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Foreign Direct Investment: A Study of the African Determinants

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ABSTRACT

This thesis explores the determinants of foreign direct investment (FDI) to Sub-Saharan Africa (SSA) compared to other developing regions, with an emphasis on risk. Estimation results from cross-section regressions using OLS and panel regressions, comparing 2003-2017 to 1988-1997, indicate the following. (1) The determinants identified in the 1990's no longer result in the best performing model in explaining the variation in FDI as % of GDP. (2) Africa is no longer in a less favorable position in attracting FDI compared to other developing regions. More importantly, an analysis on risk premium changes shows that (3) a reduction in the required risk premium related to SSA is consistent with the results in (2) and one explanation to why we observe changes. Hence, our results indicate that the required risk premium associated with investments in SSA has been lower for the last couple of decades than what it was previously.

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Sondre Skavern and Hedvig Marie S. Rosenvinge

TABLE OF CONTENT

1. INTRODUCTION

Prior research has found that countries in Sub-Saharan African (SSA) receive less foreign direct investment (FDI) than what their macroeconomic factors suggest, compared to that of other developing regions (Asiedu, 2002). In this thesis we examine whether this disparity has persisted, and interpret the results as a reduction in the risk premium required by foreign investors. In doing so we ask the following questions. First, are the factors determining FDI flows to SSA and other developing regions in the 1990's equally relevant today? Second, has the previously observed disparity between the inflow of FDI to Africa and other developing regions persisted? Finally, and most importantly, we investigate whether a change in risk premiums related to SSA is consistent with our results regarding the second question.

FDI is defined as the capital flows from one country to another resulting from the behavior of multinational companies (MNC) (Agiomirgianakis, Asteriou & Papathoma, 2003). Put simply, it is the investment made by a resident in one economy with the objective of establishing a lasting interest in an enterprise that is resident in another economy (OECD, 2008). FDI has the potential to increase development through its ability to improve trade logistics, increase knowledge and skills of local entrepreneurs, increase confidence of international buyers and gradually increase local companies' global competitiveness (African Development Bank, 2018A, p. 63-75). There has been a rapid growth in FDI to developing countries from $35 billion in 1990 to $671 billion in 2017, as shown in Table 1. In 2017, however, while the developing economies as a whole experienced a stable inflow of FDI, Africa alone suffered a 21% reduction, even more so for SSA (UNCTAD, 2018, p.17). Table 1 and Figure 1 depicts the relationship.

The absolute amount of FDI has increased significantly, also for SSA, from $2.5 billion in 1995 to $17.3 billion in 2017. Nonetheless, the SSA region still receives 3% of the total flow of FDI to developing regions; the same relationship as of 1997 (see Table 1). However, the recent movements in FDI as % of GDP for the developing regions tells a slightly different story. As shown in Figure 1, Africa has not always received less than other developing regions adjusted for differences in GDP. The recent trend has been downward-sloping, and today they receive less FDI as % of GDP than other regions, despite the positive shift in Africa's FDI inflow of world total after year 2000 (Figure 2). This has motivated taking a closer look at the region and the motives behind FDI to SSA with an updated set of data. This also to investigate whether previous findings, the disparity between macroeconomic factors and the inflow of FDI to SSA, still hold.

Table 1: FDI flows in million USD, and % of total developing economies for different countries. Comparing two different time periods (numbers retrieved from: UNCTAD, 2019)

Region	**1995**	**1996**	**1997**
Developing economies	117,753	147,136	185,392
America	29,843	43,588	65,920
Asia	81,704	97,331	108,287
Africa	5,655	6,038	11,030
Sub-Saharan Africa	2,566	1,955	5,565
% of Developing economies total			
America	25%	30%	36%
Asia	69%	66%	58%
Africa	5%	4%	6%
Sub-Saharan Africa	2%	1%	3%

Region	**2015**	**2016**	**2017**
Developing economies	744,032	670,158	670,658
America	169,233	139,698	151,337
Asia	516,407	475,347	475,839
Africa	56,633	53,190	41,772
Sub-Saharan Africa	34,127	26,647	17,274
% of Developing economies total			
America	23%	21%	23%
Asia	69%	71%	71%
Africa	8%	8%	6%
Sub-Saharan Africa	5%	4%	3%

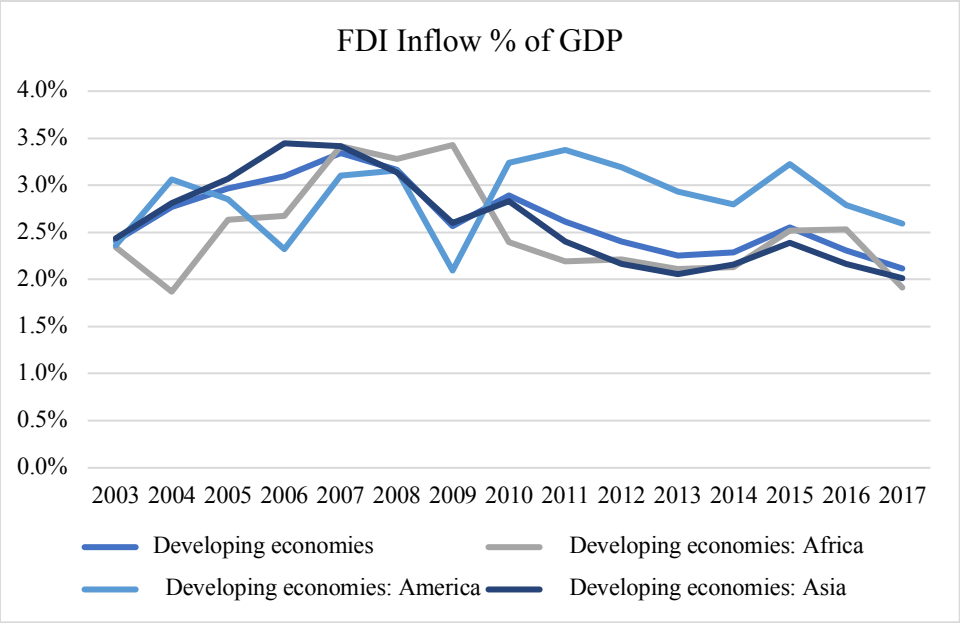

Figure 1: FDI inflow as % of GDP in Sub Saharan Africa versus other developing countries over time (numbers retrieved from: UNCTAD, 2019).

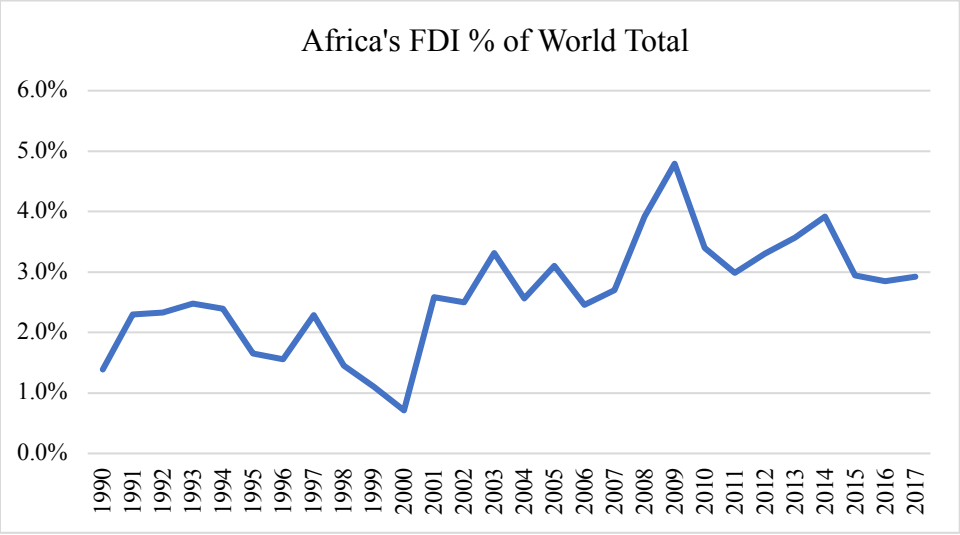

Figure 2: Africa's FDI inflow as % of world total (numbers retrieved from: UNCTAD, 2019)

1.1 HYPOTHESIS TESTS

Are the factors determining FDI flows to SSA and other developing regions in the 1990's equally relevant today? Figure 2 indicates a change in FDI flows to African regions, in particular after the year 2000. Our ambition is to find evidence on whether the determining macroeconomic factors for FDI to these regions have changed compared to findings from before year 2000. In particular, we examine whether the significance and impact of previously important determinants have changed over time, and whether new determinants better models today's situation. The first hypothesis is formulated as follows:

> Hypothesis 1: *There exist determinants better describing the variation in FDI as % of GDP to Africa and developing regions today.*

Has the disparity in FDI between SSA and other developing regions persisted? Table 1 depicts a significant disparity between the absolute numbers of FDI comparing SSA to other developing regions. However, the FDI flows adjusted for the host economy's GDP (FDI as % of GDP) in Figure 1 tell a different story. Given the same macroeconomic factors, SSA has previously been found to receive less FDI as % of GDP relative to comparable developing regions (Asiedu, 2002). That is, the relationship between FDI and its determinants has not been the same for different regions. Due to the contradictory nature of Table 1 and Figure 1, we want to know whether this disparity between countries is still prominent today. Based on previous findings and the data in Table 1, the second hypothesis is formulated as follows:

> Hypothesis 2: *The disparity between SSA and other developing regions has persisted,- the SSA dummy is still negative.*

As a final important investigation, we ask why we find a change in SSA's FDI inflows and its determinants. Is a change in the inherent risk related to SSA consistent with our findings? Literature from previous years argues that a possible explanation for the disparity between SSA and other comparable regions is related to differences in the required returns, mirroring the differences in risk premiums (i.e. Jaspersen, Aylward & Knox, 2000; Asiedu, 2002; Ajayi, 2006; Ezehoa & Cattaneo, 2012; Anyanwu, 2012). Drawing on neoclassical theory, we add a measure of risk premium in the production function in order to quantify whether the argument holds using actual numbers, and whether this can explain the changes observed over time related to our second hypothesis.

Our research contributes to existing knowledge in three ways. First, our findings provides a necessary update of the actual impact of the determinants for FDI flows to SSA. Second, subject to more robustness tests than common in literature, we contribute to the discussion of Africa's performance in attracting FDI. Third, we provide an interpretation of the changes found in the FDI inflows to SSA; changes in risk. This examination provides a deeper understanding of the disparity between Africa and other developing regions today.

The thesis precedes as follows; section 2 reviews existing literature on the determinants of FDI with an emphasis on Africa and risk in emerging markets. Section 3 further describes the data in which our analysis builds on and the explanatory variables used in our research, while section 4 depicts the process of our analyses and the methods used. Finally, in section 5 we discuss our findings and empirical results, and section 6 concludes.

2. LITERATURE

Our thesis relates to two branches of literature; those related to the determinants of FDI, in particular FDI to African countries, and those related to risks in emerging markets. We build our research on findings from these two branches to gain a better understanding of what drives the investments to African countries today.

2.1 DETERMINANTS AND MOTIVES FOR FDI

International development agencies, such as the World Bank, consider FDI as the most effective tool in fighting global poverty and thereby encourage countries to pursue policies beneficial for FDI flows (Asiedu & Lien, 2011). There exist many theories with the mission to define and describe FDI and its determinants. In the following we will present some important findings related to the FDI determinants.

Dunning (1993) identified in particular four motives for FDI for MNCs and foreign investors. These include resource seeking, market seeking, efficiency seeking and strategic asset seeking motives. Resource seeking MNCs are motivated by i.e. accessing raw materials and a low-skilled labor force. The market seeking MNCs' motives are to access the host country's domestic market, its growth and structure, as well as the country-specific consumer preferences. The efficiency seeking motives are to take advantage of lower labor- and input costs and other resources, while strategic-asset seeking motives relates to accessing research and development, innovation and advanced technology. These four motives are often grouped into two; market and non-market seeking. FDI to smaller and poorer economies is more likely to be non-market seeking FDI, most often resource-seeking (Dunning, 1993). In more detail, what regards non-market seeking FDI, domestic demand is less relevant as goods are produced in the host country, and sold abroad - consequently making trade openness and export more pertinent factors. In our research we will focus on the distinction between market – and non-market seeking FDI.

For MNCs to settle, despite their motives, elementary factors need to be in place; referred to as the push- and pull factors of FDI (Fernández-Arias, 1996; Gottschalk, 2001; Calvo et al., 1996). The push factors are external elements to the country, such as US interest rates. The pull factors are the country specific elements, such as infrastructure and openness to trade, linked to ways via which policy makers in developing stimulate FDI inflow. These elements are the focus of most research on FDI. United Nations Conference on Trade and Development (UNCTAD) define three pull factors impacting a country's capacity to attract FDI, which we will emphasize further. First, the policies of the host country, second, the proactive measures adopted by the host country to facilitate investments, and third, the characteristics of the country's economy (UNCTAD, 1998).

2.1.1 POLICIES

There are two types of policies impacting FDI; those directly related to FDI, such as the functioning of markets and the country standards of how foreign affiliates are treated, and those indirectly impacting the flow of FDI, such as trade openness and privatization policies (UNCTAD, 1998). The indirect policies have been defined as the baseline for FDI as these must be in place for foreign investors to operate in the host country. Research on both the developing world (Edwards, 1990), and advanced economies within the EU (Dellis, Sonderman & Vansteenkiste, 2017) illustrate that undertaking reforms to liberalize and open up for foreign trade is elementary for FDI to take place. In addition Dellis et.al. (2017)'s findings clearly show a positive relationship between FDI inflow and political stability, trade openness as well as beneficial tax policies. Most findings further indicate that countries executing structural liberalization reforms to open up for foreign trade will attract greater flows of FDI (i.e. OECD, 2002; Oman, 2000).

2.1.2 FACILITATING INVESTMENTS

The extent to which the country is able to promote investments and business creation, through ease of doing business, has shown to be of increased importance for FDI (UNCTAD, 1998). Research depicts that lower political risk in developing countries increases FDI (Vadlamannati, 2012), as do beneficial business creation conditions (Krifa-Schneider & Matei, 2010). Additionally, close geographical proximity and similar language, shown through the gravity model of

FDI (Deardorff, 1998), is further argued to impact investors' behavior, and having a positive impact on FDI. In addition to these elements, the past stock of foreign investment has in research proven important in explaining FDI inflows as it possibly indicates lower risk and an ease for new MNCs to settle in the respective country, called the agglomeration effect (Barry & Bradley, 1997).

2.1.3 CHARACTERISTICS OF THE ECONOMY

The literature further agrees that factors supporting companies' market seeking motives, such as market size and potential, are relevant for developed countries' inflow of FDI, while developing countries' inflow is more related to non-market seeking motives such as labor costs (Brainard, 1997; Martinez et al., 2012). Further research on FDI determinants finds that economic growth, measured through GDP growth, tends to have a positive effect on FDI flows (Ramirez 2000; Chakrabarti 2001; Zhang 2001; Onyeiwu & Shrestha, 2004; Dellis et.al., 2017). Beneficial local financial conditions, such as stable financial systems, are also shown to positively impact FDI inflows through reduced costs and risks of doing business (Alfaro, Kalemli-Ozcan & Volosovych, 2008; Lee & Chang, 2009).

There is, however, no general consensus on the determinants of FDI. For example, Edwards (1990) argued that the exchange rate in developing countries, as an indicator for international competitiveness, had a positive coefficient on FDI, while Froot and Stein (1991) found the opposite results for the US. Another example is Asiedu's (2002) findings; openness to trade had a weaker impact on FDI in SSA than other developing regions. Several studies also document the effect of tax rates on inward FDI. While some studies find that higher tax rates reduces the likelihood of FDI (Razin & Sadka, 2007), others report an insignificant relationship (Lahrèche-Révil, 2006). There is hence not one answer to the question of what determines FDI inflows. Chakrabarti (2001) proves this through investigating the existing extensive literature searching for empirical linkages between FDI and a variety of explanatory variables. He argues how the empirical work on FDI is a diverse list of a wide range of variables studied and observed to be significantly impacting FDI in different directions. The reason for this is partly related to the problem of a lacking theoretical framework, however, it is also affected by country differences (Chakrabarti, 2001).

2.2 DETERMINANTS OF FDI TO AFRICA

The research on the African region's FDI determinants is expanding as the role of FDI as a source of capital has become important to SSA (Asiedu, 2002). Even though there is an increasing amount of FDI flowing to these countries, Africa still continues to receive less FDI than that of any other region (see Table 1 and Figure 1). The studies on what determines the flow of FDI to these countries are many, and most of them conclude with Africa being different from other recipient regions, suggesting that one region cannot learn from the history of other regions (i.e. Anyanwu, 2012; Asiedu, 2002; Asiedu & Lien, 2011; Ajayi, 2006; Ezeoha & Cattaneo, 2012). The findings of various studies on the determinants of FDI to Africa have, however, also been contradictory. In the continuing we will follow the above structure in presenting the research on Africa.

2.2.1 POLICIES

Various studies find policies to affect FDI flows to countries in Africa (Balasubramanyam & Salisu, 2001; Morisset, 1999). Kandiero and Chitiga (2006) demonstrate that trade openness clearly promotes FDI to Africa, supporting the findings of Onyeiwu and Shrestha (2004) and Ezeoha and Cattaneo (2012). Ajayi (2003) further emphasize increased liberalization of markets as an additional important factor positively influencing the amount of FDI flowing to Africa. Economists also point to the role of institutions; property rights, a beneficial tax system, the rule of law and economic freedom in mobilizing capital as important for FDI inflow to African countries (Collier & Gunning, 1999). Governmental policies hence influence FDI inflow, also found by Asiedu (2006). This through offering incentives to foreign investors via i.e. tax rebates or holidays. Asiedu (2002), however, discusses that policies that have been successful in other developing regions are not as successful in Africa.

2.2.2 FACILITATING INVESTMENTS

Busse and Hefeker (2007) argue that political risk is a major component impacting the ability to facilitate investments to Africa. They conclude with government stability, internal and external conflicts, law and order, ethnic

tensions, and bureaucratic quality being the most important elements for low FDI inflows to the region. Corruption has also been argued to be an important factor, however to a lesser degree (Dupasquier & Osakwe, 2006). Contradictory to these findings, however, Asiedu (2002) found political risk insignificant in its impact on FDI, supported by Kandiero and Chitiga (2006) and Onyeiwu and Shrestha (2004).

Studies also focus on how business facilitation measures, including a high number of bilateral investment treaties (Neumayer & Spess, 2005), as well as the presence of other companies in the country (Yu & Walsh, 2010) affects companies' attitude towards a country. The results indicate the relationship to be positive, increasing FDI inflows to Africa (Ajayi, 2003). Reducing operating costs of businesses also participates in business facilitation, normally measured through infrastructure. Well-facilitated infrastructure has shown to positively impact FDI flows to SSA (Asiedu, 2002; Dupasquier & Osakwe, 2006), however also for this variable there exist contradictory findings. Onyeiwu & Shrestha (2004) and Asiedu (2006) find infrastructure insignificant in its impact on FDI.

2.2.3 CHARACTERISTICS OF THE ECONOMY

The motives for MNCs to settle in Africa have been discussed to be changing (Ezeoha & Cattaneo, 2012). Current findings indicate that MNCs settling in SSA are increasingly market seeking. This is related to the economic growth of African countries and the population increase (Asiedu, 2006; Ezeoha & Cattaneo, 2012; Anyanwu, 2012). However, the non-market seeking motives, i.e. the access to natural resources and a low-cost labor force, are still major determinants of FDI to African countries (Asiedu, 2006; Onyeiwu & Shrestha, 2004; Anyanwu, 2012). No matter the motives behind the investments, the positive relationship between economic prospects, measured through GDP growth, and FDI inflow also hold for SSA on a general basis (i.e Morisset, 1999). Researchers also point to the need for a stable macroeconomic environment and the capacity for economic management within a country for FDI inflows to increase in African countries. High rates of inflation, as a measure of economic instability, is found to have a negative impact on FDI inflows (Onyeiwu & Shrestha, 2004; Asiedu, 2006).

Research show that the drivers for FDI in some developing regions do not necessarily hold for SSA (Asiedu, 2002). Additionally, there is no general consensus in the literature on FDI (Chakrabarti, 2001) and there is hence little evidence on how to optimally motivate attracting FDI. All in all, this result in a contradictory list of prior research. Though our research will not solve this issue, we will examine the extent to which the variables included in prior research have persisted in explaining the variation in FDI for a sample of countries previously investigated. We will also look at whether countries located in the SSA today, on average, still receive less than countries in developing regions given the same determinants. Hence, we present updated information on SSA's performance in attracting FDI to further be able to investigate reasons for why changes occur.

2.3 RISK IN EMERGING MARKETS

The neoclassical theory and the law of diminishing returns predicts that capital should flow from rich to poor countries. Assume two countries producing the same good with the same constant returns to scale, same production function and same factors of production, that being capital and labor. The differences in income per capita for these countries reflects differences in capital per capita. If trade in capital goods is free and competitive, the risk-adjusted return on investment for these countries should be equalized over time, implying a flow of capital from rich and productive to poor and less productive countries. Asiedu (2002) found that the capital flow to poor countries differ, and that capital often does not flow where neoclassical theory predicts. Lucas (1990) first raised the question on why this does not happen, referred to as the Lucas Paradox.

Much research wanting to explain the Lucas Paradox focus on risk. Reinhart and Rogoff (2004) emphasize that credit market- and political risks are the main reasons for why there exist a lower flow of capital to developing countries. David, Simonovska and Henriksen (2014) further show that emerging markets are highly exposed to global shocks in growth rates in addition to default risk and expropriation risk.

As shown, there exist several variables trying to determine the effect risk has on countries' FDI inflows. These variables are i.e. related to political stability, corruption and currency stability through elements such as exchange rates. Asiedu

(2002) concludes her research with saying there exists an unaccounted for "Africa-effect" explaining why SSA is in a less favorable position compared to other countries. Implicitly, she says there is no paradox; the region is *inherently* risky. She hence argues that there is an element of risk the determinants of FDI are incapable of capturing, explaining the difference in the required returns between regions. As the determinants are incapable of capturing this risk, and as previous research falls short in quantifying the risk related to developing countries, we want to examine the production function to determine whether there exists a change in risk that could explain the change in the FDI flows over time. The process in which this is conducted follows in section 5.6.

The next section presents the variables we have chosen to include in our analysis, based on literature on the determinants for FDI, in addition to the data used for the analysis on risk.

3. DATA

3.1 DETERMINANTS OF FDI

The data in our research on FDI determinants is obtained from the World Bank's World Development Indicators (2019) and Worldwide Governance Indicators (2019), unless otherwise stated. As we want to examine whether the drivers for FDI for a particular group of countries have changed over time, we start by building on prior findings of Asiedu (2002); a research conducted on countries within SSA in comparison with other developing regions for the period 1988-1997. We have used the same countries as Asiedu (2002) for most analyses to have a sound ground for comparison. The countries defined as developing by the World Bank classification (MRS, 2019) is used in a robustness test of the variables found through the first part of our research. The countries included are listed in *Appendix A* and *B,* respectively.

An analysis including the Organization for Economic Co-operation and Development (OECD) member countries, believing these countries would contribute to show greater disparities, returned no significant results (see *Appendix D*). One important remark is that even though the situation is discussed to be changing, FDI to the countries in developing regions are more likely to be non-market seeking as most of them are characterized as small and poor (Dunning, 1993). The OECD countries, on the other hand, are more often subject to market seeking FDI, creating a separation in the data when including both developed and developing countries in one analysis. In addition to this, there could be a possible lack of variation within OECD countries, resulting in the insignificant results.

3.1.1 DEPENDENT VARIABLE

Foreign Direct Investment, Net Inflows (% of GDP):

As standard in literature, we use the ratio of net inflows of FDI to GDP as the dependent variable (Asiedu, 2002). FDI net inflow as % of GDP is defined as the net inflows of investments to acquire 10% or more of voting stock in an enterprise operating in an economy other than that of the investor, where net inflows are new investment inflows less disinvestment (The World Bank, 2019A). When empirical studies include the size of the host country market on the right hand-side of the

equation, such as GDP or GDP growth, the question of endogeneity immediately occurs. As we will look at GDP's impact on FDI, an argument for using the ratio of FDI to GDP as dependent variable is hence to alleviate this problem.

Ezeoha and Cattaneo (2012) argue this variable to be inapplicable as one transaction will affect the net inflows in two countries, especially since China, Brazil and India have become major contributors of FDI to Africa. However, disinvestment is the action of selling or liquidating an asset or subsidiary (Chen, 2019). Thus, an investment will not be recorded in our dependent variable for both countries affected of the investment.

3.1.2 INDEPENDENT VARIABLES

First, we present the variables used in the replication of Asiedu (2002)'s results. Second, the following explanatory variables are drawn from literature and defined as possible important determinants for FDI. Thus, we present all variables possibly interesting to look at in order to best answer our initial questions.

3.1.2.1 VARIABLES USED IN REPLICATION, DRAWN FROM ASIEDU (2002)

Trade Openness

In line with literature, we employ the ratio of the sum of imports and exports to GDP to measure the trade openness of an economy (i.e. Ulasan, 2012 & Asiedu, 2002). The expected sign of the coefficient depends on the type of investment, that being market- and non-market seeking FDI. If an investment is placed to seek and access new markets, there is arguably a negative relationship between trade openness and FDI. Consider a foreign company with difficulties in getting their products to the market. Based on the trade restrictions in the country, they decide to set up subsidiaries instead of doing trade. The relationship between FDI inflow and the openness to trade will hence be negative, while trade restrictions will be positive for FDI. On the other hand, when investments are non-market seeking, a positive relationship between trade openness and FDI is an applicable hypothesis as the transaction costs associated with exporting will generally be lower with a more open economy. Following literature, we treat FDI to developing countries as non-market seeking.

Return on Investment

According to neoclassical theory, countries that pay a higher return on capital will attract more FDI (see Wenkai, Xiuke, & Geng, 2009; Kravis & Lipsey, 1982; Blomström & Lipsey, 1991). However, finding an appropriate measure of return on investments is troublesome, especially for developing countries without well-functioning capital markets. As such, and in line with Asiedu (2002), we assume the marginal product of capital to be equal to the return on capital. Following this, investing in countries with less capital will yield a higher return. These capital-scarce countries tend to be poor in terms of GDP which is why the inverse of the per capita GDP is used as a measure of return on investment (Asiedu, 2002). This implies an inverse relationship between GDP per capita and FDI. That is, investing in countries with lower GDP per capita should yield a higher return, which is consistent with Table 2.

Table 2: Inward FDI rates of return in %, developed and developing economies. (Numbers retrieved from: UNCTAD, 2018)

Region	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Developed economies	6.7	6.3	6.6	5.7	6.2	5.7
Developing economies	10.0	9.8	9.5	8.5	8.1	8.0
Africa	12.3	12.4	10.6	7.1	5.4	6.3
Asia	10.5	10.8	10.6	9.9	9.5	9.1
Latin America and the Caribbean	7.9	6.7	6.6	5.2	5.3	5.6

Based on past empirical results there is no general consensus on the effect of per capita GDP on FDI. Schneider and Frey (1985) conclude with a positive relationship between per capita GDP and FDI, while on the contrast, Edwards (1990) finds the opposite. Thus, research supports both signs of the coefficient depending on the type of FDI, that being market and non-market seeking FDI.

Infrastructure Development

Countries with a more developed infrastructure will foster FDI flows as the productivity of investments increases in tandem with infrastructure development (Asiedu, 2002). There are two aspects that should be taken into account when assessing infrastructure development; the *availability* and the *reliability* of

infrastructure. However, as there is no available data on reliability, we employ a measure of infrastructure development that covers the availability aspect. We first use the number of fixed telephone subscriptions per 1,000 population to measure infrastructure development (Asiedu, 2002), and later change the variable to better proxy infrastructure as of today (see 3.1.2.2).

SSA Dummy

Through adding a dummy for SSA countries one can assess whether countries located in SSA on average receive less or more FDI than comparable developing countries, given the same variables in a regression (Asiedu, 2002). It is interesting to look at the coefficient for the SSA dummy as it measures the average difference in FDI as % of GDP between a country within SSA and a country from another developing region with the same levels of the chosen variables in the regression. We believe the F-test to be significant and the adjusted R^2 to be higher when the SSA dummy is included in the model, determining the importance of a regional effect.

Other Economic Variables

Other potential FDI determinants were added to test the robustness of the abovementioned variables. These variables include the ratio of general government final consumption expenditure to GDP as a measure of the size of the government, inflation as a measure of the overall macroeconomic stability, broad money as % of GDP as a measure of financial depth and GDP growth as a measure of market attractiveness. We wanted to include a variable for political instability to perfectly replicate Asiedu (2002). However, without access to certain databases we fall short in assessing data on this variable on the years prior to 2000. We are therefore not able to test the significance of this variable for the 10 year period 1988-1997. This variable is, however, through the Worldwide Governance Indicators, available for the years after 2003, and hence included for the analysis on today's situation.

3.1.2.2 VARIABLES DRAWN FROM EXISTING LITERATURE

For the 15 year period from 2003-2017, we have incorporated new measures that might have better availability and more precise reasoning today. The fundamentals should be the same for the variables presented above. The new determinants drawn from existing literature, adding to the variables from Asiedu (2002), will be reasoned in short in the following overview. All variables and their respective sources are presented in Table 3.

Even though wage has been included in much research on FDI, we were unable to retrieve data on this variable. Wages would arguably strengthen our analysis, even more so as the type of FDI of interest is considered to be non-market seeking. Exchange rate is also necessary to mention. It has been excluded from our research as there are many impacting factors to this variable. It is hence hard to predict to what extent the respective countries are able to impact the direction in which this moves.

Infrastructure Development

Prior research has used fixed telephone subscriptions as there is a need for infrastructure to be in place for fixed telephones to operate. However, in more recent years, the usage of fixed telephones has dropped as mobile phones have proven to be an important tool in even the poorest areas of the world. Thus, the relationship between infrastructure development and fixed telephone subscriptions will arguably no longer hold. To cope with this, we rather include gross capital formation as % of GDP to measure infrastructure development in line with Asiedu and Lien (2011). This variable consists of outlays to the construction of roads, railways and the like (The World Bank, 2019C).

Urbanization

Investors characterized by market seeking FDI, though less likely in our sample, is assumed to know that the urban population constitute the largest consumers of their products. As such, the urban population could work as a proxy for market size, or in our analysis; urbanization.

Table 3: List of variables used. ** Only used in panel regression analysis*

Proxy	**Variables**	**Source**
Foreign Direct Investment Inflow	• FDI net inflows % of GDP	World Development Indicators (2019)
Return on Investment & GDP per Capita	• Inverse of GDP per capita current US $ • GDP per capita current US $	World Development Indicators (2019)
Trade Openness	• Trade, sum of imports and exports, % of GDP	World Development Indicators (2019)
Infrastructure Development	• Fixed telephone subscriptions per 1,000 people • Gross capital formation % of GDP	World Development Indicators (2019)
SSA Dummy	• Value 1 for a country within SSA, 0 otherwise	
Size of Government	• General government final consumption expenditure % of GDP	World Development Indicators (2019)
Macroeconomic Stability	• Inflation, consumer prices in annual %	World Development Indicators (2019)
Financial Depth	• Broad money % of GDP • Domestic credit to private sector % of GDP	World Development Indicators (2019)
Market Attractiveness	• GDP growth in annual %	World Development Indicators (2019)
Urbanization	• Urban population % of total population	World Development Indicators (2019)
Human Capital	• School enrollment, secondary % gross	World Development Indicators (2019)
Aid	• Net ODA received per capita in current US dollars	World Development Indicators (2019)
Political Stability	• Control of Corruption • Political stability and absence of violence/terrorism • Regulatory Quality • Rule of Law	Worldwide Governance Indicators (2019)
Natural Resources	• Fuel exports % of merchandise exports	World Development Indicators (2019)
Taxes	• Taxes on income, profits and capital gains % of revenue	World Development Indicators (2019)
Tariffs	• Tariff rate, applied, simple mean, all products	World Development Indicators (2019)
Agglomeration*	• The first lag of the FDI inflows	

Human Capital

The level of human capital can be a relevant pull factor for FDI as a measure of the education and level of skills of the workers in the host country.

Aid

It is assumed that the aid received by a country will increase the productivity of capital by financing public investments (Anyanwu, 2012). Hence, aid can be catalytic in terms of attracting FDI.

Political Stability

The institutional variables, used in defining political stability, are downloaded from the World Bank's Worldwide Governance Indicators as percentile rank (The World Bank, 2019B). There are no general agreement in the literature on which variables nor what combination to use. However, several papers indicate the important impact efficient institutions have on FDI (Wei, 2000 & Globerman & Shapiro, 2002). We are constrained on which variables to include due to data availability. Still, our variables are supported in existing literature (Anyanwu, 2012). Different combinations have been applied in an effort to capture the overall effect of a country's political situation on FDI.

Natural Resources

Some of the countries in our sample are endowed with natural resources, that being minerals, oil and natural gas. As such, these countries attract much FDI towards these sectors. Theoretical and empirical literature mentions natural resources as a main driver of FDI, retrieved as fuel exports in % of merchandise export.

Taxes

Taxes are shown to reduce FDI inflows (Loree & Guisinger, 1995; Cassou, 1997; Swenson, 1994). Cassou (1997) particularly observed that a host country's corporate taxes (corporate and income) have a significant negative effect on FDI flows.

Tariffs

Tariffs have, to a large extent, the same reasoning as for trade restrictions, mentioned in the reasoning for the variable Trade Openness. When market seeking FDI is less likely, tariffs have shown to have a negative relationship to FDI (Nnadozie & Osili, 2004).

Agglomeration

To determine whether there exist agglomeration effects in the economies, literature has related the current FDI inflow to past FDI (i.e. Anyanwu, 2012). This is used as a proxy for already existing foreign investment, depicted to have a positive effect on the reputation of the respective country for new investors (Anyanwu, 2012). Being less knowledgeable of a country's economic environment, one may view investment decisions made by others as a positive signal of the conditions in the respective country.

Table 4 depicts the summary statistics for the variables included in the final models used for analysis.

Table 4: Summary statistics for the variables included in the models in the discussion

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI	1 047	4,11	4,99	-7,44	50,02
Trade	1 018	75,89	48,07	20,72	441,60
GDPcap	1 047	7,64	1,21	5,16	10,96
Return	1 047	-7,64	1,21	-10,96	-5,16
InfraTel	1 028	1,28	1,69	-5,12	4,10
InfraGross~p	987	24,36	8,85	1,53	73,78
GDP growth	1 047	4,41	3,69	-36,70	20,72
GovSize	971	13,38	4,07	0,95	28,73
Inflation	996	6,32	10,64	-4,79	254,95
FinDepth	1 014	51,20	33,76	2,82	208,46
DomCred	1 026	38,08	34,59	0,74	160,12
Urbanization	1 050	50,70	21,00	12,98	100,00
PolCorrupt	1 050	37,09	22,22	0,00	98,57

3.2 RISK IN SSA

To investigate the risk related to Africa, we draw on the Cobb-Douglas production function. For this analysis we are interested in the FDI stock, assumed to represent capital stock, *K*, in the production function. The data on *K*, FDI stock, is retrieved from the database generated by Lane and Milesi-Feretti (2017). According to OECD definitions, we have used the FDI liabilities for this analysis:

> "Direct investment liabilities can be ascribed to the following three categories:
>
> (i) investment of non-resident direct investor in resident direct investment enterprises
>
> (ii) reverse investment of non-resident direct investment enterprises in resident direct investors
>
> (iii) investment of non-resident fellow enterprises in resident fellow enterprises." (OECD, 2019).

Further detail on the proceedings of the analysis follows in section 5.6.

4. METHOD

This section presents the method used to examine hypothesis 1 and 2, as well as the possible explanation behind these findings. We investigate whether the determinants have changed, and whether the SSA dummy is positive or negative and robust to any changes in the data. In addition, we introduce the analysis on changes in risk premiums.

4.1 DETERMINANTS OF FDI

4.1.1 REPLICATION

The first step in our analysis is to replicate previous work on the determinants of FDI to Africa. This is important in order to be able to provide reasoned results with regards to potential changes in the African market. The article by Asiedu (2002) fits well as a baseline for our research, allowing us to draw interesting remarks with regards to our questions. Therefore, we begin by determining the variables used in explaining the variation in FDI as % of GDP for 1988-1997 using ordinary least squares (OLS). By replicating the work for the same time period we are able to verify the results and identify the variables to use for today's analysis.

The replicating analysis is conducted in five specifications (see Table 5). The first four are cross-section regressions using OLS estimation on the 10-year average value of the variables. The fifth specification is a panel regression where the variables are averaged over three subperiods, 1988-1990, 1991-1993 and 1994-1997. The first specification uses the variables *Return*, *Trade* and *Infrastructure*. The second specification introduces a dummy variable, SSA, where countries located in Sub-Saharan Africa receive the value one. That is to easily assess whether SSA countries on average receive less FDI relative to countries in other developing regions. The third specification includes a set of possible determinants based on other research, where the variables include *GDP Growth*, *Government Consumption*, *Inflation* and *Financial Depth (M2)*. Asiedu (2002) used a proxy for *Political Instability* in her third specification too. We were not able to detect this variable for the time period 1988-1997, and as it was used only for the third specification, it was excluded from the replication analysis

keeping in mind the purpose of the study; to determine the change over time in the main explanatory variables for developing countries.

Treating the second specification as our basic model, from now called *Model 1*, the third specification tests the robustness of the results. The fourth specification of the analysis goes back to *Model* 1 and interacts each of the three variables with the dummy for SSA. This allows us to assess whether the impact of the different variables on FDI as % of GDP is the same regardless of the country's geographical location. The fifth specification is equal to the fourth in terms of variables, but it is conducted to test whether the results are robust when a panel data analysis is conducted.

All variables are in % of GDP, except from *Return*, which is the natural logarithm of the inverse of GDP per capita, and *Infrastructure*, which is the natural logarithm of fixed telephone subscriptions per 1,000 population.

Table 5: Equations for specification 1 to 5.

Specification	Equation
1	$FDI_i = \beta_0 + \beta_{1i}(Return) + \beta_{2i}(Trade) + \beta_{3i}(Infrastr) + \varepsilon_i$
2	$FDI_i = \beta_0 + \beta_{1i}(Return) + \beta_{2i}(Trade) + \beta_{3i}(Infrastr) + \beta_{4i}(SSA) + \varepsilon_i$
3	$FDI_i = \beta_0 + \beta_{1i}(Return) + \beta_{2i}(Trade) + \beta_{3i}(Infrastr) + \beta_{4i}(GDPg) + \beta_{5i}(GovCons) + \beta_{6i}(Inflation) + \beta_{7i}(M2) + \beta_{8i}(SSA) + \varepsilon_i$
4	$FDI_i = \beta_0 + \beta_{1i}(Return) + \beta_{2i}(Trade) + \beta_{3i}(Infrastr) + \beta_{4i}(SSA * Return) + \beta_{5i}(SSA * Trade) + \beta_{6i}(SSA * Infrastr) + \beta_{8i}(SSA) + \varepsilon_i$
5	$FDI_{it} = \beta_0 + \beta_{1it}(Return) + \beta_{2it}(Trade) + \beta_{3it}(Infrastr) + \beta_{4it}(SSA * Return) + \beta_{5it}(SSA * Trade) + \beta_{6it}(SSA * Infrastr) + \beta_{8it}(SSA) + \varepsilon_i$

The next step is to bring the exact same test forward to the time period 2003-2017. The variables and the specifications are equal to the above equations, except that the variables are averaged over 15 years and hence five subperiods are used, with three years in each for the panel data analysis, 2003-2005, 2006-2008, 2009-2011, 2012-2014 and 2015-2017. A sample over 15 years was chosen on the basis of data availability and to avoid a significant impact of the global financial crisis around 2008 in our tests.

4.1.2 ROBUSTNESS TESTS

4.1.2.1 REPLICATION WITH ADJUSTED INFRASTRUCTURE

After the initial analysis with the exact replication of Asiedu (2002), *Model 1*, it is interesting to alter the model and approach. This is done to investigate potential estimations that could help explain more of the variation in FDI as % of GDP today, as we want to learn whether Africa has changed. In order to get a better overview of how the determinants have changed, we start by replicating Asiedu (2002)'s five specifications with one adjustment. In line with what is stated in section 3.1.2.1, and hence in line with literature, we replace the variable serving as proxy for infrastructure development from the natural logarithm of telephone subscriptions per 1000 to gross capital formation in % of GDP.

4.1.2.2 OTHER RESEARCH: REGRESSION ON AVERAGES

We further draw on existing literature when assessing whether there has been a change to the determining factors for FDI to SSA. As mentioned in section 2, there exists no consensus in the modelling approach or which determinants to employ. However, our analysis will arguably benefit from a broader approach with a combination of FDI determinants from a variety of theoretical models, while still following Asiedu (2002)'s reasoning.

The first expanded OLS estimation builds on Asiedu (2002)'s third specification, using 15 year averages, with additional determinants mentioned in Table 3 in section 3. A handful of researchers choose to use all explanatory variables expressed in natural logarithms (Anyanwu, 2012; Ezeoha & Cattaneo, 2012; Kariuki, 2015) with different reasonings. Some to interpret the variables as elasticities, others to reduce the risk of heteroskedasticity. Our research wants to explore the differences in FDI's explanatory variables comparing similar data from two different time periods. The variables from the time period 1988-1997 are transformed into logarithms only when they are not in percentages (Asiedu, 2002). Hence, we follow Asiedu (2002 & 2006)'s reasoning and believe this yields best results for comparison – also when using variables outside of her research.

As emphasized in literature (Calderón & Servén, 2010; Herger, Hodler & Lobsiger, 2008) there could be issues regarding causality in the explanatory variables, such that the most appropriate test would be to apply a simultaneous estimation model. For instance, one factor can be attributed to drive both financial development and FDI. Still, as we are to compare the determinants for two different time periods, we again argue that following Asiedu (2002)'s approach will be best suited for comparison. The process of finding the best model starts by calculating the correlation between the variables, see *Appendix C*, keeping in mind possible issues of multicollinearity between for instance *Infrastructure* and *Human Capital* (Asiedu, 2006). The variables have further been combined in several different ways to test the variables' robustness in describing the variation in FDI as % of GDP. The final model, referred to as *Model 2*, includes *Trade*, *GDP growth*, Domestic credit to private sector as a proxy for *Financial Depth*, Urban population in % of total as a proxy for *Urbanization*, Gross Capital Formation as a proxy for *Infrastructure* Development and a *SSA dummy*.

$$FDI_i = \beta_0 + \beta_{1i}(Trade) + \beta_{2i}(GDP\ growth) + \beta_{3i}(Financial\ Depth) + \beta_{4i}(Urbanization) + \beta_{5i}(Infrastructure) + \beta_{6i}(SSA) + \varepsilon_i$$

Finally, we interact the variables in *Model 2* with the dummy for SSA to investigate the difference between their effect on FDI inflow to countries in SSA compared to other developing regions.

4.1.2.3 OTHER RESEARCH: PANEL DATA

Alfaro et al. (2008) argues that the OLS regression is suited due to slow changing explanatory variables. However, to test the robustness of the variables from *Model 2*, in line with Asiedu (2002), we execute a panel data regression analysis using the five subperiods presented above. Panel regression analysis with yearly data is common practice for research on FDI when there is more data available (Asiedu & Lien, 2011; Ezeoha & Cattaneo, 2012; Onyeiwu & Shrestha, 2004; Dellis et.al.,2017; Swenson, 1994; Globerman & Shapiro, 2002). As data availability has increased since 2000 we therefore also investigate the results stemming from a panel data analysis using yearly data. For this analysis we introduce another variable to add to *Model 2*; *Agglomeration*– the first lag of FDI. This both due to

the interesting aspect of the effect of prior investments on today's investments, as well as to correct for possible residual autocorrelation present in the data.

4.1.2.4 UPDATED LIST OF DEVELOPING COUNTRIES

The reasoning behind the choice of countries in the sample from 1988-1997 is based on the prior classification of developing countries combined with data availability. To be able to compare our findings with the findings of Asiedu (2002), it is in our opinion most important to conduct the analysis on these countries. However, it is also interesting to look at the results when changing the sample, using an updated list of today's developing countries. This will arguably contribute to a better understanding of the relationship between Africa and other developing regions today. Thus, we conduct an analysis, using *Model 1* and *Model 2*, as well as a combination of the two, on the countries classified as developing countries according to World Bank classifications (MRS, 2019), with some exceptions due to data availability. The countries included are listed in *Appendix B.*

4.1.3 ADDITIONAL ANALYSES

See *Appendix D* for the additional analysis of the natural logarithm of FDI as dependent variable as well as the analysis where the OECD countries were included. These results were excluded from the final discussion due to insignificant results as well as the endogeneity problem related to not including a measure of GDP on the left hand-side of the equation.

4.2 RISK IN SSA

To investigate whether changes, found in the prior analyses and robustness tests, in the disparity between SSA and other developing regions can be explained by a change in risk, we look to the Cobb-Douglas production function. In doing so we first calculate the changes in FDI stock from the time period 1988-1997 to 2005-2015 (time periods of 10 years), as well as the % of total FDI stock in developing countries. The change in FDI stock is further used to analyze the change in risk premiums, assuming the risk adjusted returns are equalized in different regions due to competitive global financial markets. The process in which this analysis is conducted will be further explained when presenting the results (see section 5.6).

5. EMPIRICAL RESULTS AND DISCUSSION

The discussion will follow the structure of the previous section presenting the results from the analyses sequentially. Firstly, the results for the replication, *Model 1*, will be presented and discussed. Starting with the replication for 1988-1997, continuing with the replication for 2003-2017 and ending with a replication for 2003-2017 with an adjusted proxy for *Infrastructure*. These analyses set the baseline for our research. Secondly, we present and discuss the results of the analysis with other potential explanatory variables drawn from existing literature, *Model 2*, and the results of the robustness tests using a new set of developing countries.

Finally, we present the calculations and analysis of one potential reason for our findings to the first and second questions; an observed change in the FDI inflows to SSA. We interpret one important reason to be a change in risk premiums. This analysis and its method will in this section be presented and emphasized thoroughly.

All in all, this framework allows us to draw conclusions with regards to the questions raised initially. That is; has the determinants for FDI to developing regions, and the disparity in FDI between SSA and other developing regions persisted, and can we observe a change in the *inherent* risk related to Africa. The two first questions will be addressed and discussed in section 5.1 to 5.5, while the risk analysis is addressed in section 5.6.

5.1 REPLICATION OF 1988-1997 RESULTS

The results from the first replication analysis (1988-1997) is used for comparison with Asiedu (2002), see Table 6 for our replication results and *Appendix E* for the results from the paper "*On the Determinants of Foreign Direct Investment to Developing Countries: Is Africa Different?"* (Asiedu, 2002).

Table 6: Exact replication 1988-1997
P-values are in parentheses *Significance at 10% **Significance at 5% ***Significance at 1%

Variable	1	2	3	4	5
β_0	*4.49** (0.014)*	*4.46** (0.013)*	*5.11** (0.025)*	*4.90** (0.047)*	*9.92*** (0.002)*
Trade	0.032*** (0.000)	0.033*** (0.000)	0.035*** (0.000)	0.034*** (0.000)	0.037*** (0.000)
Return	1.110*** (0.002)	0.958*** (0.009)	1.056** (0.020)	1.331** (0.013)	1.757*** (0.000)
Infrastructure	0.925*** (0.000)	0.658** (0.025)	0.605 (0.104)	1.263*** (0.005)	1.165*** (0.000)
SSA Dummy		-0.750* (0.078)	-0.758 (0.150)	0.135 (0.967)	-7.558** (0.047)
GDP Growth			0.047 (0.602)		
Government Consumption			-0.018 (0.674)		
Inflation			0.000 (0.510)		
Financial Depth (Broad money)			0.000 (0.992)		
SSA * Trade				-0.028** (0.040)	-0.030*** (0.002)
SSA * Return				-0.475 (0.485)	-1.465** (0.014)
SSA * Infrastructure				-0.781 (0.162)	-1.118*** (0.004)
Adjusted R^2	0.60	0.61	0.64	0.67	0.55
Number of observations	69	69	58	69	203

The two first specifications in the replication indicate that we are adopting the same set of explanatory variables as Asiedu (2002). *Trade*, *Return* and *Infrastructure* are statistically significant at 5% or better with the same estimated signs of their coefficients as in the previous study. The *SSA dummy* is statistically significant at 10% with a negative coefficient, though with less magnitude than that of Asiedu (2002). Further, the adjusted R^2 is similar.

The third specification, the robustness test of the model, yields slightly different results. We confirm that none of the introduced explanatory variables are statistically significant. However, as opposed to Asiedu (2002), *Infrastructure* and the *SSA dummy* are no longer statistically significant with p-values of 0.104 and 0.150 respectively. This could be due to the lack of the political variable. The fourth and fifth specification in our replication, including the interactive terms, yield similar results for the variables *Trade*, *Return* and *Infrastructure*. Most of the coefficients are statistically significant at 1% and they carry a positive sign, suggesting that these variables are important in explaining FDI flows to non-SSA developing countries. The *SSA dummy* differs from Asiedu (2002)'s in terms of significance and magnitude, though it is in line with Asiedu (2002) with a statistically significant and negative coefficient.

Based on this, we argue having adopted variables similar enough to Asiedu (2002). The determinants identified through this analysis will be used as a baseline for comparison when we address and discuss the results of the previously introduced hypotheses. The results will be presented as follows in every part of the analysis; first examining hypothesis 1, and second hypothesis 2.

> Hypothesis 1: *There exist determinants better describing the variation in FDI as % of GDP to Africa and developing regions today.*

> Hypothesis 2: *The disparity between SSA and other developing regions has persisted,- the SSA dummy is still negative.*

5.2 REPLICATION WITH 1988-1997 VARIABLES TODAY: Model 1

The first analysis brings forward the explanatory variables identified through the replication to the years 2003-2017, see Table 7. This replication gives a first glimpse into whether there has occurred changes to the FDI inflows to SSA and its determinants.

Table 7: Replication of Asiedu (2002) for 2003-2017
P-values are in parentheses *Significance at 10% **Significance at 5% ***Significance at 1%

Variable	1	2	3	4	5
β_0	*0.16 (0.955)*	*-1.68 (0.607)*	*-3.39 (0.287)*	*-7.70** (0.037)*	*-7.09*** (0.000)*
Trade	0.053*** (0.000)	0.052*** (0.000)	0.053*** (0.000)	0.042*** (0.000)	0.043*** (0.000)
Return	-0.232 (0.644)	-0.291 (0.560)	-0.248 (0.554)	-0.582 (0.295)	-0.659** (0.023)
Infrastructure	-0.527 (0.129)	-0.282 (0.468)	0.014 (0.970)	0.687 (0.198)	0.431 (0.134)
SSA Dummy		1.306 (0.186)	0.813 (0.368)	13.368** (0.017)	10.188*** (0.001)
GDP Growth			0.345* (0.100)		
Government Consumption			0.054 (0.578)		
Inflation			-0.013 (0.660)		
Financial Depth (Broad money)			-0.026* (0.056)		
SSA * Trade				0.083** (0.000)	0.087*** (0.000)
SSA * Return				1.818** (0.049)	1.472*** (0.002)
SSA * Infrastructure				-1.249* (0.076)	-1.284*** (0.001)
Adjusted R^2	0.40	0.41	0.51	0.56	0.46
Number of observations	69	69	65	69	334

Two indications stand clear from these results. Firstly, specification 1 to 3 indicate that the determinants have changed. *Trade* is the only statistically significant explanatory variable of the three identified in 1988-1997, more specifically *Trade*, *Return* and *Infrastructure*. In addition, both *GDP growth* and *Financial Depth* prove to be statistically significant at 10%, suggesting that these variables may today be important in explaining FDI flows to developing countries. Secondly, the disparity between SSA and other developing regions has changed. The *SSA dummy* has a positive coefficient, though not always statistically significant.

Based on the results depicted in Table 7, the coefficients of the variables *Return* and *Infrastructure* have changed. However, as discussed, employing gross capital formation as a proxy for *Infrastructure* instead of fixed telephone subscriptions would yield more accurate estimations for today while still assessing the same underlying determinants as in *Model 1*. Noticing the drop in R^2 from past times further supports the change.

5.3 REPLICATION WITH ADJUSTED INFRASTRUCTURE TODAY: Model 1

To further set the ground for our research aiming to present updated results, specification 1 and 3 of Table 8 will be discussed in relation to the first hypothesis and specification 2 and 4 will be discussed in relation to the second hypothesis. The section ends with the fifth specification and whether the inferences made are robust when using panel data (see Table 8).

5.3.1 HYPOTHESIS 1

> *There exist determinants better describing the variation in FDI* as % of *GDP to Africa and developing regions today.*

Infrastructure is now positive and statistically significant at 10% in the first specification as opposed to the previous analysis where it was proxied by fixed telephone subscriptions. As previously mentioned, the coefficient using fixed telephone subscriptions is not significant. Replacing it with gross capital formation yields a coefficient of ~0.09. In addition, the adjusted R^2 increases noticeably compared to the previous replication. Comparing *Infrastructure's* coefficient with the findings from Asiedu (2002) at 0.837, shows that it has significantly reduced its impact on the inflow of FDI to developing regions today.

Table 8: Replication of Asiedu (2002) for 2003-2017 with updated variable for Infrastructure
P-values are in parentheses *Significance at 10% **Significance at 5% ***Significance at 1%

Variable	1	2	3	4	5
β_0	*1.980 (0.410)*	*-2.607 (0.393)*	*-3.155 (0.285)*	*-7.585** (0.044)*	*-6.575*** (0.001)*
Trade	0.050*** (0.000)	0.050*** (0.000)	0.053*** (0.000)	0.043*** (0.000)	0.044*** (0.000)
Return	0.520* (0.087)	0.047 (0.894)	-0.210 (0.525)	-0.883** (0.029)	-0.777*** (0.000)
Infrastructure	0.089* (0.054)	0.097** (0.031)	0.099** (0.041)	0.009 (0.862)	0.008 (0.785)
SSA Dummy		1.858** (0.023)	0.889 (0.261)	14.618*** (0.003)	11.746*** (0.000)
GDP Growth			0.083 (0.724)		
Government Consumption			-0.022 (0.816)		
Inflation			-0.015 (0.586)		
Financial Depth (Broad money)			-0.028** (0.017)		
SSA* Trade				0.060*** (0.004)	0.050*** (0.000)
SSA * Return				2.921*** (0.000)	2.586*** (0.000)
SSA * Infrastructure				0.181** (0.019)	0.222*** (0.000)
Adjusted R^2	0.44	0.47	0.54	0.64	0.55
Number of observations	68	68	65	68	331

Trade is the most significant determinant of FDI as % of GDP with a statistically significant coefficient at 1% for all specifications. Today's coefficient of around 0.05 compares to 0.03 for 1988-1997, indicating an increase of this variable's impact on FDI as % of GDP. Further, *Return* is positive and statistically significant at 10% for column 1. This is in line with previous findings for 1988-1997. However, the coefficient has changed from 1.11 to 0.52, indicating that return on investments has a lower impact on the inflow of FDI today. The coefficient is also not robust to the other specifications.

The third specification indicates that explaining today's variation in FDI as % of GDP benefits from including other variables. That is, the adjusted R^2 increases from 0.47 in the second specification to 0.54 in specification 3, and *Financial Depth* is negative and statistically significant at 5%. This contrasts to the findings from 1988-1997, where this variable was insignificant.

5.3.2 HYPOTHESIS 2

> *The disparity between SSA and other developing regions has persisted,- the SSA dummy is still negative.*

Model 1 depicts a positive and statistically significant coefficient for the *SSA dummy,* except for specification 3. That is, countries located in SSA receive on average more FDI relative to GDP than the other developing countries in our sample, given a set of macroeconomic determinants. More specifically, the result from column 2 in Table 8 indicates that the average FDI as % of GDP for a country located in SSA is approximately 1.8% more than that of a comparable country outside the region. However, due to high standard errors and highly varying values for different specifications, the exact number will not be emphasized further. Despite this, the sign is always positive indicating that Africa has increased its popularity and improved its reputation. The adjusted R^2 increases also from specification 1, indicating an importance of a regional effect.

Including the interactive terms in column 4, one assesses the partial effects of the determinants comparing SSA to non-SSA countries. The coefficients of the "original" explanatory variables refer to the non-SSA developing countries, while the coefficients of the interactive terms can be used to calculate the partial effects for SSA countries. More specifically, the coefficients for SSA countries are the sum of the coefficients of the original variable and the interactive terms.

Trade and *Return* remains significant when introducing interactive terms, suggesting that these variables are important in explaining the variation in FDI to non-SSA countries. The interactive terms of *Return* and *Trade* themselves are also statistically significant, indicating an importance of these variables to SSA too.

*SSA * Trade* is positive, showing that the marginal effect of *Trade* on FDI as % of GDP is greater for SSA countries compared to non-SSA countries. While a 1% increase in *Trade* leads to a 0.04% increase in FDI as % of GDP for non-SSA countries, a 1% increase in Trade for SSA countries leads to a 0.1% increase in FDI as % of GDP (0.043+0.060 = 0.103). This contrasts to the previous findings of Asiedu (2002) who argued that African countries would not benefit as much as other developing countries from opening up to trade. Based on our results, the situation is quite opposite today; African countries would likely benefit more than other developing countries from opening up to trade. There are several possible explanations as to why this change has occurred. Both regional and global trade agreements the region has entered into for the past decade have arguably improved the credibility of reforms in Africa, argued to be an important factor to attract foreign investments (de Melo & Tsikata, 2014). In addition, China has significantly increased trade with countries in SSA since the late 1990's. This relationship has induced some of SSA's key commodity exporting economies, possibly paving the way for other investors (Raphael, Dorothy & Mike, 2007).

*SSA * Return* is positive, suggesting that the marginal effect of *Return* on FDI as % of GDP is greater for countries located in SSA compared to countries in other developing regions. Specifically, a 1% increase in *Return* in non-SSA countries leads to a 0.9% decrease in FDI as % of GDP, while it leads to a 2% increase in FDI as % of GDP for SSA countries (-0.883+2.921 = 2.038). These results may suggest that the comparable developing countries in our sample are characterized by market-seeking FDI, while SSA countries are characterized by non-market seeking FDI. A positive relation between *Return* and FDI for SSA countries is in line with the expected effect of *Return* to developing countries, while a negative relation between *Return* and FDI is in line with the expected effect of GDP per capita to more developed countries (Schneider and Frey, 1985), as *Return* is the inverse of GDP per capita. Hence, some of the countries are probably no longer classified as developing countries. Asiedu (2002) shows a significant coefficient for *Return* only for non-SSA countries when including interactive terms, concluding with high returns not inducing more FDI when a region, such as SSA, is perceived risky. This has changed. Now, *Return* is significant for both SSA and non-SSA when the interactive terms are included.

Infrastructure alone does not remain significant when including the interactive variables. Since the interactive term *SSA * Infrastructure* is significant, *Infrastructure* is apparently more important to SSA countries than other developing countries, in contrast to previous findings of Asiedu (2002). One possible explanation may be due to the level of infrastructure development in the different countries going into 2003. Other developing countries may be ahead of SSA in terms of infrastructure and thus, today's level of gross capital formation is not an important determinant of FDI to those comparable developing countries. One could be interested in the aggregated level of gross capital formation, but we have chosen not to incorporate this to our analysis.

The results from the fifth specification indicate that our findings are robust when using panel data. The same variables in column 5 of Table 8 are significant with similar coefficients as in column 4. Due to the positive sign of the *SSA dummy*, as well as the lower R^2 of the model compared to 1988-1997, we build an alternative model with variables drawn from the existing literature; *Model 2*. This to both test the robustness of the results of *Model 1,* and to further investigate other specifications that may help explain more of the variation in today's net inflow of FDI as % of GDP. This is done through including other determinants drawn from literature and to do the analysis on an updated list of developing countries based on World Bank's classification (2019).

5.4 ANALYSIS ON VARIABLES FROM LITERATURE: Model 2

This part of the analysis tests the robustness of the previous findings, and aims to give a well-argued and robust answer to the two hypotheses before investigating *why* we find what we find. We first test hypothesis 1; that the variables describing the variation in FDI as % of GDP to developing countries have changed over time. In doing so, we investigate the explanatory power of variables drawn from other research, resulting in *Model 2.* We cannot say whether the variables in *Model 2* describe more today than they did in the time period 1988-1997 as most of them are not included in the analyses for prior years. Nonetheless, we are able to discuss the extent to which *Model 2* describes more of today's variation in FDI as % of GDP compared to *Model 1*. Second, we examine hypothesis 2; that the *SSA dummy* has remained negative.

Table 9: Cross-section analysis for *Model 2*
P-values are in parentheses *Significance at 10% **Significance at 5% ***Significance at 1%

Variable	1	2	3	4
β_0	*-3.976** (0.013)*	*-5.799*** (0.001)*	*-4.786*** (0.007)*	*-3.910** (0.081)*
Trade	0.054*** (0.000)	0.052*** (0.000)	0.049*** (0.000)	0.044*** (0.000)
GDP Growth	0.436* (0.070)	0.410* (0.075)	0.272 (0.181)	0.265 (0.359)
Financial Depth (Domestic Credit to Private Sector)	-0.035*** (0.002)	-0.027** (0.016)	-0.032*** (0.004)	-0.009 (0.552)
Urbanization	0.029* (0.092)	0.042** (0.015)	0.039** (0.026)	0.048** (0.014)
Infrastructure	0.074 (0.125)	0.085* (0.070)	0.069* (0.097)	0.009 (0.894)
SSA Dummy		1.828** (0.011)	1.362* (0.053)	-0.524 (0.871)
Corruption			0.019 (0.297)	
Inflation			-0.021 (0.444)	
Tariffs			0.008 (0.929)	
SSA * Trade				0.047** (0.041)
SSA * GDP Growth				0.093 (0.843)
SSA * Financial Depth				-0.023 (0.290)
SSA * Urbanization				-0.076* (0.066)
SSA * Infrastructure				0.114 (0.238)
Adjusted R^2	0.50	0.54	0.60	0.58
Number of observations	68	68	66	68

The results of the cross-section analysis on *Model 2*, with 15-year averages are reported in column 1 to 4 in Table 9. To further test for the robustness of the variables in *Model 2* we conduct analyses on panel data. The panel regressions are presented in Table 10 with results using subperiods reported in column 1 and 2, and yearly data in column 3. For column 3, a variable for the agglomeration effect – the lag of FDI – is added.

Table 10: Panel data analysis, subperiods and yearly, for *Model 2*
P-values are in parentheses *Significance at 10% **Significance at 5% ***Significance at 1%

Variable	1	2	3
β_0	*-4.913*** (0.000)*	*-3.111** (0.011)*	*-2.987*** (0.000)*
Trade	0.053*** (0.000)	0.045*** (0.000)	0.025*** (0.000)
SSA Dummy	1.697*** (0.000)	-0.149 (0.925)	0.869*** (0.001)
GDP Growth	0.129* (0.098)	0.257** (0.030)	0.079** (0.016)
Financial Depth (Domestic Credit to Private Sector)	-0.027*** (0.000)	-0.010 (0.202)	-0.015*** (0.000)
Urbanization	0.029*** (0.004)	0.039*** (0.001)	0.014** (0.026)
Infrastructure	0.129*** (0.000)	0.004 (0.904)	0.086*** (0.000)
SSA * Trade		0.043*** (0.001)	
SSA * GDP Growth		-0.271* (0.069)	
SSA * Financial Depth		-0.020* (0.099)	
SSA * Urbanization		-0.087*** (0.000)	
SSA * Infrastructure		0.188*** (0.000)	
Agglomeration			0.546*** (0.000)
Adjusted R^2	0.46	0.52	0.58
Number of observations	327	327	903

5.4.1 HYPOTHESIS 1

> *There exist determinants better describing the variation in FDI* as % of *GDP to Africa and developing regions today.*

In determining which variables best describing today's variation in FDI as % of GDP for the same sample of countries as Asiedu (2002), we start by investigating the correlation between the possible explanatory variables listed in Table 3 (see *Appendix C* for the correlation matrix). This to have a basis for choosing which variables to include in the model, such that multicollinearity is more likely to be avoided. There exist high values of correlation between some of the variables as

several of the variables from other research are proxies for the same determinant. Hence, high values of multicollinearity between several variables are expected to exist. *Appendix C* further depicts the results of the variance inflation factor (VIF) analysis determining the multicollinearity in the combination of several variables as well as for *Model 2*. Values above 10, as a rule of thumb, is indicating possibilities of too high multicollinearity. The VIF show that there is a low likelihood for multicollinearity in the data for *Model 2*. Many combinations of variables have been tested.

The first interesting remark is that the adjusted R^2 for *Model 2* is notably higher for all analyses compared to *Model 1*, from on average around 0.4 in *Model 1* to 0.6 for *Model 2.* This implies that the variables in *Model 2* together describes up to 20% more of the variation in FDI as % of GDP today than *Model 1*. Additionally, the regional effect proves to be present for *Model 2* as the R^2 increases when the *SSA dummy* is included. This is further proven through an F-test (p-value: 0.011) of the two specifications in column 1 and 2 of Table 9.

The test including additional variables; *Inflation*, *Tariffs* and a variable for political risk proxied as the degree of *Corruption* in column 3 of Table 9 and 2 of Table 10, further indicates that *Model 2* is robust to changes. Hence, today we conclude with the inflow of FDI as % of GDP to be better described by a combination of a country's openness to *Trade*, its *Financial Depth*, the extent of *Urbanization*, its *Infrastructure* development and to a large extent its *GDP growth*.

The variables *Trade* and *Infrastructure*, as well as the *SSA dummy*, remains important determinants from *Model 1*. The coefficients for *Trade* and *Infrastructure* are similar to the results from *Model 1*, both in terms of significance and magnitude. The *SSA dummy*, however, has a more stable coefficient for the analyses, also with lower standard errors.

Urbanization is a variable not included in *Model 1*. This variable is also significant, with positive coefficients ranging from 0.014 for the panel regression in Table 10 to around 0.04 for the cross-section analysis on averages in Table 9. This shows that increasing the urban population with 1% increases FDI as % of

GDP with around 0.04%. More importantly, these results indicate that the variable is important in explaining some of the variation in FDI as % of GDP for developing countries.

GDP growth remains positive and significant for all analyses in Table 10, and most analyses in Table 9. This suggests that the growth of a country's economy impacts the flow of investments into the respective country, supporting Chakrabarti (2001). The coefficient is, however, quite fluctuating, making it hard to make inferences with regards to why and to what extent GDP growth impacts FDI as % of GDP.

Financial Depth, proxied in *Model 2* as domestic credit to the private sector, is significant and negative in all analyses except when including the interactive terms. This variable is also significant when proxied as broad money in *Model 1*. The significance of the variable can possibly show that there have occurred some changes in the motivations behind investments. One possible explanation for the negative coefficient is that more domestic credit to the private sector implies higher abundance of domestic capital, creating a lower need for FDI in the form of investment. Another explanation supporting this result is the negative relationship between FDI inflows and inflows of other forms of financial flows, such as bank loans (Hausmann & Fernández-Arias, 2000).

The political variable, *Corruption*, the variable *Tariffs* and the macroeconomic variable *Inflation* were added to the model to test for robustness. They are all insignificant. Firstly, the insignificance of *Corruption*, related to political risk, is supported by the findings of Asiedu (2002), Edwards (1990) and Hausmann and Fernández-Arias (2000). The political situation of the country, in particular the rank it attains in its degree of corruption, has a lower effect on FDI inflows than i.e. structural reforms related to trade openness. Secondly, the insignificant coefficients for both *Tariffs* and *Inflation* is supported by several researchers (Chakrabarti, 2001; Anyanwu, 2012).

Finally, the variable for *Agglomeration* is added to the analysis on yearly panel data. This variable is proxying the extent to which prior investments reduces the perceived risk for new investors, or how prior FDI impacts new FDI inflows.

The positive and highly significant coefficient, in addition to a noticeably higher R^2 (from 0.52 to 0.58), shows that there is a quite clear relationship between prior FDI and today's FDI inflow in developing countries. This indicates support for prior findings; that there might be a risk-reducing effect through the existing FDI in the country of interest (Yu & Walsh, 2010).

These results show that there exist additional determinants better describing the variation in FDI as % of GDP today compared to *Model 1*, supporting the first hypothesis.

5.4.2 HYPOTHESIS 2

> *The disparity between SSA and other developing regions has persisted,- the SSA dummy is still negative.*

The most interesting result of the replication of Asiedu (2002), and *Model 1*, is the fact that the sign of the coefficient for the *SSA dummy* is positive. This indicates that Africa is no longer relatively unsuccessful in attracting FDI flows, and that they do not receive less relative to other countries in developing regions. As this result contradicts previous results, to investigate this further is indispensable.

Model 2 shows that the *SSA dummy* is in fact positive and significant. Even though the coefficient is negative when adding the interactive terms, it is highly insignificant with p-values of 0.8-0.9. Hence, we conclude with the *SSA dummy* being positive, and robust. A positive *SSA dummy* indicates that SSA is in a better situation today than that of 1988-1997. To further investigate the disparity between SSA and other comparable developing countries, we investigate the interactive terms further. Note that the explanatory power of the model increases with the inclusion of the *SSA dummy*, as previously shown.

Openness to trade, when interacted with the *SSA dummy*, is significant and positive. This indicates that the effect of *Openness to trade* on FDI is, in fact, higher for SSA than other developing countries, supporting the findings of the replication. The fact that the variable alone stays significant shows that *Openness to trade* is also important to other developing regions, however to a lower extent.

More specifically, our results indicate that the marginal effect of a country's openness to trade on its inflow of FDI is today higher for countries within SSA than non-SSA, again supporting the findings discussed for *Model 1*.

Urbanization proved significant and positive for all analyses when investigated alone. However, when interacted with the *SSA dummy* the coefficient is negative. This shows that there exists a lower marginal effect of having a larger urban population when located in SSA compared to non-SSA regions. More accurately, urbanization has a negative effect on FDI inflow to SSA; a 1 % increase in the urban population leads to a 0.028% decrease in FDI as % of GDP (0.048 – 0.076 = 0.028) in SSA according to the cross-country regression. One possible explanation is that the countries within SSA more often are subject to non-market seeking FDI, while some of the comparable countries in the sample, such as i.e. China and India, are more opposed to market seeking FDI. A larger urban population can indicate a larger consumer group, increasing market seeking FDI. A larger urban population may also indicate migration from villages to cities due to economic growth and development, which possibly leads to an increase in prices. This might decrease non-market seeking FDI as the raw materials and low-cost labor force will no longer be as accessible.

GDP growth when interacted with the *SSA dummy* has a negative and significant coefficient when looking at the results for the panel data in Table 10. While it is insignificant for the other analysis, this result can to some extent indicate that SSA experiences a lower marginal effect of economic growth compared to countries in other developing regions. One reason for this could be related to the above argument; the comparable countries could be subject to different types of FDI. One country might be subject to market seeking FDI making GDP growth a necessity for investments, while the motives for investing in SSA might be different making GDP growth irrelevant to some extent. The numbers presented in *Appendix F* further show that the GDP growth in SSA countries is lower than their increased inflow of FDI comparing today with the time period 1988-1997. This supports the finding that GDP growth is not an important factor for FDI inflows to SSA.

The fact that the coefficient for *Financial Depth* is insignificant when including the interactive terms implies that this variable is not important in describing FDI inflows to countries outside SSA. For the analysis on panel data, it proves significant and negative when interacted with the *SSA dummy*, implying a possible lower degree of impact of *Financial Depth* to SSA compared to others. However, this result is not highly robust, making it hard to conclude with this variable having a lower or less significant impact on either of the group of countries.

Our results indicate that the disparity has changed; Africa is no longer in a less favorable position than that of other comparable countries.

5.5 ROBUSTNESS TEST: OTHER COUNTRIES

To further investigate our results we find it important to do the tests on an updated sample of developing countries before examining why our findings are as they are. As earlier discussed the comparable developing countries in Asiedu (2002)'s sample may not be classified as developing today. In order to test the robustness of both the determinants of FDI today and the positive coefficient of the *SSA dummy*, we conduct a final analysis using an updated list of developing countries, see *Appendix B* for the new list of countries. First, we use the variables from *Model 1* and *Model 2*, with the results provided in the first and second column of Table 11. While both analyses show similar and significant results as the prior analyses, the adjusted R^2 is notably lower for both *Model 1* and *Model 2* when tested on an updated list of developing countries (0.39 compared to 0.47, and 0.35 compared to 0.54, respectively). Hence, we combine the two models in a more optimal combination of the variables, with the results shown in the third column of Table 11. The interactive terms are excluded as we are interested in investigating the *SSA dummy* and the variables' explanatory power on developing countries as a whole.

Table 11: *Model 1, Model 2* and a *Combined Model* cross-section analysis on today's definition of developing countries, including SSA
P-values are in parentheses *Significance at 10% **Significance at 5% ***Significance at 1%

Variable	*Model 1*	*Model 2*	*Combined Model*
β_0	*4.738* *(0.166)*	*-4.885*** *(0.044)*	*9.530**** *(0.008)*
Trade	0.087*** (0.000)	0.073*** (0.000)	0.089*** (0.000)
SSA Dummy	1.814** (0.035)	1.681* (0.081)	1.591** (0.049)
Return	1.501*** (0.003)		2.720*** (0.000)
Infrastructure	0.104* (0.060)	0.067 (0.282)	0.093* (0.071)
Urbanization		0.039 (0.194)	0.103*** (0.001)
GDP Growth		0.103 (0.703)	
Financial Depth (Domestic Credit to Private Sector)		-0.041** (0.025)	
Adjusted R^2	0.39	0.35	0.47
Number of observations	80	79	80

Table 11 shows that when including other developing countries the signs of the significant variables are the same as for the other analyses. In addition, the coefficients are similar to the results from *Model 1* and *Model 2* using the countries from Asiedu (2002)'s sample. Nonetheless, the adjusted R^2 for *Model 2* using today's developing countries is notably lower, indicating that the model describes less of the variation in FDI as % of GDP with the new set of developing countries. The combined model, however, increases the explanatory power with 12%. The significant and positive variable *Return* supports Asiedu (2002). A higher per capita income yields a lower return, and vice versa, and *Return* is significant in describing FDI inflows to developing countries. The *SSA dummy* is more importantly still positive and significant, and all other results supports prior discussions.

5.6 RISK IN SSA

Why do we find a change in the disparity?
- Has the risk related to Africa changed?

Competitive markets predict that if capital is allowed to flow freely, new investments will occur only in the poorer economies with lower capital, as these yield higher returns to capital. This flow of investments will continue to happen until the expected risk-adjusted return on investment is equalized between all countries. As such, the change in the sign of the SSA dummy's coefficient, found to reject hypothesis 2, may be an indication of a change in the risk related to SSA. Lucas (1990) raised the question why the world does not experience this predicted flow of capital to poor countries, referred to as Lucas' Paradox. His work generated extensive theoretical literature, where one important branch of our interest covers the international capital market imperfections, mainly sovereign risk and asymmetric information. We will investigate whether international capital market imperfections may explain the observed changes through examining the production function, inspired by Alfaro et.al (2008). This is the most important question we are asking, and the most significant contribution stemming from this research; *Why do we find a change in the disparity?*

Previous findings conclude with the SSA countries being in a less favorable position compared to other developing countries with regards to FDI. Capital did flow to SSA, however to a lesser extent than what their macroeconomic factors would suggest. One of the explanations for this situation is that, even though these countries yield higher expected returns, they offer too low risk-adjusted returns to induce more investments, explaining the "Lucas Paradox" (Asiedu, 2002, p.115). The common conception seems to be the same today; investing in African countries is highly risky (African Development Bank, 2018B).

Nonetheless, the results of our analyses indicate that the situation may have changed. First, the SSA dummy is no longer negative; Africa does not receive less FDI as % of GDP relative to other comparable developing countries. In fact, today this region receives *more* than what their macroeconomic factors

predict. Second, Asiedu (2002)'s findings with regards to *Return* no longer holds. *Return*, as opposed to the 1990's, has today a significant impact on FDI inflows to SSA, and hence higher returns induce more investments to this region.

The change found in the capital flow, and hence the change in Africa's situation, may be a result of the changes in some underlying conditions. We interpret the change in these underlying conditions to be related to a change in the level of risk in the region. In particular, it is interesting to investigate whether our findings can be reasoned by a level of risk that is lower today than that of the 1990's. In order to calculate how this might be true, we employ the neoclassical theory. Drawing on the Cobb-Douglas production function, we need a measure for capital stock; FDI stock. FDI stock differs from FDI flows in the sense that FDI stock refers to the level of investment at a given point in time, while FDI flows provide information of FDI activity within a given time period (OECD, 2019). We will in the following treat FDI stock as the capital stock in a country, referred to as *K* in the Cobb-Douglas production function (1). To answer our question, we must investigate the risk-return relationship on a regional level. In order to do so, we work out the properties of the Cobb-Douglas production function with one additional extension, namely risk. The following equation should hold for any country.

$$Y_D = Z_D \, K_D^{\alpha} \, L_D^{(1-\alpha)} \qquad (1),$$

where Y_D is the output or GDP, Z_D is the technical factor of production, K_D^{α} is the capital stock and $L_D^{(1-\alpha)}$ is the labor force, all with subscript D for developing countries. The first step to arrive at the risk-return relationship is to derive a measure of return. In line with Cobb-Douglas, the return on capital can be given by the first derivative of equation (1) with respect to *K*:

$$r_D = \frac{\partial Y}{\partial K} = \alpha \, \frac{Y_D}{K_D} \qquad (2).$$

In competitive international capital markets, the expected return on all investments are equalized, hence also the expected discounted return on investments in a developing country should equal the expected discounted return on investments in SSA, formally:

$$E(m\, r_D) = E(m\, r_{SSA}) = E(m \frac{\partial Y}{\partial K}) = E(m\, \alpha\, \frac{Y_{SSA}}{K_{SSA}}) \quad (3),$$

where m is the market's stochastic discount factor. We further modify the presentation of the relationship between expected returns and risk. The relationship between the measure of risk, now presented through ρ, and expected returns holds for any country through the following equation. The expected risk adjusted return is given by:

$$E(r_D) = \alpha\, \frac{Y_D}{K_D} + \rho \quad (4),$$

where ρ is the risk premium. When equation (3) and (4) holds, we expect the risk adjusted return in developing countries to equal the risk adjusted return in SSA. Equation (4) is further expected to hold regardless of time periods. Thus, we can implicitly assess the change in risk premiums by examining the change in FDI stock from past years. More specifically, following the properties of equation (1) through (4), there is an inverse relationship between capital stock (K) and the risk premium (ρ). One could infer that if the risk premium has dropped, it will be reflected through an increased capital stock, given through the following properties:

$$\rho \downarrow \Rightarrow K \uparrow \; i.e \; FDI \uparrow \quad (5).$$

Our analysis compare the average stock of FDI for SSA and non-SSA countries included in *Appendix A* for the time period 1988-1997 and 2006-2015. The results are depicted in Table 12.

Table 12: Comparison of the FDI stock for SSA and non-SSA countries in 1988-1997 and 2006-2015, and its percentage increase.

FDI Stock	**1988-1997**	**2006-2015**
SSA	1,109	16,340
Non-SSA	9,445	124,864
Total	10,554	141,204
SSA % of Total	10.51%	11.57%
% increase		
SSA	1373.25	
Non-SSA	1222.00	

In 2006-2015, the stock of FDI held by SSA countries in % of total is more than that of 1988-1997. More so, the FDI stock in SSA countries have increased relatively more than that of other developing countries, with 1373.25 % compared to 1222.00% respectively. Given the inverse relationship between capital stock and risk premiums in equation (4) together with equation (3), we can argue that the risk premium in SSA has dropped by more than that of other developing countries. These observations are consistent with our previous results from hypothesis 2. In line with this reasoning, an increased risk premium (ρ) is compatible with our findings, and could be a reason as to why we see the change of sign for the *SSA dummy*. In sum, Africa is no longer relatively unsuccessful in attracting FDI and a reason consistent with this is likely to be due to a reduction in the risk related to SSA. This analysis, a slight modification of the standard neoclassical theory, and the results stemming from it, is a contribution to the existing literature discussing Lucas' Paradox. As our results show, the changes in risk premiums may account for the difference in FDI inflows today in relation to prior years. Hence, the paradox can be argued to disappear.

6. CONCLUSION

This thesis has shed light on the complex situation of the determinants of FDI to developing countries with a special emphasis on Africa and the risks related to this region. We have gathered new data and executed several robustness tests on a large number of FDI determinants for a group of previously analyzed developing countries. Through this process we have documented that (1) if we control for macroeconomic factors, SSA now receive more FDI than other developing regions, and (2) this finding is consistent with a fall in the risk premium required by investors in Africa.

Our results clearly indicate that the determinants for FDI to developing regions have changed. The significance, and hence explanatory power of some of the previously used variables have diminished, while the impact of some of them has increased. In addition, through several robustness tests, there have been identified new determinants better describing today's situation. This finding implies that the dynamics between the developed and developing world may have changed in tandem with the globalization. It also rejects prior results indicating that trade- and other economic policies do not affect Africa as much as other regions. The implication of this finding contributes to policy makers within the SSA region through updating the impact of economic factors on FDI inflows.

The regional effect, the difference between countries, is present today as for prior years. Conducting an F-test on the model with and without an SSA dummy show that the explanatory power of the model increases when this variable is included. Nonetheless, the sign of the SSA dummy's coefficient has changed from negative to positive; Africa is no longer in a less optimal situation than that of other developing regions. This finding is robust, suggesting that countries in Africa is receiving *more* than what their macroeconomic determinants predicts. Additionally, the partial effects of the determinants, comparing SSA to non-SSA countries, have also changed, insinuating a change in the motives of the investors or that countries within SSA have increased their ability to attract FDI.

Most importantly, the key to our results is the change in the risk premium related to SSA. The fact that Africa no longer is in a less optimal situation than

that of other developing regions implies a change in some underlying conditions. We interpret risk as one of these underlying conditions. The region not only experiences an increase in the flow of FDI as % of GDP, but also a higher increase in the stock of FDI than that of other developing regions. Drawing on this finding, we have proven that the change in the disparity can, in fact, be appointed to a change in the risk premium required by investors. This result is consistent with the interpretation of the underlying conditions, supporting the results of our initial analyses. Additionally, it supports and quantifies the statements of previous literature claiming that risk *may* explain why Africa is different. Both the risk related to SSA, and the disparity between SSA and other developing regions have changed.

Nonetheless, it is important to bear in mind a couple of caveats. First, in order to be able to draw conclusions, proxies are used to describe elements impacting FDI as % of GDP. These proxies are not perfect, even though supported by other research, and there might exist better variables to determine several elements, such as *Infrastructure* and *Financial Depth*. Due to data availability and the reliability of the numbers provided, we are limited in which proxies to use. Second, building on the problem of data availability, there have been limitations to which variables to include in our analysis. We wanted to incorporate i.e. *Wages* and a better proxy for *Political Risk* and *Human Capital*. However, some of the databases used in other research have been out of reach, and accessible proxies for these variables have been subject to low data quality for the countries within SSA and some other developing regions. Hence, we have been limited in which variables to include in *Model 2*. Finally, there exist possible statistical problems related to endogeneity in our models. In addition, without accounting for reverse causality, estimated coefficients for *Model 2* may be biased. We have chosen not to change Asiedu (2002)'s modelling approach and methodology in order to achieve best possible ground for comparison. Nonetheless, to better account for this, following researchers such as Dellis et.al. (2017) and Asiedu and Lien (2011), one could apply two estimation techniques – the difference General Method of Moments (GMM) and the system GMM.

Finally, our thesis proposes some remarks interesting to investigate further, some of which we have chosen to highlight. First, we leave for future work a more detailed and robust analysis of the changes in the risks related to SSA and other developing regions, either through a further utilization of the Cobb-Douglas production function, or some financial measure of risk. This can help to both attain a deeper understanding of the changes that have occurred, and to learn how SSA can attain the investments needed for development. Furthermore, examining the institutional differences across countries and its impact on risk may result in a deeper understanding of the findings on risk-adjusted returns. Second, Figure 2 depicts the changes in SSA's FDI as % of world total. The table shows interesting movements around year 2000 – the dot-com bubble – and year 2007 – the financial crisis. Investigating the reasons behind these movements and how this impacted both the return and the perceived risk related to the countries, would be of interest to grasp a better understanding of the motives for FDI. Third, a final potential avenue of research includes the role of China in SSA. In addition to the possible explanation of the change in FDI being due to changes in risk levels, China's increased participation in the global market could be part of the reason too. To better understand the results of our analyses, incorporating a measure of the extent to which China is involved in the countries could be of interest.

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8. APPENDIX

Appendix A: *List of countries*

Sub-Saharan Africa	**Latin America**	**Asia**	**Other**
Benin	Argentina	Bangladesh	Algeria
Botswana	Bolivia	China	Egypt
Burkina Faso	Brazil	India	Morocco
Cabo Verde	Chile	Indonesia	Papua New Guinea
Cameroon	Colombia	Korea, Rep	Tunisia
Central African Republic	Costa Rica	Malaysia	
Congo, Dem. Rep	Ecuador	Nepal	
Congo, Rep	El Salvador	Pakistan	
Cote d'Ivoire	Grenada	Philippines	
Gabon	Guatemala	Singapore	
Gambia	Guyana	Sri Lanka	
Ghana	Haiti	Thailand	
Guinea	Honduras		
Guinea-Bissau	Jamaica		
Kenya	Mexico		
Madagascar	Nicaragua		
Malawi	Panama		
Mali	Paraguay		
Mauritania	Peru		
Mauritius	Trinidad and Tobago		
Mozambique	Uruguay		
Niger	Venezuela		
Nigeria			
Senegal			
Sierra Leone			
South Africa			
Tanzania			
Togo			
Uganda			
Zambia			
Zimbabwe			

Appendix B: *New list of countries*

Sub-Saharan Africa		**Other developing**	
Angola	Liberia	Afghanistan	Mongolia
Benin	Madagascar	Armenia	Moldova
Botswana	Malawi	Bangladesh	Morocco
Burkina Faso	Mali	Bhutan	Myanmar
Burundi	Mauritania	Bolivia	Nepal
Cabo Verde	Mauritius	Cambodia	Nicaragua
Cameroon	Mozambique	Egypt	Pakistan
Central African Rep.	Namibia	El Salvador	Papua New Guinea
Chad	Niger	Georgia	Philippines
Comoros	Nigeria	Guatemala	Solomon Islands
Congo, Dem. Rep.	Rwanda	Haiti	Sri Lanka
Congo, Rep.	Sao Tome and Principe	Honduras	Tajikistan
Cote d'Ivoire	Senegal	India	Thailand
Equatorial Guinea	Seychelles	Indonesia	Timor-Leste
Eritrea	Sierra Leone	Korea, Rep.	Tunisia
Eswatini	South Africa	Kyrgyz Republic	Ukraine
Ethiopia	Sudan	Lao PDR	Uzbekistan
Gabon	Tanzania	Micronesia	Vietnam
Gambia	Togo		
Ghana	Uganda		
Guinea	Zambia		
Guinea-Bissau	Zimbabwe		
Kenya			
Lesotho			

Appendix C: *Correlation matrix and Variance Inflation Factor*

	GDPcap	Trade	InfraTel	InfraG~p	GovSize	Inflat~n	FinDepth	DomCred	GDPg	Urbani~n
GDPcap	1,0000									
Trade	-0,0352	1,0000								
InfraTel	**0,7059**	0,0621	1,0000							
InfraGross~p	0,1445	0,0553	0,2221	1,0000						
GovSize	0,1029	0,1907	0,2227	0,1462	1,0000					
Inflation	-0,1912	-0,1403	-0,1356	-0,1707	-0,3582	1,0000				
FinDepth	0,2995	0,1839	0,5850	0,4645	0,1975	-0,1717	1,0000			
DomCred	0,3206	0,1728	0,5691	0,2641	0,2593	-0,2041	**0,8169**	1,0000		
GDPg	-0,2287	-0,1595	-0,2678	0,3679	-0,3332	0,1683	0,1539	0,0447	1,0000	
Urbanization	0,6304	0,0849	0,6468	0,0420	0,2031	-0,189	0,2403	0,3049	-0,3591	1,0000
HumanCap	**0,7884**	0,0335	**0,8761**	0,2051	0,1432	-0,0005	0,4763	0,5057	-0,2287	0,6937
Aid	-0,4379	0,2639	-0,4331	-0,1745	0,2524	0,0454	-0,4816	-0,3943	-0,1854	-0,3416
PolCorrupt	0,5117	0,0851	0,6619	0,2324	0,4032	-0,0671	0,3643	0,4703	-0,1008	0,5770
PolRegulat~y	0,5637	0,0449	0,6706	0,1006	0,2236	-0,0503	0,3059	0,5005	-0,0704	0,5079
PolStability	0,2116	0,3432	0,3864	0,0991	0,3988	-0,0289	0,1882	0,2714	-0,1325	0,3694
PolRuleofLaw	0,3996	0,0936	0,5396	0,2316	0,2945	0,0383	0,3634	0,4756	0,0369	0,3571
NaturalRes~e	0,0838	-0,0056	-0,1194	0,0642	-0,1340	0,1525	-0,1321	-0,2266	-0,0789	0,2108
Taxes	0,1099	0,1288	0,0946	-0,0602	0,0617	0,0696	0,1387	0,2479	-0,1145	-0,0566
Tariffs	-0,4786	-0,1208	-0,5394	0,0620	0,0890	-0,0102	-0,1725	-0,3211	-0,0137	-0,2486

	HumanCap	Aid	PolCor~t	PolReg~y	PolSta~y	PolRul~w	Natura~e	Taxes	Tariffs
HumanCap	1,0000								
Aid	-0,4397	1,0000							
PolCorrupt	0,6491	-0,1149	1,0000						
PolRegulat~y	0,6126	-0,2686	**0,8357**	1,0000					
PolStability	0,3372	0,1928	**0,7829**	0,5788	1,0000				
PolRuleofLaw	0,5407	-0,1022	**0,9196**	**0,8247**	**0,7430**	1,0000			
NaturalRes~e	0,0082	-0,0997	-0,2755	-0,3587	-0,412	-0,3466	1,0000		
Taxes	0,0680	-0,2935	0,0355	0,2305	-0,1202	0,0985	-0,0244	1,0000	
Tariffs	-0,4176	0,2999	-0,3088	-0,6150	-0,2351	-0,2760	0,2596	-0,3413	1,0000

Comment: the possibility for multicollinearity is highly present for correlation values > 0.8, and we have therefore highlighted values > 0.7.

Variable	VIF	1/VIF
PolCorrupt	21,02	0,047583
PolRuleofLaw	16,09	0,062164
PolRegulat~y	12,22	0,08182
InfraTel	11,52	0,086773
HumanCap	9,97	0,100309
PolStability	7,52	0,132934
FinDepth	7,51	0,133101
Urbanization	5,4	0,185135
Tariffs	5,35	0,187014
DomCred	5,12	0,195367
Return	4,35	0,229738
Aid	3,46	0,288745
GDPg	3,1	0,322129
NaturalRes~e	2,64	0,378319
Taxes	2,22	0,451406
Trade	2,19	0,457474
Inflation	2,17	0,46065
GovSize	2,15	0,46588
InfraGross~p	1,96	0,510517
Mean VIF	6,63	

Variable	VIF	1/VIF
DomCred	1,54	0,650305
Urbanization	1,44	0,695882
SSA	1,41	0,707254
Trade	1,22	0,820486
GDPg	1,16	0,864766
GovSize	1,12	0,894973
Mean VIF	1,31	

Appendix D: *Additional analyses*

Natural logarithm of FDI inflow:

Variable	Result
β_0	*17.30*** (0.000)*
Trade	-0.004** (0.024)
SSA Dummy	-0.788*** (0.000)
GDP Growth	0.225*** (0.000)
Financial Depth (Domestic Credit to Private Sector)	0.017*** (0.000)
Urbanization	0.037*** (0.000)
Infrastructure	0.021* (0.061)
Adjusted R^2	0.49
Number of observations	326

P-values are in parentheses *Significance at 10% **Significance at 5% ***Significance at 1%

This analysis of *Model 2* concerns the dependent variable – FDI inflow. Although standard in the literature, the ratio of net inflows of FDI to GDP is in some research replaced by the natural logarithm of FDI inflows (Dellis et al., 2017). The FDI to GDP ratio is created to control for the size of the host economy and to alleviate possible problems of endogeneity. Despite the popularity of using this ratio as the dependent variable, it is not without controversy to use ratios in general (Wiseman, 2009). Kronmal (1992) further argues that ratios in regression analyses should be avoided. In line with this, we estimate a linear panel regression on the countries and variables used in the prior analysis' with the natural logarithm of FDI inflows as the dependent variable. However, the results are suspiciously significant and both *Trade* and *SSA* have different signs as in the other analyses, where these variables are among the most robust findings.

Analysis including the OECD countries:

Variable	*Model 1*	*Model 2*
β_0	*3.196* *(0.277)*	*-5.550*** *(0.002)*
Trade	0.101*** (0.000)	0.098*** (0.000)
Return	0.800** (0.016)	
GDP growth		0.121* (0.064)
Financial Depth		0.007 (0.416)
Urbanization		0.028 (0.198)
Infrastructure	0.173 (0.530)	-0.139 (0.454)
SSA dummy	-1.502 (0.166)	1.774* (0.086)
Adjusted R^2	**0.17**	**0.17**
Number of observations	1536	1414

P-values are in parentheses *Significance at 10% **Significance at 5% ***Significance at 1%

The adjusted R^2 is the reason why we decided not to include the OECD member countries in the analyses included in the discussion. Note, however, the positive and significant SSA dummy for *Model 2*. Possible reasons for the low R^2 is mentioned in section 3.

Appendix E: *Regression output from Asiedu (2002)*

Variable	1	2	3	4	5
β_0	*4.32 (0.146)*	*6.188*** (0.000)*	*6.523** (0.047)*	*13.098** (0.013)*	*12.252*** (0.002)*
Trade	0.030*** (0.000)	0.032*** (0.000)	0.032*** (0.000)	0.033*** (0.000)	0.035*** (0.000)
Return	0.906* (0.056)	0.997** (0.026)	1.112** (0.032)	2.220*** (0.007)	2.107*** (0.007)
Infrastructure	0.837*** (0.002)	0.574** (0.032)	0.623* (0.052)	1.399*** (0.001)	1.345*** (0.000)
SSA Dummy		-1.342*** (0.002)	-1.415*** (0.001)	-1.451*** (0.001)	-1.523*** (0.000)
GDP Growth			0.004 (0.966)		
Government Consumption			0.027 (0.562)		
Inflation			0.000 (0.629)		
Financial Depth (Broad money)			0.002 (0.862)		
Political Instability			-0.022 (0.972)		
SSA * Trade				-0.005 (0.615)	-0.003 (0.742)
SSA * Return				-1.800* (0.059)	-1.611** (0.027)
SSA * Infrastructure				-1.374** (0.014)	1.384*** (0.001)
Adjusted R^2	0.60	0.65	0.62	0.71	0.57
Number of observations	71	71	68	71	211

P-values are in parentheses *Significance at 10% **Significance at 5% ***Significance at 1%

Appendix F: *Comparison of averages and percentage changes for selected variables of interest*

1988-1997	**GDP (current US$)**	**FDI net inflow (current US$)**	**Inflation**	**Trade**	**Fixed Telephone**
SSA	9 490 094 240	82 631 677	16,28	60,61	1,32
Non-SSA	88 125 665 365	1 653 867 728	14,29	70,47	7,25
2003-2017					
SSA	39 438 216 162	1 040 237 762	5,86	72,22	2,73
Non-SSA	517 139 129 817	14 015 578 912	6,91	78,11	14,36
% change from 1988-1997					
SSA	315,57 %	1158,88 %	-64,01 %	19,15 %	107,55 %
Non-SSA	486,82 %	747,44 %	-51,62 %	10,84 %	98,15 %

Source: Calculations based on data from World Bank's World Development Indicators.

Appendix G: *Codes from STATA*

```
* Merged script for use in Appendix

*** Model 1 ***

*** Replication 1988-1997 ***

import excel "/Users/Sondre/Dropbox/Skole/MASTER/Data/Asiedu_replication_v01.xlsx", sheet("10 YR AVG") firstrow

rename Foreigndirectinvestmentneti FDI
rename TradeofGDP Trade
rename GDPgrowthannual GDPG
rename Inflationconsumerpricesannu Inflation
rename Generalgovernmentfinalconsump GovCons
rename BroadmoneyGDP FinDepth
rename OfficialexchangerateLCUper ExchangeRate
rename Schoolenrollmentsecondary HumanCapital
rename Urbanpopulationoftotal UrbPop
rename Domesticcredittoprivatesecto DomCredit

* First specification

regress FDI Trade Return InfraBRUK

* Second specification

regress FDI Trade Return InfraBRUK SSA

* Third specification

regress FDI Trade Return InfraBRUK SSA GDPG Inflation GovCons FinDepth

* Fourth specification

generate OpenAfrica = Trade * SSA
generate InfracAfrica = InfraBRUK * SSA
generate RetAfrica = Return * SSA

regress FDI Trade InfraBRUK Return SSA OpenAfrica InfracAfrica RetAfrica

* Fifth specification

clear all

import excel "/Users/Sondre/Dropbox/Skole/MASTER/Data/Asiedu_replication_v01.xlsx", sheet("Subperiod") firstrow

rename Foreigndirectinvestmentneti FDI
```

```
47  rename TradeofGDP Trade
48
49  generate OPENAFR = (Trade * SSA)
50  generate INFRAAFR = (Infrastructure * SSA)
51  generate RETAFR = (Return * SSA)
52
53  reghdfe FDI Trade Return Infrastructure SSA OPENAFR INFRAAFR
    RETAFR, noabsorb
54
55  *** Exact replication 2003-2017 ***
56  clear all
57
58  import excel
    "/Users/Sondre/Dropbox/Skole/MASTER/Data/Updated_variables_2003_20
    17.xlsx", sheet ("15 YR AVG") firstrow
59
60  rename Foreigndirectinvestmentneti FDI
61  generate Return = ln(1/GDPpercapitacurrentUS)
62  generate GDPcap = ln(GDPpercapitacurrentUS)
63  rename TradeofGDP Trade
64  rename Generalgovernmentfinalconsump GovSize
65  rename BroadmoneyGDP FinDepth
66  rename Inflationconsumerpricesannu Inflation
67  rename GDPgrowthannual GDPg
68  rename Domesticcredittoprivatesecto DomCred
69
70  rename Urbanpopulationoftotal Urbanization
71  rename Schoolenrollmentsecondary HumanCap
72  rename LnODA Aid
73  rename Taxesonincomeprofitsandcap Taxes
74  rename Tariffrateappliedsimplemea Tariffs
75  rename ControlofCorruptionPercentil PolCorrupt
76  rename RegulatoryQualityPercentileR PolRegulatory
77  rename RuleofLawPercentileRank PolRuleofLaw
78  rename PoliticalStabilityandAbsence PolStability
79
80  rename GrosscapitalformationofGD InfraGrossCap
81  rename LnMoblePhone InfraMob
82  rename LnFixedPhone InfraTel
83
84  * First specification
85
86  regress FDI Trade Return InfraTel
87
88  * Second specification
89
90  regress FDI Trade Return InfraTel SSA
91
92  * Third specification
93
94  regress FDI Trade Return InfraTel SSA GDPg GovSize Inflation
    FinDepth
```

```
95
96  * Fourth specification
97
98  generate TradeSSA = Trade * SSA
99  generate ReturnSSA = Return * SSA
100 generate GDPcapSSA = GDPcap * SSA
101 generate InfraTelSSA = InfraTel * SSA
102 generate InfraGrossCapSSA = InfraGrossCap * SSA
103
104 regress FDI Trade InfraTel Return SSA TradeSSA ReturnSSA
    InfraTelSSA
105
106 * Fifth specification
107
108 clear all
109
110 import excel
    "/Users/Sondre/Dropbox/Skole/MASTER/Data/Updated_variables_2003_20
    17.xlsx", sheet("Sub") firstrow
111
112 rename Foreigndirectinvestmentneti FDI
113 gen Return = ln(1/GDPpercapitacurrentUS)
114 generate GDPcap = ln(GDPpercapitacurrentUS)
115 rename TradeofGDP Trade
116 rename Generalgovernmentfinalconsump GovSize
117 rename BroadmoneyofGDP FinDepth
118 rename Inflationconsumerpricesannu Inflation
119 rename GDPgrowthannual GDPg
120 rename Domesticcredittoprivatesecto DomCred
121
122 rename Urbanpopulationoftotal Urbanization
123 rename Schoolenrollmentsecondary HumanCap
124 rename LnODA Aid
125 rename Taxesonincomeprofitsandcap Taxes
126 rename Tariffrateappliedsimplemea Tariffs
127 rename ControlofCorruptionPercentil PolCorrupt
128 rename RegulatoryQualityPercentileR PolRegulatory
129 rename RuleofLawPercentileRank PolRuleofLaw
130 rename PoliticalStabilityandAbsence PolStability
131
132 rename GrosscapitalformationofGD InfraGrossCap
133 rename LnMobilePhone InfraMob
134 rename LnFixedPhone InfraTel
135
136 generate OPENAFR = (Trade * SSA)
137 generate INFRAAFR = (InfraTel * SSA)
138 generate RETAFR = (Return * SSA)
139
140 reghdfe FDI Trade Return InfraTel SSA OPENAFR INFRAAFR RETAFR,
    noabsorb
141
142
```

```
*** Replication 2003-2017 with adjusted variables ***
clear all

import excel "/Users/Sondre/Dropbox/Skole/MASTER/Data/Updated_variables_2003_2017.xlsx", sheet ("15 YR AVG") firstrow

rename Foreigndirectinvestmentneti FDI
generate Return = ln(1/GDPpercapitacurrentUS)
generate GDPcap = ln(GDPpercapitacurrentUS)
rename TradeofGDP Trade
rename Generalgovernmentfinalconsump GovSize
rename BroadmoneyGDP FinDepth
rename Inflationconsumerpricesannu Inflation
rename GDPgrowthannual GDPg
rename Domesticcredittoprivatesecto DomCred

rename Urbanpopulationoftotal Urbanization
rename Schoolenrollmentsecondary HumanCap
rename LnODA Aid
rename Taxesonincomeprofitsandcap Taxes
rename Tariffrateappliedsimplemea Tariffs
rename ControlofCorruptionPercentil PolCorrupt
rename RegulatoryQualityPercentileR PolRegulatory
rename RuleofLawPercentileRank PolRuleofLaw
rename PoliticalStabilityandAbsence PolStability

rename GrosscapitalformationofGD InfraGrossCap
rename LnMoblePhone InfraMob
rename LnFixedPhone InfraTel

* First specification

regress FDI Trade Return InfraGrossCap

* Second specification

regress FDI Trade Return InfraGrossCap SSA

* Third specification

regress FDI Trade Return InfraGrossCap SSA GDPg GovSize Inflation FinDepth

* Fourth specification

generate TradeSSA = Trade * SSA
generate ReturnSSA = Return * SSA
generate GDPcapSSA = GDPcap * SSA
generate InfraTelSSA = InfraTel * SSA
generate InfraGrossCapSSA = InfraGrossCap * SSA

```

```
regress FDI Trade InfraGrossCap Return SSA TradeSSA ReturnSSA
InfraGrossCapSSA

* Fifth specification

clear all

import excel
"/Users/Sondre/Dropbox/Skole/MASTER/Data/Updated_variables_2003_20
17.xlsx", sheet("Sub") firstrow

rename Foreigndirectinvestmentneti FDI
gen Return = ln(1/GDPpercapitacurrentUS)
generate GDPcap = ln(GDPpercapitacurrentUS)
rename TradeofGDP Trade
rename Generalgovernmentfinalconsump GovSize
rename BroadmoneyofGDP FinDepth
rename Inflationconsumerpricesannu Inflation
rename GDPgrowthannual GDPg
rename Domesticcredittoprivatesecto DomCred

rename Urbanpopulationoftotal Urbanization
rename Schoolenrollmentsecondary HumanCap
rename LnODA Aid
rename Taxesonincomeprofitsandcap Taxes
rename Tariffrateappliedsimplemea Tariffs
rename ControlofCorruptionPercentil PolCorrupt
rename RegulatoryQualityPercentileR PolRegulatory
rename RuleofLawPercentileRank PolRuleofLaw
rename PoliticalStabilityandAbsence PolStability

rename GrosscapitalformationofGD InfraGrossCap
rename LnMobilePhone InfraMob
rename LnFixedPhone InfraTel

generate OPENAFR = (Trade * SSA)
generate INFRAAFR = (InfraTel * SSA)
generate RETAFR = (Return * SSA)

generate adjOPENAFR = (Trade * SSA)
generate adjINFRAAFR = (InfraGrossCap * SSA)
generate adjGDPcapAFR = (GDPcap * SSA)

reghdfe FDI Trade Return InfraGrossCap SSA adjOPENAFR adjINFRAAFR
 RETAFR, noabsorb

*** MODEL 2 ***

clear all

import excel
"/Users/Hed/Dropbox/Data/Updated_variables_2003_2017.xlsx", sheet
```

```
("15 YR AVG") firstrow clear


rename Foreigndirectinvestmentneti FDI
generate Return = ln(1/GDPpercapitacurrentUS)
generate GDPcap = ln(GDPpercapitacurrentUS)
rename TradeofGDP Trade
rename Generalgovernmentfinalconsump GovSize
rename BroadmoneyGDP FinDepth
rename Inflationconsumerpricesannu Inflation
rename GDPgrowthannual GDPg
rename Domesticcredittoprivatesecto DomCred

rename Urbanpopulationoftotal Urbanization
rename Schoolenrollmentsecondary HumanCap
rename Taxesonincomeprofitsandcap Taxes
rename Tariffrateappliedsimplemea Tariffs
rename ControlofCorruptionPercentil PolCorrupt
rename RegulatoryQualityPercentileR PolRegulatory
rename RuleofLawPercentileRank PolRuleofLaw
rename PoliticalStabilityandAbsence PolStability
rename LnODA Aid
rename GrosscapitalformationofGD InfraGrossCap
rename LnFixedPhone InfraTel
rename Fuelexportsofmerchandisee NaturalResource

global ylist FDI
global xlist GDPcap Trade InfraTel InfraGrossCap GovSize
Inflation FinDepth DomCred GDPg Urbanization HumanCap Aid
PolCorrupt PolRegulatory PolStability PolRuleofLaw
NaturalResource Taxes Tariffs
corr $xlist
reg $ylist $xlist
vif

* After many tests we ended up with these variables in Model 2:

* First specification, Model 2

regress FDI Trade GDPg GovSize DomCred Urbanization
*R2 at 0.5

regress FDI Trade SSA GDPg GovSize DomCred Urbanization
vif
*R2 at 0.54

*F test
di (412.096478-370.207068)/1
*41.88941
di 370.207068 / 61
*6.0689683
di 41.88941/6.0689683
```

```
*6.9022292
di Ftail(1,61,6.9022292)
* p-value: 0.01087275
*Model has better explanatory power with SSA dummy

* Second specification, Model 2

regress FDI Trade SSA GDPg DomCred Urbanization InfraGrossCap PolCorrupt Inflation Tariffs

* Third specification, Model 2

generate SSATrade = SSA * Trade
generate SSAGDPg = SSA * GDPg
generate SSADomCred = SSA * DomCred
generate SSAUrb = SSA * Urbanization
generate SSAInfra = SSA * InfraGrossCap

regress FDI Trade SSA GDPg DomCred Urbanization InfraGrossCap SSATrade SSAGDPg SSADomCred SSAUrb SSAInfra

*** Robustness test of Model 2 against panel data ***

clear all

import excel "/Users/Hed/Dropbox/Data/Updated_variables_2003_2017.xlsx", sheet ("Sub") firstrow

rename Foreigndirectinvestmentneti FDI
gen Return = ln(1/GDPpercapitacurrentUS)
generate GDPcap = ln(GDPpercapitacurrentUS)
rename TradeofGDP Trade
rename Generalgovernmentfinalconsump GovSize
rename BroadmoneyofGDP FinDepth
rename Inflationconsumerpricesannu Inflation
rename GDPgrowthannual GDPg
rename Domesticcredittoprivatesecto DomCred

rename Urbanpopulationoftotal Urbanization
rename Schoolenrollmentsecondary HumanCap
rename LnODA Aid
rename Taxesonincomeprofitsandcap Taxes
rename Tariffrateappliedsimplemea Tariffs
rename ControlofCorruptionPercentil PolCorrupt
rename RegulatoryQualityPercentileR PolRegulatory
rename RuleofLawPercentileRank PolRuleofLaw
rename PoliticalStabilityandAbsence PolStability

rename GrosscapitalformationofGD InfraGrossCap
rename LnMobilePhone InfraMob
rename LnFixedPhone InfraTel
```

```
335
336 generate SSATrade = SSA * Trade
337 generate SSAGDPg = SSA * GDPg
338 generate SSADomCred = SSA * DomCred
339 generate SSAUrb = SSA * Urbanization
340 generate SSAInfra = SSA * InfraGrossCap
341
342 * Subperiod, Model 2
343
344 reghdfe FDI Trade SSA GDPg DomCred Urbanization InfraGrossCap,
    absorb(SUBPERIOD)
345
346 * Subperiod with interactive terms, Model 2
347
348 reghdfe FDI Trade SSA GDPg DomCred Urbanization InfraGrossCap
    SSATrade SSAGDPg SSADomCred SSAUrb SSAInfra, absorb(SUBPERIOD)
349
350 *** Panel data including Agglomeration (w/o subperiods) ***
351
352 clear all
353
354 import excel
    "/Users/Hed/Dropbox/Data/Updated_variables_2003_2017.xlsx", sheet
    ("PanelSorted") firstrow clear
355
356
357 rename Foreigndirectinvestmentneti FDI
358 gen Return = ln(1/GDPpercapitacurrentUS)
359 generate GDPcap = ln(GDPpercapitacurrentUS)
360 rename TradeofGDP Trade
361 rename Generalgovernmentfinalconsump GovSize
362 rename Inflationconsumerpricesannu Inflation
363 rename GDPgrowthannual GDPg
364 rename Domesticcredittoprivatesecto DomCred
365
366 rename Urbanpopulationoftotal Urbanization
367 rename Schoolenrollmentsecondary HumanCap
368 rename Taxesonincomeprofitsandcap Taxes
369 rename Tariffrateappliedsimplemea Tariffs
370 rename ControlofCorruptionPercentil PolCorrupt
371 rename RegulatoryQualityPercentileR PolRegulatory
372 rename RuleofLawPercentileRank PolRuleofLaw
373
374 rename GrosscapitalformationofGD InfraGrossCap
375
376 egen CountryNum = group(Country)
377 xtset CountryNum Year, yearly
378 global id CountryNum
379 global t Year
380 sort $id $t
381 xtset $id $t, yearly
382 global ylist FDI
```

```
383
384 gen FDI_lead = FDI[_n+1] if Country==Country[_n+1]
385 gen FDI_lag = FDI[_n-1] if Country==Country[_n-1]
386
387 generate SSATrade = SSA * Trade
388 generate SSAGDPg = SSA * GDPg
389 generate SSADomCred = SSA * DomCred
390 generate SSAUrb = SSA * Urbanization
391 generate SSAInfra = SSA * InfraGrossCap
392 generate SSAGDPcap = SSA*GDPcap
393
394 global xlist Trade SSA GDPg DomCred Urbanization InfraGrossCap
    FDI_lag
395 xtreg $ylist $xlist, re
396
397 *** Updated list of developing countries ***
398
399 clear all
400
401 import excel "/Users/Hed/Dropbox/Data/SubPeriods_Full_SSADevOECD
    v02.xlsx", sheet("15 YR AVG x OECD") cellrange(A1:AI83) firstrow
    clear
402
403
404 rename Foreigndirectinvestmentneti FDI
405 gen Return = ln(1/GDPpercapitacurrentUS)
406 generate GDPcap = ln(GDPpercapitacurrentUS)
407 rename TradeofGDP Trade
408 rename Generalgovernmentfinalconsump GovSize
409 rename Inflationconsumerpricesannu Inflation
410 rename GDPgrowthannual GDPg
411 rename Domesticcredittoprivatesecto DomCred
412
413 rename Urbanpopulationoftotal Urbanization
414 rename Schoolenrollmentsecondary HumanCap
415 rename Taxesonincomeprofitsandcap Taxes
416 rename Tariffrateappliedsimplemea Tariffs
417 rename ControlofCorruptionPercentil PolCorrupt
418 rename RegulatoryQualityPercentileR PolRegulatory
419 rename RuleofLawPercentileRank PolRuleofLaw
420 rename PoliticalStabilityandAbsence PolStability
421
422 rename GrosscapitalformationofGD InfraGrossCap
423
424 * Model 1
425
426 regress FDI Trade Return InfraGrossCap SSA
427
428 * Model 2
429
430 regress FDI Trade SSA GDPg DomCred Urbanization InfraGrossCap
431
```

```
* Combined Model

regress FDI Trade Return InfraGrossCap Urbanization SSA

*** Aditional tests ***

clear all

* Natural logarithm of FDI inflow

import excel "/Users/Sondre/Dropbox/Skole/MASTER/Data/Updated_variables_2003_2017.xlsx", sheet("Sub") firstrow


rename Foreigndirectinvestmentneti FDI
gen Return = ln(1/GDPpercapitacurrentUS)
generate GDPcap = ln(GDPpercapitacurrentUS)
rename TradeofGDP Trade
rename Generalgovernmentfinalconsump GovSize
rename BroadmoneyofGDP FinDepth
rename Inflationconsumerpricesannu Inflation
rename GDPgrowthannual GDPg
rename Domesticcredittoprivatesecto DomCred

rename Urbanpopulationoftotal Urbanization
rename Schoolenrollmentsecondary HumanCap
rename LnODA Aid
rename Taxesonincomeprofitsandcap Taxes
rename Tariffrateappliedsimplemea Tariffs
rename ControlofCorruptionPercentil PolCorrupt
rename RegulatoryQualityPercentileR PolRegulatory
rename RuleofLawPercentileRank PolRuleofLaw
rename PoliticalStabilityandAbsence PolStability

rename GrosscapitalformationofGD InfraGrossCap
rename LnMobilePhone InfraMob
rename LnFixedPhone InfraTel

reghdfe LnFDI Trade SSA GDPg DomCred Urbanization InfraGrossCap, absorb(SUBPERIOD)

* Regression including OECD member countries

clear all

import excel "/Users/Hed/Dropbox/Data/Paneldata_ALL_v01.xlsx", sheet("Ark1") firstrow clear

rename Foreigndirectinvestmentneti FDI
rename TradeofGDP Trade
rename GDPgrowthannual GDPg
```

```
rename Domesticcredittoprivatesecto DomCred
rename Urbanpopulationoftotal Urbanization

* Model 1

reghdfe FDI Trade Return Infrastructure SSA, noabsorb

* Model 2

reghdfe FDI Trade GDPg DomCred Urbanization Infrastructure SSA, noabsorb

```