	0,9500*	Yes

As can be seen in table 6, there is a rather weak positive relation between productivity per sector and Chinese FDI instock. When these figures are separated for each country, a different and rather ambiguous image occurs. Countries show positive as well as negative relations between instock of Chinese FDI and productivity per sector. The highest correlations (and with most significant values) can be found for agriculture and services. This would imply that most of the productivity developments take place in other sectors than industry. This is an opposite finding of the current focus on industrialization in African countries (African Union, 2015). Table 7 shows the correlation coefficients between the log of productivity per sector and GDP growth percentages.

Table 7: Correlation matrix of the log of sectoral productivity and GDP development (N=104, \*=significant at 5% significance level) (Author's calculations based on Timmer, De Vries, and De Vries, 2015; World Bank, 2018)

Country	Prod. Agriculture X GDP growth (%)	Prod. Industry X GDP growth (%)	Prod. Services X GDP growth (%)	Receiver of Chinese FDI
ALL countries	-0,1989*	-0,2039*	0,2006*	-
BWA	0,0043	0,6411	-0,1230	No
ETH	0,6267	-0,4341	0,4958	Yes
GHA	0,4955	0,3463	-0,5307	-
KEN	0,0230	0,1808	0,1417	Yes
MWI	-0,0787	-0,0896	-0,1654	No
MUS	-0,2910	-0,2803	-0,2710	No
NGA	0,0644	-0,0563	0,0779	No
SEN	-0,1945	-0,5705	0,4574	-
ZAF	-0,3445	-0,1887	-0,2628	Yes
TZA	-0,7358*	0,7433*	0,8277*	Yes
ZMB	0,4120	-0,4105	-0,3945	Yes
MOR	-0,7209*	0,2927	-0,1508	No
EGY	0,9024*	0,6121	0,8816*	Yes

When comparing the values in table 6 to those in table 7, no clear differences or patterns can be recognized. Just like in table 6, there appears to be no clear relation between sectoral productivity levels and GDP growth, as only a few of the outcomes have a statistically significant value (at the 5% significance level).

The question remains whether or not structural economic changes take place because of the existence of Chinese FDI in an economy. Figure 14 shows the annual GDP growth percentages for the African countries in this research. For both receiving and non-receiving countries, all average percentages are positive for the whole research period. Generally speaking, FDI receiving countries perform slightly better in terms of GDP development, compared to non-receiving countries. Moreover, table 4 shows an increasing instock of Chinese FDI during the research period. This implies that the inflow of Chinese FDI is more due to a stronger outward economic policy of China to specific economies than it is related to structural economic changes. Based on the findings in this chapter, it can be stated that a growing African economy is a reason for China to invest in African countries.



Figure 14: annual GDP growth percentages, 2003-2010 (World Bank, 2018)

Besides a slightly better performance in annual GDP growth for FDI receiving countries, there is also a difference in productivity changes between receiving and non-receiving countries. In figure 15, changes in sectoral decomposition and aggregated productivity are visualized for both receiving and non-receiving countries. For all types of change, receiving countries perform better than non-receiving countries. This finding strengthens the argument that better-performing economies appear to attract more Chinese investments.

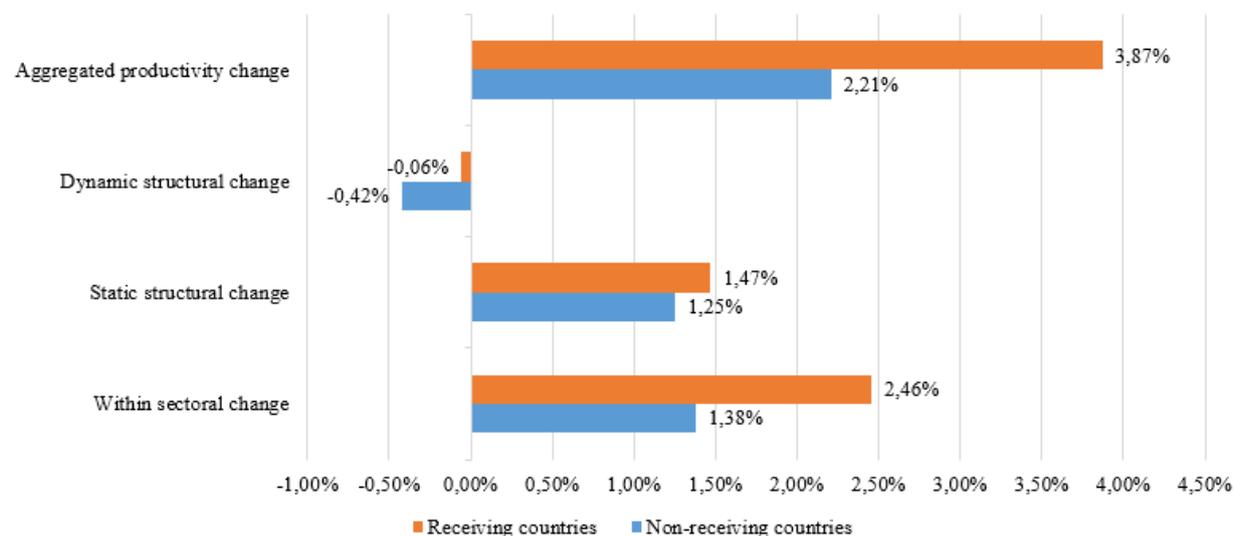


Figure 15: Decomposition of annual aggregated productivity changes in receiving and non-receiving African countries, 2003-2010 (Author's calculations based on Timmer, De Vries, and De Vries, 2015)

Does structural economic change take place because Chinese FDI instock is growing? Or is China investing in African economies because they are developing, especially in terms of productivity? Looking at the relative size of Chinese FDI instock and the already presented results, it is assumable that the latter is the case. In relation to the GDP of FDI receiving countries in this research, the amount of Chinese money is relatively small to have a large impact on an economy.

To find out how Chinese FDI is related to economic change in African economies, a correlation matrix is made which is shown in table 8. Here annual GDP growth (%) for the period 2003-2010 and the log of Chinese FDI instock are correlated with each other. The outcomes of this correlation matrix show generalized economic trends and provide a context in what kind of economic situation African countries are when they receive Chinese investments.

Table 8: Correlation matrix of the log of Chinese FDI instock and GDP development (N=48, \*=significant at 5% significance level) (Author's calculations based on World Bank, 2018; UNCTAD, 2014)

Country	Log of Chinese FDI instock X GDP growth (%)	Receiver of Chinese FDI
<b>ALL countries</b>	0,0663	-
<b>BWA</b>	-	No
<b>ETH</b>	0,6061	Yes
<b>GHA</b>	-	-
<b>KEN</b>	0,4276	Yes
<b>MWI</b>	-	No
<b>MUS</b>	-	No
<b>NGA</b>	-	No
<b>SEN</b>	-	-
<b>ZAF</b>	-0,2986	Yes
<b>TZA</b>	0,1466	Yes
<b>ZMB</b>	0,4490	Yes
<b>MOR</b>	-	No
<b>EGY</b>	0,8867*	Yes

With table 8 it has to be kept in mind that annual GDP growth (%) in the African countries in this research was positive (see figure 14), but until 2009 the speed of economic growth was slowing down instead of becoming negative (World Bank, 2018). Especially for Egypt, there appears to be a relation between the instock of Chinese FDI and GDP growth as both values develop in almost equal trends. In figure 16, changes in GDP and Chinese FDI instock is given. In this graph, both variables are indexed with the year 2003 as base year (= 100).

The average annual increase in GDP shows a steady and positive trend during the research period. Until 2005, both instock of Chinese FDI and GDP show comparable growth. Between 2005 and 2007 Chinese FDI instock starts to increase in growth. After 2007, a large increase in instock of Chinese FDI takes place. The large increase in Chinese FDI instock between 2007-2009 can mainly be explained by a massive growth in South-Africa (see table 4). This massive growth took place because of a \$5,6bn. investment of the Industrial and Commercial Bank of China (ICBC), which purchased 20% of the South Africa’s Standard Bank in 2007 (Reuters, 2007).

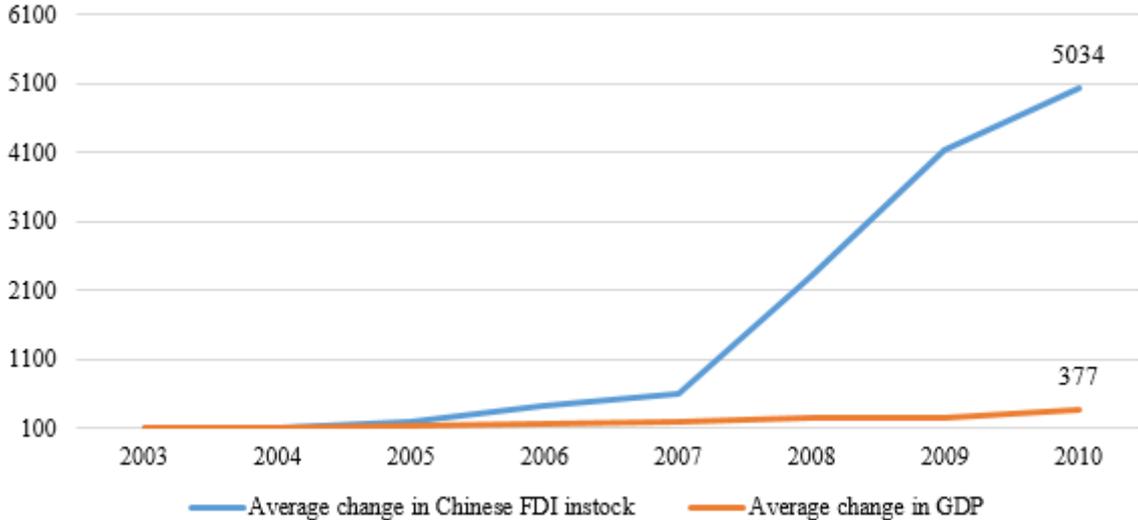


Figure 16: Comparison of changes in Chinese FDI instock and GDP growth for all receiving countries, 2003-2010 (indexed, 2003 = 100) (Author’s calculations based on World Bank, 2018; UNCTAD, 2014)

In figure 16 Chinese FDI instock is based on changes in million US dollars whereas changes in GDP is based on billion US dollars. Still, the actual economic impact of Chinese money is relatively small within an economy due to the relative amount of FDI to the economy as a whole. However, China invests in strategic important organizations as the Standard Bank in South Africa, but also in fisheries, ports, agribusiness, power plants, and mining (Dahman-Saidi, 2013). Such organizations make it possible for Chinese investments to have a presence within foreign economies.

**4.3 Structural change and economic development**

As can be seen in figure 15, receiving countries show better performance in changes in structural change and aggregated productivity levels than non-receiving countries. This raises the question of whether or not a better performance in structural change and productivity change leads to an overall better economic performance within a country. A short look at figure 14 would imply that this is the case. This figure shows that those countries that receive Chinese FDI (i.e. this is the group of countries with stronger performances in structural change) also have higher GDP growth percentages than non-receiving countries. In this part, a more in-depth analysis of the effects of structural change on economic development will be given.

In chapter 2.2 structural change is explained and in this chapter figure 3 is shown. This figure represents a shift from a developing economy to a developed economy. Diao et al. (2017) explain that for African

countries, a shift from a predominantly agricultural economy towards a more industry and services oriented economy occurs when agricultural productivity increases. The idea behind this statement can be explained as follows: once a farmer becomes more productive, he is able to sell more products and increase his income. This increased income has significant demand effects for modern, nonagricultural goods. The farmer is able to spend more money on these goods, and when this is the case for a large group of farmers, the increased demand for modern goods will lead to increased business opportunities in the manufacturing sector (industry) and services sector. The result of this increasing welfare of farmers is a market for small businesses, that accordingly to Diao et al. (2017) often operate informally.

The plain shift of workers towards a different sector is seen as static structural change. If there is structural change of workers that have a low productivity (due to a lack of education or experience), the consequence might be a fall in labor productivity for modern sectors, this is called dynamic structural change. Figure 12 shows the exact distribution of these changes in productivity and sectoral decomposition.

Figure 12 does not explain what contribution each sector has to changes in productivity. Therefore figure 17 is produced. Here average annual changes in productivity per sector are shown for each country. This figure shows results that are in line with the research of Diao et al. (2017), that on average the largest growth in productivity takes place in agriculture. De Vries, Timmer, and De Vries (2015) also find that the largest contribution to productivity growth takes place in agriculture. In their research De Vries, Timmer, and De Vries (2015) also state that this productivity growth in agriculture partially explains the negative dynamic structural change effects that can be seen in figure 12. Due to productivity growth in agriculture, a surplus of workers exists and is released from agriculture. For agriculture, this leads to a further increase in productivity. The surplus workers will be taken up into the industry and services sector, and if productivity growth in agriculture is faster than in other sectors, this will lead to a negative term for dynamic structural change. As can be seen in figure 17, the largest contribution to growth in productivity takes place in agriculture. This is due to larger scale levels and the use of higher levels of technology (De Vries, Timmer, and De Vries, 2015; AGRA, 2017).

A negative term for dynamic structural change doesn't necessarily point at a negative development. This surplus of workers points at a new phase of economic development, but De Vries, Timmer, and De Vries (2015) write about this new phase: "*...it is clear that this development phase can only provide a temporary boost to aggregate growth as long-run growth is driven by activities that have high productivity growth and attract resources at the same time.*". Based on figure 17, it can be stated that industry scores a below average annual change in productivity. This would imply that if this situation remains the same on the long-run, positive values for dynamic structural change can be achieved by moving into the services sector but not by reallocation of workers to industry. However, both Diao et al. (2017) and De Vries, Timmer, and De Vries (2015) write that these productivity developments remain to be seen and therefore the effects of dynamic structural change is hard to interpret.

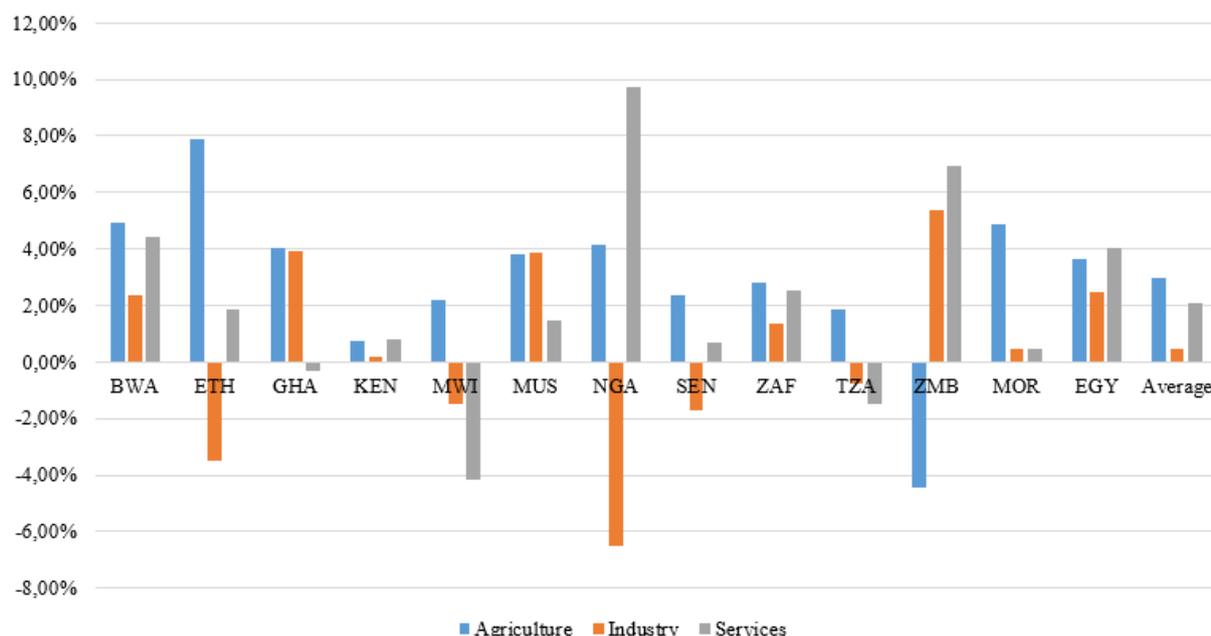


Figure 17: Annual changes in productivity per sector, 2003-2010 (Author’s calculations based on Timmer, De Vries, and De Vries, 2015)

Coming back to the question of what the contribution is of structural change on economic development, the answer is ambiguous for the case of Africa. Structural change has a positive effect on economic performance when the reallocation of workers takes place towards a sector with a within sectoral productivity growth that is above average. For the combination of all African countries in this sample agriculture and services show above average productivity growth figures whereas industry has a productivity growth that is below average. This would imply that economic effects are negative when reallocating workers from agriculture towards industry and that economic effects are positive when moving from agriculture to services. The most important remark that has to be made is that these impacts differ per economy and its sectoral productivity growth performances. As can be seen in figure 17, these strongly differ per country in this research.

#### 4.4 A comparison between FDI sending countries

Globally, China’s foreign direct investments are increasing by the year. In 2015 China was the second largest investing country on a worldwide scale (UNCTAD, 2014). In this paragraph, the focus is on the question if China is overtaking other top-investors in African countries. Here we look at African countries (as receiving countries) that are integrated in the GGDC 10-sector database.

Based on FDI data of UNCTAD (2014), FDI instock levels are measured for all African countries in this research. This has led to the graph in figure 18 that shows the share of total FDI instock in Africa that originates from the EU, the US, and China. What immediately stands out is that the EU is responsible for a way larger part of FDI instock than the US and China. For both EU and US, a decline in share took place during the great recession of 2008. In this research period, the share of Chinese FDI instock kept increasing but only at a slow pace. A trend that takes place during the whole research period is that Chinese and US FDI instock shares are converging. See table 9 for average absolute FDI instock in African economies.

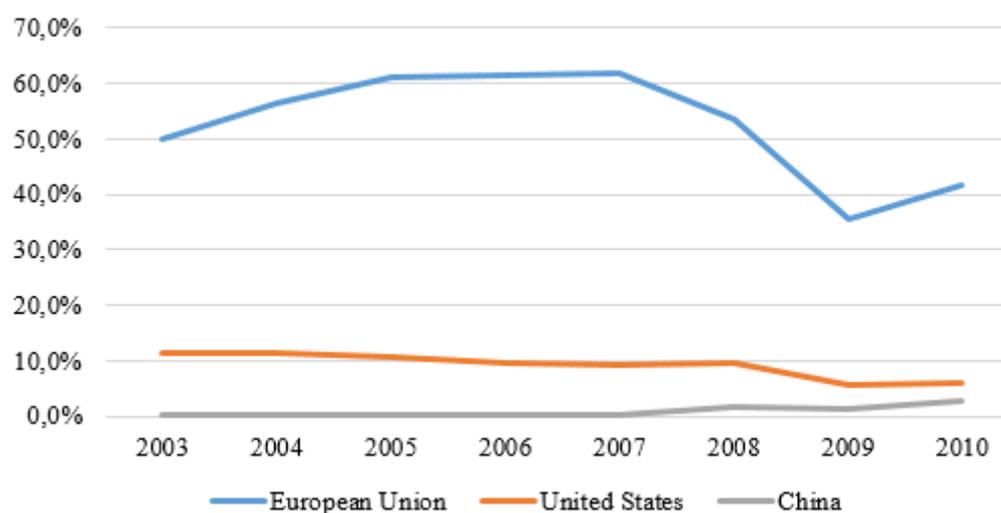


Figure 18: Comparison of shares of FDI instock in Africa, 2003-2010 (UNCTAD, 2014)

Table 9: Average instock of FDI for all countries in this research, 2003-2010 (in million US dollars) (UNCTAD, 2014)

	China	EU	US	World (total)
<b>2003</b>	11	3.826	870	7.653
<b>2004</b>	13	6.269	1.255	11.140
<b>2005</b>	20	7.467	1.311	12.201
<b>2006</b>	47	9.046	1.386	14.719
<b>2007</b>	67	11.453	1.682	18.527
<b>2008</b>	254	8.231	1.456	15.325
<b>2009</b>	474	12.777	1.969	36.146
<b>2010</b>	1.149	16.845	2.372	40.405

To see if there are differences in impact of FDI instock on productivity levels, a comparison is made between senders of FDI. This means comparing the relation between FDI instock out of China, the US, the European Union, and total FDI instock to aggregated productivity changes. Only FDI receiving countries are integrated into this comparison (note that these receivers of Chinese FDI also receive FDI from the EU and the US).

What stands out in table 10, is that aggregated productivity notes positive values for all senders of FDI. If significance is ignored, changes in aggregate productivity react less strong to Chinese money than to money from the EU, the US, or total FDI instock. An important remark that has to be made here is that years in which a country had an FDI instock of more than 1bn US dollar are kept into the sample. This explains the different outcome for Chinese FDI instock compared to figure 13 where these cases are dropped. The reason to keep cases with large FDI instock values into the sample is due to the fact that for many countries the EU, US, and total FDI instock exceeds 1bn US dollar.

When a division is made for sectoral productivity values, the same positive pattern continues. Here all outcomes are significant, except those where China is the sending country of FDI. This suggests that productivity and FDI instock seem to positively influence each other, but for China, this isn't statistically supported. It remains hard to state if productivity increases because of FDI or that FDI gets attracted because sectors become more productive.

Table 10: Correlation between the log of FDI instock and the log of productivity values for receiving countries, 2003-2010 (N=48, \* = significant at 5% significance level, dropped if FDI instock ≤ 0) (Author's calculations based on Timmer, De Vries, and De Vries, 2015; UNCTAD, 2014)

	<b>China</b>	<b>EU</b>	<b>US</b>	<b>World</b>
<b>Aggregated productivity</b>	0,1993	0,4201*	0,3725*	0,4349*
<b>Productivity Agriculture</b>	0,1673	0,4634*	0,4637*	0,4947*
<b>Productivity Industry</b>	0,1767	0,3256*	0,2674*	0,3948*
<b>Productivity Services</b>	0,1495	0,3013*	0,2612*	0,2812*

There appears to be a positive relation between the source of FDI instock and the effects on productivity. A next step in the analysis on differences between source of FDI instock and the effects on African economies is to check whether or not there is a relation between GDP development and the instock of FDI from various countries/continents. To test this, a correlation matrix is performed and the outcomes are shown below in table 11. Just like the outcomes for productivity, the relation between GDP development and FDI instock is positive. Again, the outcome for China is insignificant whereas it is significant for other sending countries or group of countries.

Table 11: Correlation between the log of FDI instock and GDP development for all countries, 2003-2010 (N=48, \* = significant at 5% significance level) (Author's calculations based on World Bank, 2018; UNCTAD, 2014)

	<b>China</b>	<b>EU</b>	<b>US</b>	<b>World</b>
<b>% GDP change</b>	0,0663	0,4966*	0,3551*	0,4873*

The positive correlation coefficients of the log of FDI instock and GDP developments might have two explanations. It could be stated that GDP develops positively due to FDI, or that FDI instock grows when an economy develops. A confirmation of one of the statements cannot be waterproof, but GDP developments over time might give an idea on the order of events (see figure 14).

This finding is an advocate for the first as well as for the second explanation. The correlation coefficients for the EU, the US, and total FDI instock are significantly positive. The correlation coefficient for China is positive as well, but insignificant. As China only started to invest abroad relatively late (after 2001), the second statement is supported. Furthermore, African GDP growth percentages were already relatively high when China started to invest in Africa (figure 14). This suggests that Chinese FDI instock grew when an economy developed. For other origins of FDI, the opposite might be true. The EU, the US, and other countries were already investing in Africa before China did. This longer period, in combination with larger investments, might explain the higher correlation coefficients for these sending countries. For the EU, the US, and other sending countries, the first statement might be more applicable: GDP appears to develop positively due to higher FDI instock.

Below, a last comparison is made between different origins of FDI instock. Here the relation between the origin of FDI and its effects on employment per sector is investigated. Results of this comparison indicate whether or not there might be jobs created with foreign investments. This is more assumable than the statement that more employment in a certain sector attracts more or less foreign direct investments as one might expect foreign governments and firms to create more economic activity instead of reacting to economic activity that is already around and not create new jobs. Table 12 shows the correlation coefficients of this comparison between the log of FDI instock and employment per sector.

Table 12: Correlation between the log of FDI instock and sectoral employment developments for all countries, 2003-2010 (N=104, \* = significant at 5% significance level) (Author's calculations based on Timmer, De Vries, and De Vries, 2015; UNCTAD, 2014)

	<b>China</b>	<b>EU</b>	<b>US</b>	<b>World</b>
<b>Total employment</b>	0,2610	0,1396	0,0094	0,0344
<b>Agricultural employment</b>	0,0418	-0,1426	-0,3141*	-0,2334*
<b>Industry employment</b>	0,3636*	0,5520*	0,6637*	0,3753*
<b>Services employment</b>	0,4959*	0,5296*	0,5190*	0,5028*

Following the results in table 12, it can be seen that FDI instock positively relates to employment, but this relation is insignificant for all origins of FDI instock. Another thing that stands out in this table is that Chinese FDI instock is the only variable that positively correlates with agricultural employment (albeit insignificant). Especially FDI instock from the US and the EU show a positive relation with employment in industry and services. Comparing EU and US FDI instock to Chinese FDI instock, it might be stated that employment effects of money from the EU and especially the US are more in line with the goal to industrialize the African economy (African Union, 2015). Another conclusion that can be drawn based upon table 12, is that FDI instock of EU and the US appears to be more of an engine for structural change than Chinese FDI instock. This can be seen as employment in agriculture is decreasing and there is a significant increase in employment in industry and services when there is more EU and US money in an economy.

## 5 Conclusion and discussion

The final chapter of this thesis consists of conclusions that can be drawn based on findings in previous chapters. Furthermore, this chapter will include critical remarks about these conclusions, recommendations for further research and some policy implications. First, conclusions will be presented that aim to answer the relation between economic growth and structural economic change. Secondly, the influence of Chinese FDI on structural economic change will be discussed. Thirdly, differences between the effects of Chinese FDI and FDI from other origins on structural economic change in Africa are described. After answering the three subquestions, the answer to the central question will be presented. This is followed by a critical explanation of the data collection, research methods and the results of this study, and what the consequences of these limitations are. This chapter ends with recommendations for further research and suggestions for future policy in the field of foreign direct investment.

### 5.1 Conclusion

#### 5.1.1 Economic growth and structural economic change

This sub-paragraph aims to answer the first subquestion:

*To what extent is economic growth related to structural economic change?*

In answering this question, it stood out that countries with better GDP growth performances also receive more Chinese FDI. Another interesting finding is that these receiving countries perform better in terms of structural economic change. This relation suggests that countries that show stronger GDP growth figures, appear to be more resilient against the negative effects of dynamic structural change. Moreover, these better performing countries seem to be more able to increase productivity levels and induce a reallocation of workers towards more productive sectors.

During this research, the largest average productivity growth took place in the agricultural sector (figure 17). As De Vries, Timmer, and De Vries (2015) found, this increase in productivity in agriculture is a reason for negative dynamic structural change to take place. Increasing productivity levels due to the use of better technology and working at larger scale levels leads to a surplus of workers. However, this doesn't necessarily need to be a bad development, as long as the surplus workers reallocate to sectors that show productivity growth that is above average. This research has found that productivity developments in agriculture and the service sector are above average and for industry this is below average.

There appears to be no clear pattern between sectoral productivity changes per country. Some countries show growing productivity figures for industry, whereas others see a decline in industrial productivity. It is assumable that this is caused by sectoral decomposition of an economy. Some countries have large agricultural export processing zones (Ethiopia) whereas other countries are more oriented towards mining (Nigeria) or logistics (South-Africa).

It can be concluded that for developing economies, like African economies, structural change positively contributes to economic growth when the reallocation of workers is towards sectors with above-average employment growth. For the combination of all African countries in this research, this implies that structural change towards services is positive, whereas reallocation towards industry is negative. This means that the goal to industrialize, which the African Union (2015) has set, is rather ambitious when productivity growth stays behind.

Based on this conclusion, hypothesis 3 (*Chinese investments have a positive effect on the demand for consumer goods in the modern sector*) cannot be rejected. The reason behind this is that on average, productivity in all sectors is increasing. This leads to higher incomes and higher expenditures that disproportionately take place in the modern sector.

### 5.1.2 The economic influence of Chinese FDI

The second subquestion, stated below, will be answered in this subparagraph:

*How does foreign direct investment from China influence structural economic change?*

The first step in answering this question is by making a distinction between FDI receiving countries and countries that do not receive Chinese investments. This allows for comparisons between the two categories. These comparisons consist of the relation between Chinese FDI instock and changes in productivity, employment, and sectoral decomposition, and GDP developments.

Looking at the results of the direct relation between Chinese FDI instock and productivity changes per sector, no clear pattern exists. Both significant positive and negative relations are found for countries that receive Chinese FDI for years, as well as for countries that receive very little Chinese investments. Positive relations are to be expected as productivity changes are usually positive, as well as the instock of Chinese FDI is increasing instead of decreasing. However, positive relations are found for both receiving and non-receiving countries.

Changing the focus towards the relation between Chinese FDI instock and employment changes, a positive relation is found for total employment in FDI receiving countries. When looking at sector-specific changes in employment, again a positive relation becomes visible. For employment in industry and services this value is significant, and for agriculture this is insignificant. This finding is in line with productivity changes, which most positive in the agricultural sector. A higher productivity leads to less need for workers, which explains the smaller value and insignificance for employment in the agricultural sector. This value, however, is still positive as the agricultural sector is growing along with the total economy.

Looking at GDP development, both receiving and non-receiving countries see large positive annual GDP developments. Within the period 2003-2010, FDI receiving countries perform slightly better than non-receiving countries. This also explains the positive correlation between instock of Chinese FDI and GDP development. Although, it can be said that this positive correlation is no surprise as on average all investigated countries show positive GDP figures. The correlation coefficient that is found is small and insignificant, which would imply that GDP development and Chinese FDI instock are hardly related. A lack of relatedness also advocates for possible spurious correlations as FDI is not the only determinant for GDP development.

Analyzing GDP developments and the timeline of Chinese investments, it appears that stronger economies attract more Chinese investments. However, China started investing in African economies when these economies were already growing rapidly. This order of events suggests that economic growth isn't a result of Chinese investments, but that Chinese investments follow when economic growth takes place.

When comparing structural change patterns between receiving and non-receiving countries, a clear difference appears. Receiving countries perform better on all aspects of aggregated productivity changes: within sectoral productivity, static structural change and dynamic structural change. Results show higher levels of within sectoral productivity growth, static structural change and aggregated structural changes, as well as a lower negative impact of dynamic structural change in countries that receive Chinese FDI.

Based on the answer to this subquestion, hypothesis 2 (*Chinese investments have a positive effect on employment in more productive sectors*) is not rejected. It turns out that Chinese investments do correlate increasingly positive when sectors become more productive.

### 5.1.3 Differences between country of origin of FDI

*What are the differences in structural change in Africa between Chinese FDI and other FDI sending countries?*

The subquestion above will be answered in this paragraph. Instock of Chinese FDI is compared to total FDI instock in African countries and FDI that originates from the US and the European Union.

When comparing shares of FDI instock per origin, large differences occur. It turns out that countries from the EU are the most important investor in African economies. Between 2003-2010 the EU was responsible for around 50% of total FDI instock in African countries. For the US this share decreased from 10% to around 5%, whereas the Chinese share increased and almost reaches 5% of the total FDI instock. Overall, FDI instock is growing at an increasing pace. Between 2008 and 2010 total FDI instock grew from 15bn US dollars to over 40bn US dollars.

Looking at the relation between productivity (per sector) and origin of FDI, some differences occur. The general trend is positive. For total FDI instock, FDI from the US and the EU, outcomes are significant whereas they are insignificant for Chinese FDI instock. It appears to be the case that especially agricultural productivity is positively related to FDI. Chinese FDI is less related to productivity growth in every individual sector than FDI from other origins. A reason for this finding might be that China is a follower in terms of FDI instock. China started to invest in Africa relatively recently when other countries were already involved in Africa. This might lead to less rootedness and impact of Chinese money in the African economy compared to investments from other countries. However, it should be kept in mind that, besides FDI, there will be more factors that influence productivity levels.

GDP developments correlate positively with FDI instock from different sources. Only for FDI instock that comes from China, an insignificant value is found. This can be explained by the relatively small amount of Chinese FDI and a strongly developing African economy. The EU, US, and total FDI instock show significant positive results.

More interesting results show up when the focus is on employment. Here Chinese FDI seems to show different patterns than FDI that originates from other sources. Total employment correlates positively with Chinese FDI instock. Total FDI instock and instock from the US and the EU almost don't correlate to total employment. Another difference is the positive relation of Chinese FDI on employment in agriculture whereas all other values on agricultural employment appear to be negative. This might imply that FDI from other sources than China leads to more productivity in agriculture, which leads to a decline in employment. Another explanation might be that Chinese investments have a positive impact on the scale of agricultural firms in Africa.

For employment in industry or the service sector, positive significant correlations are found for all sources of FDI. Here Chinese FDI contributes the least of all investigated countries or group of countries to employment. This distribution of effects on employment suggests that Chinese investments focus more on relatively low skilled jobs, whereas investments from other origins are more related to sectors that require higher skill levels of workers.

### 5.1.4 The relation between Chinese FDI and structural change in Africa

After discussing the three subquestions in the paragraphs above, the focus will now turn to the central question of this research. This central question, '*how is Chinese FDI related to structural economic change in Africa?*', can be seen as an overarching question of the three sub-questions.

This research has shown that structural economic change positively relates to economic growth. Since many African economies show strong growth figures, it is interesting what the role of structural economic change is in this growth. Based on research provided by Diao et al. (2017) and De Vries, Timmer, and De Vries (2015) it is found that structural economic change is of great value for developing economies. As many African economies are developing economies, a changing sectoral decomposition might

contribute to increasing welfare and economic activity. For developing countries, a shift from agriculture towards industry is seen as one that is positive in many aspects. Industrialization employs people for a relatively high wage and it leads to vertical spillovers. Keeping this in mind, it makes sense that the African Union (2015) aims at industrialization for further economic development.

But, is a transition from agriculture towards industry beneficial for African economies? Theory states that structural change is beneficial when workers reallocate towards sectors in which productivity-levels show above-average growth (De Vries, Timmer, and De Vries (2015)). In this research, it happens to be the case that of the three sectors in the economy, industry shows the lowest growth-rate in productivity levels. Therefore a transition towards industry is only beneficial if this is combined with further productivity increases. In this research, a transition towards services appears to be a positive development due to productivity growth that is above average.

Although structural economic change is seen as positively contributing to economic growth, the effect of Chinese FDI on structural economic change appears to be ambiguous among FDI receiving countries. Countries that receive FDI from China show negative as well as positive correlations between Chinese FDI instock and levels of productivity. When measuring changes in aggregated productivity, a difference occurs between receiving and non-receiving countries. As the equation that measures aggregated productivity is built up out of static structural change, dynamic structural change and within sectoral productivity growth, it is a good measure of structural economic changes that take place in an economy. When performing this equation for a selection of non-receiving countries and a selection of receiving countries, a clear image occurs: countries that receive Chinese FDI perform better in each term of the equation.

Do countries that receive Chinese FDI perform better because of the investments from China? Arguably not, as the share of Chinese investments is relatively small in comparison to an economy as a whole. Moreover, economic performance is subject to more external influences than just FDI. China has only started investing in African countries recently. As these economies were already growing before China entered, it is fair to say that China selects more successful countries to invest in, instead of being the cause of economic success.

China may have only started to invest abroad relatively recently, other countries were already doing this for years. To see if there are any differences between the economic impacts of FDI from other origins, comparisons have been performed between FDI instock from China, the US, the EU and total FDI instock in African countries. It turns out that there are differences between Chinese investments, and those coming from other countries. These differences occur, especially in employment. Whereas Chinese investments relate to overall growth in employment (in all three sectors) and employment in agriculture, FDI from other regions is more positively related to industry and services. This indicates that Chinese investments appear to be more focused on sectors with lower productivity whereas FDI from other origins relates more to higher productivity sectors. Therefore total FDI and FDI from the US and the EU are more in line with the goal of industrialization (and structural change) (African Union, 2015).

All in all, Chinese FDI appears to be related to structural change in Africa, as countries that receive Chinese money show stronger performances in structural change, although performance on country-level is ambiguous. However, compared to FDI from other countries or regions, Chinese FDI is of less influence on structural change. Chinese investments relate to larger overall employment, but not necessarily in more productive sectors. Another finding in this research is that it appears to be the case that China selects better-performing countries to invest in, instead of being the cause of good performance. This conclusion leads to a partial rejection of hypothesis 1, stated in chapter 2 of this research (*There is a positive relation between Chinese FDI on structural change in Africa*). There is a positive relation between Chinese FDI and structural change in Africa, but these change patterns differ per country.

## **5.2 Discussion**

This study is based upon data that is provided by African and Chinese data sources. As mentioned in chapter 3 of this research, there is some debate about the trustworthiness of these sources (Devarajan,

2013; Jerven, 2013; De Vries et al., 2012). It is very well possible that, in the process of gathering data, not all figures presented by Chinese and African governments are of equal quality. Although the sources used in this research (the GGDC 10-sector database, UNCTAD bilateral FDI statistics, and World Bank GDP developments) are some of the most reliable around, there might be some measurement error. This is not due to the constructors of these sources but to the quality of the available data. One might expect that the quality of these data sources improves each year as more advanced methods of collecting and management become available.

Another data issue that has to be addressed is that the only possibility to construct a dataset that was as complete as possible was by using the research period 2003-2010. Since China has only opened up foreign trade after joining the WTO in 2001, 2003 is a reasonable year to start this research. However, a comparable research with a longer research period than until 2010 would have been more useful. A longer research period would have offered a better insight into patterns in the effects of Chinese FDI in Africa. Although due to the availability of data, it wasn't possible to measure these effects over a longer period, it would be useful for comparable research in the future.

This research solely focusses on productivity, employment, FDI, and GDP. One might state that it would be valuable to increase the focus on technological developments and their effects on productivity and employment. However, the aim of this research is to address the macroeconomic relations that take place due to the relation between FDI and structural economic change. This leads to results that are more focused on outcomes instead of causes.

As written above, macroeconomic relations are being investigated. Here different FDI sending countries are compared with each other. Another way of analyzing such relations is by changing the scale level of research; for example on a project basis (micro) instead of macroeconomic scale. This might also lead to an insight into whether or not there are differences in projects that are funded by different countries. This could answer questions whether Chinese investments lead to better social circumstances in African than EU investments do. Or that FDI from the US focusses more on protecting the environment in African countries. Although these questions are very interesting, they do not belong to the focus of this research, the aim is to offer information about macroeconomic relations.

### **5.3 Recommendations for further research**

The previous paragraph already gives some ideas for further research. This paragraph elaborates on recommendations for further research. Currently, the main setback for increasing the time span from 2010 to a more recent year is a lack of data availability. Once more up to date data becomes available, a similar research could give a more realistic view on the relation between Chinese FDI and structural economic change in Africa. Therefore, the first recommendation is to expand the research period when possible.

A second recommendation is to focus on project-specific investments. Narrowing the scope of research on this theme gives a more detailed insight into the local and regional effects of foreign direct investments. Looking at the size of the Chinese FDI in this research, one can assume that on a national or continental scale, effects are limited, whereas they might be significant on a smaller scale. This also offers the opportunity to make a distinction between FDI sending countries and the reason why they invest in Africa; is their goal of investing abroad for financial aid or are the investments aimed at creating business opportunities?

As this research is possible to be repeated, one could also conduct it with different FDI sending countries as a topic instead of China. Since China only invests abroad for a relatively short period, the effects may still be rather limited. When, for example, looking at FDI from the US, a longer period can be researched. This offers the opportunity to find (possible) stronger linkages between structural economic change and FDI.

#### **5.4 Recommendations for future policy**

The topic of sending and receiving FDI is one that is strongly related to policymaking. Attracting or sending FDI is a strategic policy-decision that becomes more and more relevant as globalization intensifies. This research provides policymakers an insight into the effects of attracting Chinese investment. Although this research only elaborates on productivity and employment (and not on the environment or social circumstances), it can be used in the decision-making process to receive or send FDI.

Throughout this research, industrialization has been seen as a key development for developing economies like many African economies. Foreign investments might be supportive of industrialization and therefore increase employment and prosperity among inhabitants. However, during this research, it has turned out that FDI instock from the EU and the US appear to be more positively related to industrialization than Chinese investments. Keeping the Agenda 2063 (African Union, 2015) in mind, FDI from the US and the EU might be more supportive to realize the goal to industrialize than Chinese FDI.

Focusing more on the aspects of structural economic change, policymakers should aim at keeping the negative effects of dynamic structural change as small as possible. The best situation would be that all terms: within sectoral productivity, static structural change and dynamic structural change are positive. This can be achieved when more productive sectors (in the case of this research: industry and services) score above average productivity changes. This makes it possible to realize positive values for dynamic structural change. A way to achieve higher productivity in these sectors is by educating workers and youth to work in these sectors instead of (subsistence) agriculture.

## **Word of gratitude**

During the process of writing this thesis, I've been supervised by Dylan Jong. I would like to thank him for giving constructive and motivating feedback. His help has led to a research process that has been joyful and educative.

Menno Hunneman

Groningen, August 2018

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## Appendix

Appendix 1: Instock of total FDI, FDI from the US, the EU and China, 2003-2010, (UNCTAD, 2014)\*

	2003	2004	2005	2006	2007	2008	2009	2010
<b>BWA</b>	1720	..	806	1133	969	893	1354	1542
EU	965	..	580	519	568	482	989	1069
US	4	..	1	69	70	55	2	19
China	0	..	0	0	0	0	0	1
<b>ETH</b>	57	17	38	100	268	329	521	610
EU	0	0	0	0	149	188	205	211
US	50	7	6	2	2	2	3	6
China	5	8	30	96	109	126	283	368
<b>GHA</b>	..	..	..	..	..	..	4688	5962
EU	..	..	..	..	..	..	2453	1843
US	..	..	..	..	..	..	558	12
China	..	..	..	..	..	..	185	-2
<b>KEN</b>	978	817	864	971	1610	1386	2003	2240
EU	848	592	541	730	1347	960	1379	1575
US	90	178	246	166	189	196	309	208
China	26	28	58	46	55	78	120	222
<b>MWI</b>	410	562	..	..	1315	2584	1029	1150
EU	144	191	..	..	442	1015	264	280
US	101	163	..	..	29	40	-6	2
China	1	1	..	..	0	0	0	1
<b>MUS</b>	..	..	..	..	..	..	179265	185269
EU	..	..	..	..	..	..	1964	2225
US	..	..	..	..	..	..	46	50
China	..	..	..	..	..	..	49	52
<b>NGA</b>	29275	31402	26345	31243	37330	45578	54228	53840
EU	4626	4962	4163	4936	5898	7201	8568	25897
US	193	207	174	206	246	301	358	1197
China	0	0	0	0	0	0	0	7685
<b>SEN</b>	..	..	..	..	..	..	..	..
EU	..	..	..	..	..	..	..	..
US	..	..	..	..	..	..	..	..
China	..	..	..	..	..	..	..	..
<b>ZAF</b>	57061	80278	96693	106928	131832	83649	138751	179564
EU	39630	56525	71698	81685	100624	55309	97875	131043
US	7194	9837	9799	10402	12338	8926	12415	15315
China	47	77	76	96	100	2926	4667	5710
<b>TZA</b>	3590	3954	4439	4827	5950	6240	8066	8762
EU	1079	1032	1337	1259	1548	1493	1286	1532
US	155	149	210	188	221	218	72	74
China	51	44	62	53	50	46	48	40
<b>ZMB</b>	..	..	..	6025	7604	..	9221	9956
EU	..	..	..	788	951	..	2519	2155
US	..	..	..	85	108	..	42	62
China	..	..	..	214	427	..	520	521
<b>MOR</b>	..	19883	20752	29939	38613	39388	42581	45082
EU	..	15307	16437	24192	30945	32085	33979	36148
US	..	1252	1131	1338	1635	1380	1542	1297
China	..	0	0	0	0	0	0	0
<b>EGY</b>	6395	7913	8676	10180	15366	19172	28197	31294
EU	2440	2882	2321	3485	6421	8270	14620	15001
US	3524	4526	5475	5564	7023	7804	10257	12599
China	14	14	40	100	132	131	285	337

\* .. = missing value of instock of FDI.