UNIVERSITY
OF OSLO

Master's thesis

Attracting Chinese FDI to Sub-Saharan Africa: An Empirical Study of the Importance of Natural Resources and Institutional Quality

Jan Aleksander Sobieski

Master of Economic Theory and Econometrics

30 ECTS credits

Department of Economics

Faculty of Social Sciences

November 2022

Jan Aleksander Sobieski

Attracting Chinese FDI to Sub-Saharan Africa: An Empirical Study of the Importance of Natural Resources and Institutional Quality

Preface

This thesis concludes four and a half years of economic studies at the University of Oslo. Writing my thesis has been both a challenging and rewarding experience, and I have attained knowledge of a topic I knew little about prior to this process.

I would like to thank my supervisor, professor Halvor Mehlum, for advice and suggestions throughout the process that have been of vital importance, and have undoubtedly improved the contents of my thesis substantially.
Thanks to my parents, Sverre Hval and Matylda Sobieska, for their advice on the final draft.

I'm grateful for both general support, as well as excellent advice on economic theory and econometrics from Linn Karina Stormo, whose knowledge of these subjects far surpasses my own.

Jan Aleksander Sobieski

Oslo
November 10, 2022

Attracting Chinese FDI to Sub-Saharan Africa: An Empirical Study of the Importance of Natural Resources and Institutional Quality

Jan Aleksander Sobieski

November 10, 2022

Abstract

The aim of this thesis is to evaluate the importance of natural resources, democracy and institutional quality in attracting Chinese FDI to Sub-Saharan Africa. Analysing data on Chinese investments for the period 2005-2022 in 44 Sub-Saharan African countries by probit and linear probability models, results suggest that governance effectiveness and control of corruption have a positive and significant effect, and a negative and significant effect, respectively. The results indicate that government effectiveness is important for attracting FDI, but also that Chinese FDI is not necessarily deterred by a lack of corruption and possibly attracted by those exhibiting traits of low regulatory quality. No significant results are reported at the 5% level for natural resources, hence there is little evidence to support the prevailing notion that Chinese FDI is primarily motivated by a quest for natural resources. My findings suggest that measures to increase government effectiveness can increase FDI inflows from China to SSA, but also that such investments should be transparent and subject to scrutiny, in order to prevent exploitation of countries also facing challenges related to corruption and weak regulatory quality.

Table of Contents

List of Figures

List of Tables

Chapter 1

Introduction

There has long been a common notion that Chinese foreign direct investments (FDI) in Sub-Saharan Africa (SSA) are primarily driven by a quest for natural resources, leading to exploitation of the host countries. Researching the existing literature, the findings are inconclusive with some presenting evidence that investment decisions are not primarily driven by a natural resource quest, if at all (Shan, Lin, Li, & Zeng, 2018; Y. Chen, Zhai, & Zhang, 2020), with others finding the relationship between natural resources and FDI inflows to be negative, as a result of the resource curse which leads to an unstable environment, less favourable for FDI (Asiedu, 2013). Several others show a significant effect of natural resource abundance in attracting Chinese FDI (W. Chen, Dollar, & Tang, 2016; Asiedu, 2006; Sanfilippo, 2010), and many also find institutional qualities to be a key determinant (Asiedu, 2006; Asiedu & Lien, 2011; Adegboye, Osabohien, Olokoyo, Matthew, & Adediran, 2020; Kolstad & Wiig, 2012). However, the role of institutional quality also remains ambiguous, with some studies showing that a higher institutional quality increases Chinese FDI (Asiedu, 2006), while others find no significant effects (Shan et al., 2018; Cleeve, 2012; Cheung & Qian, 2009). A higher level of corruption increases FDI flows from China when also abundant in natural resources according to Gossel (2018), while findings that less corruption increases Chinese FDI are also reported (Asiedu, 2006; Makonda & Ngakala, 2021).

If a natural resource quest is the primary motivation for China's investments, then countries that are relatively poor in natural resources will struggle to attract FDI due to an uncontrollable factor (Asiedu, 2006). If Chinese FDI is attracted by higher institutional quality, this gives reason for a more positive outlook, if the aim is to increase FDI inflows, as improving institutions is a possibility through strengthened governance and policy reforms. On the contrary, if actively seeking out those countries that have a lower quality of institutions, are less democratic and more corrupt is a staple of Chinese FDI in SSA, then this could have implications for how actively these investments should be monitored and to what extent they should be subject to scrutiny by the international community. This is also remi-

niscent of the resource curse, in which poor institutions lead to more conflicts and lower economic growth in those countries that are abundant in natural resources (Mehlum, Moene, & Torvik, 2006; Torvik, 2009). Exploitation of Sub-Saharan African countries with already weak institutions can potentially have long-lasting ramifications, further tampering economic growth in one of the least developed regions of the world.

1.1 Research Question

In this thesis the importance of natural resources and quality of institutions for attracting Chinese FDI to Sub-Saharan African countries is evaluated. Using cross-sectional data on Chinese investments for the period 2005-2022 in 44 Sub-Saharan African countries, effects of natural resources and indicators of institutional quality on FDI inflows are examined by various probit and linear probability models. Drawing on similarities to discriminatory analysis which will be explained in chapter 5, the primary aim of this thesis is to assess the importance of the aforementioned variables, and not to determine any causal relationships.

Investigating this is relevant for several reasons, as China's presence in SSA can have dire consequences as previously explained, if due to reasons of resource seeking and exploitation. If such concerns are not valid or justified, and increased inflow of FDI from China is a desired outcome and a source of economic growth, then establishing the primary drivers of FDI inflows would be of interest to all of SSA. Already having become an established international actor, China's economic endeavours are naturally also of great interest to other countries, for reasons related to international trade, human rights, environmental concerns as well as military aspects and strategic long-term developments. Establishing what variables, if any, are suitable for forecasting Chinese FDI in the SSA region, could therefore be a valuable insight across fields and industries.

Although there is naturally a significant degree of politics involved in China's investments decisions, and significant controversies with regards to human rights in China, these subjects are outside the scope of this thesis, and will not be elaborated upon to any significant extent. Natural resources and quality of institutions and their role in attracting Chinese FDI is the primary focus, while political motives or long-term planning from a Chinese perspective will mostly not be elaborated upon. Hence, no detailed analysis or discussion with regards to neither domestic nor international politics will be presented, other than brief explanations where required or deemed appropriate.

1.2 Outline

The second chapter gives a brief introduction to Chinese economic history and development, briefly describing China's standing and ambitions in terms of trade and international investments. An overview of SSA and the various resources that make it potentially attractive destination for FDI is also presented. Existing theory and results on the potential benefits and issues related to FDI, and the role of natural resources and quality of institutions in attracting FDI, will be presented in the third chapter with emphasis on Chinese FDI inflows to SSA. An overview of the data analysed in the thesis, as well as definitions of variables will be presented in the fourth chapter. The method is presented in the fifth chapter, in which the driving forces behind China's investments in SSA will be estimated, focusing on natural resources and various measures of the quality of institutions. Probit and linear probability models will be used, as well as variations of these in form of stepwise and subset regressions. Obtained results are summarized in chapter six. Drawing on existing findings in the literature, a discussion of how the results coincide or differ from previous work in the field will be discussed in chapter seven, in particular the possible reasons for differences in the results. The conclusion is presented in the eighth and final chapter.

The thesis is written in LaTeX, and all regressions are done in R. All figures are also produced in R, unless otherwise noted.

Chapter 2

Background

2.1 Overview of Chinese Economic Development

Decades of unprecedented economic growth have established China as one of the world's foremost economic powers. Partly due to its role as an international trading partner, as goods produced in China are exported to nearly all regions of the world. With total exports for 2021 exceeding $3.5 trillion (World Bank, 2022a) and a GDP surpassing $17 trillion, second only to that of the US (World Bank, 2022b), China has firmly established itself as an economic force to be reckoned with.

Emerging from one the most devastating famines in recorded human history as a result of "The Great Leap Forward", China sought to rebuild and reposition itself as one of the leading nations in terms of growth and prosperity. In 1978 a new era began, as what came to be known in the West as the opening of China was initiated. The following decades transformed China from a closed socialist state to what is now one of the pillars of the global economy, through various reforms that enabled the establishment of businesses and implementation of trade on a large international scale.

Estimates vary both in magnitude and in credibility, with official numbers claiming an average annual growth rate in GDP of 9.5% for the 40-year period from 1978 to 2018, in line with The World Bank estimates of almost 10 %. Others find that growth has been lower, estimating a growth rate of 8.5% (Wu & Li, 2021) and 8%(The Economist Intelligence Unit, 2021). None the less, China has undergone an astonishing economic transition, unparalleled in modern times.

2.2 Belt-and-Road Initiative

Going back 2,000 years, China was connected to the West by an extensive network of trade routes which came to be known as Silk Road. Silk was exported to the West, while the East received gold and silver in return. Established by the Han Dynasty in 130 B.C., the Silk Road routes remained in use until 1453 A.D. Now, nearly 600 years later, a modern form of Silk Road is in the making. Known as the Belt & Road Initiative(BRI), it is a strategy initiated by China in 2013 with the aim of establishing passages from China to the rest of Asia, Europe, the Middle East and Africa. This was to be implemented both by land and sea, known respectively as the Silk Road Economic Belt and the Maritime Silk Road.

According to Huang (2016), China's decision to establish the Belt & Road Initiative was probably triggered by several factors. China needs to find new ways to reignite economic growth which has slowed down in recent years, and must do so through adjusting both domestic and international economic models. In addition, due to having become a major emerging power, China faces more pressure in terms of taking greater responsibilities in the international economic system. So far conventional policy doctrines have not been very successful in the developing world, but if BRI lives up to its potential it could greatly increase living standards for 64% of the world population which resides in this region, as well as becoming part of the global supply chain.

While infrastructure development is a central part of the BRI, the aims are complex and not only related to facilitating economic growth in China or in the involved nations. The five main priorities are policy dialogue, infrastructure connectivity, unimpeded trade, financial support and people-to-people exchange (European Bank for Reconstruction and Development, 2020). While 64 economies were involved from the beginning, 146 (out of which 43 are located in SSA) countries and 32 international organizations had signed cooperation agreements for the BRI as of March, 2022.

2.3 Sub-Saharan Africa (SSA)

As one of the poorest regions of the world, SSA[1] economies are faced with several challenges such as authoritarian regimes, corruption and natural disasters. Largely dependent on a few commodities, countries in SSA suffer from a lack of diversification in terms of production, exports as well as revenue (Michałowski, 2012). Poor infrastructure in the power sector leads to comparably little power being generated, and underdeveloped road infrastructure increases costs of transportation, which in turn increases costs of doing business and hampers trade.

From large oil fields in Angola, copper and cobalt mines in Congo, to Botswana with both the largest and most valuable diamond mines, it is no wonder that an impression of a region rich in natural resources has been established. And although there is no denying the formidable resource, SSA might not be as resource wealthy as once thought. According to Izvorski, Coulibaly, and Doumbia (2018), "Africa is indeed rich in natural resources, but its resource wealth is one of the lowest among the world's developing regions, both in aggregate and per capita terms". The report published by the World Bank Group states that SSA countries must focus on building both human capital and infrastructure, while also establishing markets and strengthen their institutions, in order to reap the benefits of the natural resources. Interestingly, the two countries in SSA that have experienced the highest economics growth are Botswana, rich in natural resources, and Mauritius which is relatively poor. Natural resources and their importance for attracting FDI, and Chinese FDI in particular, will be further examined in chapters 3.4 and 3.5, respectively.

Over the years there have been several measures aimed at development of SSA, but a major obstacle has been poor governance and dysfunctional political institutions. Significant improvements have been made, as most countries have now adapted principles of democratic governance. However, it still poses a severe challenge for economic growth in the region. The role of institutions in attracting FDI to SSA will be discussed in detail in chapter 3.4 and 3.6.

[1]The region of Sub-Saharan Africa includes: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Dem. Rep., Congo, Rep., Cote d'Ivoire, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mayotte, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe

Chapter 3

Foreign Direct Investments

The implementation of free-trade policies in the 1970s and the resulting globalization trend which followed, has paved the way for investment and trade opportunities that would previously have been impossible. Increased access to communication and technology means that corporations and governments can exchange information, transfer assets and invest more rapidly than ever before in history. Perhaps it should come as no surprise that investments across borders have surged in recent decades, as nations become increasingly intertwined.

While examining the role of natural resources and institutional quality in attracting Chinese FDI to SSA is the primary aim, an overview of why firms pursue investments abroad will be covered in this chapter. First by outlining the general theory on FDI, then the potential benefits and disadvantages of FDI will be discussed, both from the perspective of the host and source countries. As the thesis is concerned with Chinese FDI, all of the above is important, with the potential benefits for corporations in the source country demanding particular attention. Actively pursuing foreign investment opportunities must be rooted in a belief of reaping benefits, whether in the form of high yield, or motivated by a desire to gain influence for other reasons.

3.1 Theoretical Overview of FDI

Prior to the highly influential work of Hymer (1960), the theory on international capital movements which predicts that capital will move according to interest rates, was also used as a possible explanation for foreign direct investments. In his work, Hymer argued that the movement of capital in the case of FDI is motivated by the desire to gain control, and not by differences in interest rates. Corporations from countries where interest rates are high can have international investments in countries with low interest rates, the opposite of what is proposed by the theory of international capital movement. Additionally, he found empirical support for his hypothesis of direct investments occurring in relatively few sectors across the

world, and not in all sectors in relatively few countries, as would be the expected outcome if differences in interest rates were the main motivation. Later works by John Dunning refined the works by Stephen Hymer, and introduced the eclectic paradigm known as the OLI model (Dunning, 1980; Dunning, 1979; Dunning, 2000).

According to the OLI framework, the reasons for firms investing abroad can be explained by; an ownership advantage (**O**), allowing firms to compete in unfamiliar environments due to advantageous firm-specific assets ; locational attractions (**L**), of alternative countries or regions. The more immobile resources favour a presence in other locations, the more firms will choose to augment or expand their specific advantages by engaging in FDI; internalization advantages(**I**), which states that the greater the net benefits of internalizing cross-border intermediate product markets, the more likely it is that a firm will prefer to engage in foreign production itself, rather than license the right to do so.

Multinational corporations(MNC)/multinational enterprises(MNE) and their foreign based activities can be divided into four main types (Dunning, 2000)

1. That designed to satisfy a particular foreign market, or set of foreign markets, viz. *market seeking*, or demand oriented, FDI.

2. That designed to gain access to natural resources, e.g. minerals, agricultural products, unskilled labour, viz. *resource seeking*, or supply oriented FDI.

3. That designed to promote a more efficient division of labour or specialization of an existing portfolio of foreign and domestic assets by MNE, i.e. rationalized or *efficiency seeking* FDI. This type of FDI, though related to the first or second kind, is usually sequential to it.

4. That designed to protect or augment the existing O specific advantages of the investing firms and/or to reduce those of their competitors, i.e. *strategic asset seeking* FDI.

All of the above can be relevant for Chinese MNC and their reasons for investing in Sub-Saharan Africa, especially in the form of resource seeking. Having outlined the general theory on FDI and reasons for investing abroad, benefits and disadvantages from the perspective of the host country will now be discussed.

3.2 Benefits of FDI

OECD (2022) states that "FDI is a key element in international economic integration because it creates stable and long-lasting links between economies. FDI is an important channel for the transfer of technology between countries, promotes international trade through access to foreign markets, and can be an important vehicle for economic development."

According to Todaro and Smith (2012) there are several arguments in favour of FDI, mainly based on what is commonly assumed to be the determinants of economic growth. The first and most common is the role of foreign investments as a way of filling the gap between targeted or desired investment and locally mobilized savings. Todaro refers to the Harrod-Domar growth model, which claims that there is a direct relationship between a country's rate of net savings, s, and its rate of output growth, g, via the equation $g = \frac{s}{c}$, where c is the national capital-output ratio. "If the desired rate of national output growth, g, is targeted at 7% annually and the capital output ratio is 3, the needed rate of annual net saving is 21% (because $s = gc$). If the saving that can be domestically mobilized amounts to only, say, 16% of GDP, a "savings gap" equal to 5% can be said to exist" (Todaro & Smith, 2012, p. 689).

Secondly, foreign investments can be a way of filling the foreign-exchange gap, by the inflow of foreign capital. Ideally this would not alleviate only the current deficit, but also reduce the deficit over time, given that the foreign enterprise generates a net positive flow of export earnings.

A third gap FDI is said to fill is the gap between targeted governmental tax revenues and locally raised taxes. This relies on the assumption that the profits the multinational corporations (MNC) generate are taxed accordingly, which might not be the case.

The fourth argument in favour of FDI assumes that when foreign corporations set up local operations, there will be a transfer of knowledge due to management experience, knowledge of business and marketing practices as well technological skills, which the host country will adapt throughout the learning process. Transfer of human capital has been one of the main arguments for subsidizing FDI, as the spillover effects are argued to be significant. Similarly, transfer of modern machinery and equipment to capital-poor countries could have lasting ramifications and be beneficial to the receiving nations. This is consistent with findings by Borensztein, De Gregorio, and Lee (1998), who found FDI to be important for

the transfer of technology, contributing relatively more to growth than domestic investment, adding that this only holds true when the host country has human capital stock above a certain threshold.

Similar explanations of the potential benefits of FDI for the host country are addressed by Feldstein (2000), emphasizing the gain in human capital and technology that would not be possible through trade of goods and services alone. Feldstein also states that foreign investments can be either an advantage or a disadvantage for the source country, due to taxation in the host country. This can in turn be mitigated if leveraged profits are large enough and lead to net benefits for the source country. Investigating the benefits for domestic firms resulting from FDI, Görg and Greenaway (2004) concludes that there is little robust evidence to support the theory of spillover effects, suggesting more work is needed. Later research on the topic also shows varying results, but a study assessing more than 57 empirical studies finds evidence of the aforementioned positive effects, further noting that the effect is stronger in countries with underdeveloped financial systems (Havranek & Irsova, 2010).

3.3 Disadvantages of FDI

Although FDI can potentially provide the host country with several benefits, there are also several arguments for why FDI is potentially harmful (Todaro & Smith, 2012).

MNC can provide the host country with capital, but it may also lead to lower demand for input factors from domestic firms, as the foreign corporations might use products from other affiliates. There is also no guarantee that profits will be re-invested in the host country.

As previously mentioned, filling the foreign exchange gap is a potential benefit. However, even though the initial effect might be a net positive for the host nation, the importation of factors used in production and outflow of capital might lead to a reduction in the expected foreign-exchange earnings. Taxation can generate significant revenue for the host country, but Todaro and Smith argue that the amount is often considerably less than initially expected. This can be due to transfer pricing and other accounting procedures by the MNCs in order to lower the tax burden and maximize profits.

In addition to tax revenue being smaller than expected, there is no guarantee for the transfer of human capital in form of management, entrepreneurial skills and

technology from the MNC to the local firms, and their development might be inhibited if MNC dominate the local markets.

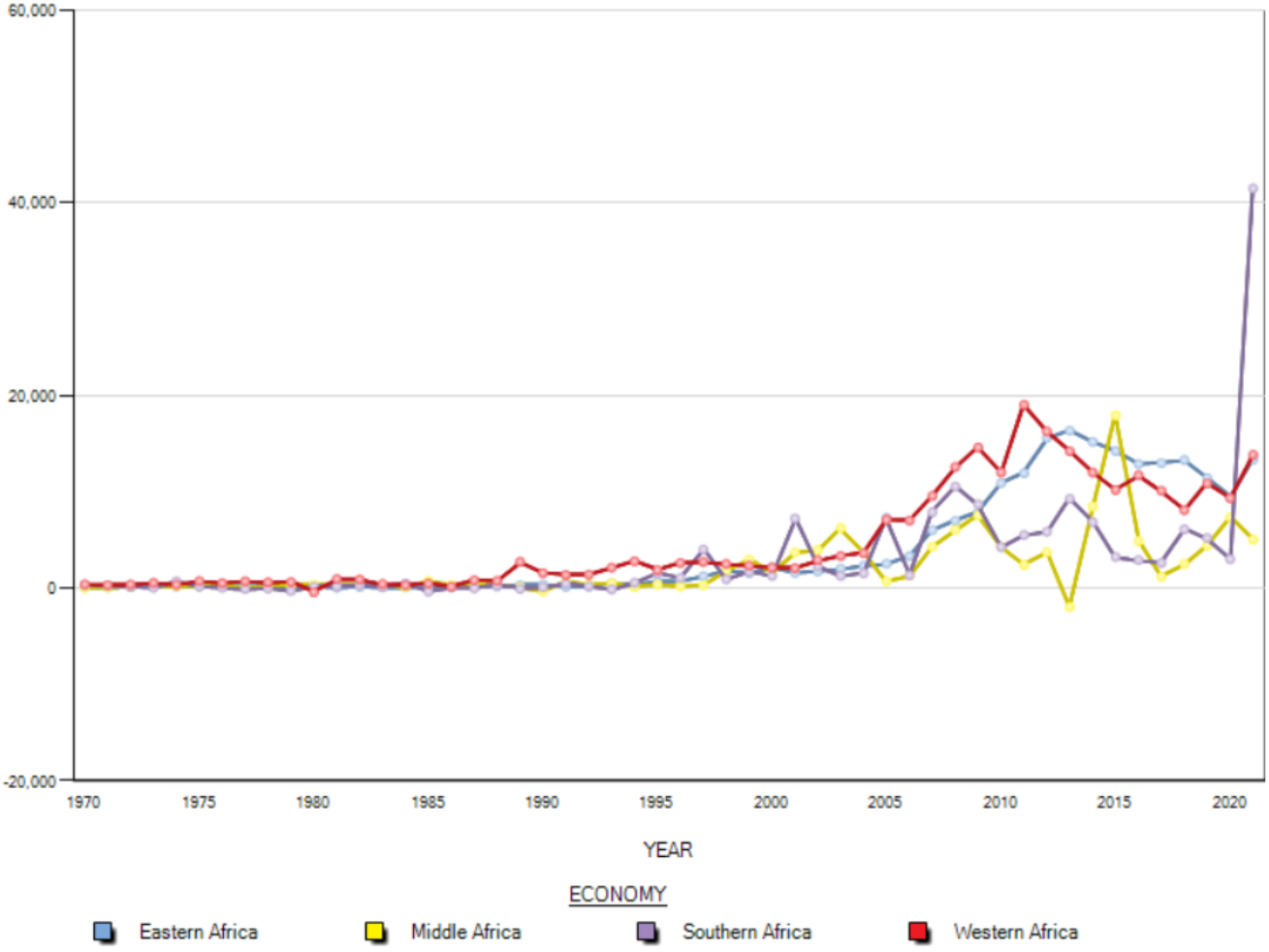
Foreign investments have also been subject to criticism due to uneven impact of development, and in many cases they reinforce existing economic structures and inequalities. A relatively small group tends to reap the benefits, such as local factory managers and modern sector workers. Resources can also be diverted away from necessities such as food production, in order to manufacture demanded goods for local elites and foreign consumers. Building on this, Todaro and Smith (2012) also claim that the major criticism of MNC is the fact that not only do they produce products that provide little benefit to the general population, but the production of goods also tends to be capital-intensive and hence does not lead to higher employment. Consequently, local resources are diverted and allocated to project that are socially undesirable, further aggravating inequalities between the urban and rural population.

FDI in SSA will be discussed next in chapter 3.4, with a recent example from Ethiopia illustrating the potential effects of FDI on economic growth. The role of Chinese FDI in particular will be covered thoroughly in chapter 3.5 and 3.6, emphasizing the role of natural resources and quality of institutions in attracting FDI.

3.4 FDI in Sub-Saharan Africa

The previous decades have seen a relatively large increase in FDI inflows to SSA, although with large fluctuations. In a recent investment report from UNCTAD (2022) a record high of $73 billion was reported for 2021, up from $29 billion in 2020 which saw investments decrease as a result of the covid pandemic. Excluding a large financial transaction in South Africa, the increased in inflow was more moderate and more in line with other developing regions.

Figure 3.1: *Global FDI flows to SSA by regions, 1970-2021 (mUSD)*



Note. Adapted from "World Investment Report 2022: International tax reforms and sustainable investment" by UNCTAD

Natural resources are regarded by many as a key factor for attracting FDI to SSA, but other findings that will be discussed in more detail later show that political stability, a well-functioning legal system and less corruption also can promote FDI (Asiedu, 2006). Democracy also appears to be a significant driving force in attracting FDI, for those countries where natural resources account for a low share of total exports. If natural resources account for the majority of total exports, the opposite seems to be true and democracy has a negative impact on FDI inflows (Asiedu & Lien, 2011). In an econometric study of 29 Sub-Saharan African countries for the period 1990-1997, Morisset (1999) found that the availability of natural resources has a positive effect on FDI inflows, with elasticities of 0.92 and 1.2 using panel and cross-sectional data, respectively.

For the period 1996-2019, Makonda and Ngakala (2021) finds that forest resources have a beneficial but negligible effect on FDI inflows in SSA, while oil and mining, have significant and negligible adverse effects on FDI inflows to Central Africa and West Africa, respectively. Political instability, civil wars and the corruption generated by their exploitation can be potential causes for this result, according to the authors. In contrast, oil and mining have significant and negligible positive effects on FDI inflows in Southern Africa and East Africa, respectively. Explaining this result, Makonda and Ngakala (2021) highlights the relative political stability and progress in the fight against corruption in Southern Africa compared to East Africa. When FDI inflows started to increase in the 1990s, the majority was allocated to those countries not only with natural resources, but to those who had also implemented major policy changes (Odenthal, 2001).

A recent study from London School of Economics looked at Ethiopia specifically, and assessed the effects of Chinese FDI on local growth. Findings shows that firms operating in districts that receive Chinese FDI, shrink their operations significantly in terms of lower production, employment, investment, and raw material inputs. This follows as a consequence of increased local competition which drives some local firms out of the market (Crescenzi & Limodio, 2021).

However, they also find that firms operating in the relevant upstream and downstream sectors in the districts that receive Chinese FDI benefit from it are able to expand their operations. According to Crescenzi and Limodio (2021), these effects cancel each other out, and their results suggest close to zero effect on local economic conditions in the short run due to increased FDI from China. The authors also find that "the average positive effect on local economic activity is 0.02 after 3 years and climbing to 0.14 after 12 years. Beyond this, such effects become statistically different from zero after 6 years and stay persistently significant with

time". A possible explanation for why there is an increase after the initial decline, is according to the researchers that competing firms might need time to adapt and improve resource allocation, and similarly it might take some time before knowledge spillover has an effect.

In an interview Crescenzi elaborated on their findings, saying that "our results suggest that Chinese investments are, and can be, a means to economic development" adding also that "our research suggests that missing the opportunity that comes from China, based purely on an ideological basis and fear of negative impacts, is a risk," before concluding by saying "we need to embrace internationalisation with a critical but open mindset." (fDi Intelligence, 2021)

3.5 Chinese FDI in SSA: Natural Resources

Examining FDI inflows from all regions of the world to countries in SSA, Ideue (2019) finds these to be unevenly distributed and targeted mostly at resource rich countries. Such countries seem to reap the most benefits from FDI, yet there are also others that have seen inflows of investments and benefited, even though not being notably rich in terms of natural resources. These do however seem to be the exception, as data for the period 2010-2017 show that the top 10 recipient countries of FDI account for 68% of total FDI. Further , it is worth noting that 9 out of these 10 rely heavily on natural resources.

By examining the case of Chinese FDI to SSA in particular, Ideue notes that Kenya and Ethiopia both have attracted substantial investments, despite both being what she refers to as non-resource rich. This seems to be in contrast with the notion that Chinese FDI is nearly entirely directed at resource rich nations.

This finding also has additional support in the conclusion of Nuetah and Xin (2019), in which they claim that their findings refute the argument that only countries rich in natural resources are able to attract Chinese investments. Looking at exploitation of natural resource, primarily in the form of mineral extraction, they find that China had invested significantly in infrastructure as well, also in sectors not linked to mineral extraction. Their findings suggest that approximately 30 percent of the total financial flow from China to SSA between 2005 and 2017 has been invested into the natural resource sector, dispelling the prevailing view of Chinese investments being driven by a pursuit for natural resources.

A more critical view is presented by Nissanke and Söderberg (2011), where they look at the economic relationship between China and SSA from a broader perspective, including aid, debt and direct investments as forms of economic cooperation. They claim that the most resource-rich countries such as Angola, Nigeria, Sudan, Tanzania and Zambia are the main recipients. A development they mention as one that has received much criticism, is the recent big push for Chinese farmers to focus on opening new lands for development and setting up plantations in Africa. Naturally, this can be perceived as a threat to local farmers. In terms of economic outcomes, they argue that countries in SSA that experienced high growth rates did so as a result of a combination of higher commodity prices, combined with higher demand from Asia, including China.

According to Nissanke and Söderberg (2011), it has been reported that Chinese aid contracts to SSA contain an agreement that up to 70% of construction and civil engineering contracts are to be given to Chinese companies, and additionally that 50% of equipment, material and technology needed for a project is to be sourced directly from Chinese companies(Foster, 2009). As previously mentioned, there is obviously no guarantee for knowledge spillover, increase in human capital nor increased local employment as an outcome of FDI. Indeed, in the case of Chinese aid, Nissanke and Söderberg argue that Chinese workers are brought in to perform relatively simple tasks, effectively sidelining local workers and possibly doing more harm than good in terms of labour participation. As was the case when more than 40,000 Chinese workers were brought in to work on local projects and attempts from the Angolan government to include more local workers had limited success (Vines, Wong, Weimer, & Campos, 2009).

There is a pattern of resources-for-infrastructure (RIF) as a form of payment, which itself is not unusual. However, the extent to which China implement it seems to indicate a preference for this form of payment. Not only in oil exploration, which is also usual for Western investors, but also for other commodities that are exported, such as minerals and agricultural products. An example is that part of the Bui Dam hydropower project in Ghana would be paid for by cocoa exports to China (Foster, 2009). In the same paper the authors state that "In terms of distribution by country, resource-rich countries such as Nigeria, Angola, Sudan and Guinea have so far accounted for over 70% of China's infrastructure finance, though resource-poor countries such as Ethiopia are also listed among countries which have received more than 10% of Chinese aid for infrastructure development".

Although FDI in general in SSA have increased throughout the last three decades, the investments are spread unevenly across the region, with larger concentrations in only a few countries (Michałowski, 2012). Spillover effects are also very limited. Preliminary findings seem to suggest that resource rich countries receive most of the investments and infrastructure projects, although there is also evidence suggesting that this is not the sole reason as other countries not rich in resources also attract Chinese investments. Using panel data from 22 African countries for the period 2008-2014, Shan et al. (2018) found natural resources not to have a significant effect on attracting Chinese FDI. Contrary to this, by analysing data for 41 African countries in the period 1998-2007, Sanfilippo (2010) finds Chinese investment activity in Africa to be driven by the need to meet a growing demand for natural resources. For the period 1991-2005, Cheung and Qian (2009) found no substantial evidence to support the hypothesis that Chinese investments in African

and oil-producing countries are due to the motives of resource seeking. Zhang and Daly (2011) found that Chinese FDI is largely directed at countries that display economic openness and are rich in terms of natural resources.

As studies so far have arrived at conflicting results with regards to the importance of natural resources, other factors must be examined in order to gain a thorough understanding of the driving forces behind China's presence in Africa. By reviewing results from studies that have investigated whether the quality of institutions matter, and consequently how, I will further examine the role of institutional quality and its importance for attracting Chinese FDI.

3.6 Chinese FDI in SSA: Quality of Institutions

The role of institutional quality and the effect on attracting FDI has been thoroughly examined in existing literature, yet the role it has in the the particular case of Chinese FDI to SSA is still ambiguous. First I will outline the findings of the role institutional quality has on FDI inflows in general, then I will elaborate further on Chinese FDI to SSA in particular.

Previous studies have indicated that the quality of institutions can have an impact on other important findings in economics, such as the paradox of plenty, also known as the resource curse. There are both growth losers and growth winners in countries that are rich in natural resources, but the quality of institutions seem to be an important factor in whether a country falls victim to the resource curse or not, and not merely the quantity of natural resources (Mehlum et al., 2006). Similar findings are reported by Bhattacharyya and Hodler (2010) in a study covering 124 countries in the period 1980-2004, in which resource rents were found to increase corruption only if the quality of democratic institutions was below a certain threshold. In similar fashion, it could very well be an important factor in explaining Chinese investment decisions. One might assume that host countries that have a lower quality of institutions, are easier to bribe and manipulate. This could in turn enable MNCs to exert influence over local communities, gain access to and exploit natural resources or in other ways take advantage of local resources in form of labour or resources. The opposite could also be argued, as investing in a country where you are less likely to deal with corrupt officials, be a victim of violence, or having to rely on outdated and flawed financial infrastructure would naturally be prefered.

In a study of 53 developing countries for the period 1982-1995, including several from SSA, Li and Resnick (2003) found that democratic institutions have conflicting effects on FDI inflows to less-developed countries. Their findings show that increased democracy leads to improved property rights, which in turn increases FDI flow. However, while increasing levels of democracy can lead to improvements in the judicial systems and rule of law, these higher levels of democracy also drive foreign investors away, due to the imposed constraints on both foreign capital and the host government.

As the authors emphasize, the relationship between regime type and FDI is a complex one. Their findings support previous results, suggesting that the way democ-

racy improves FDI inflows is as a consequence of the improvement in property rights, which again comes from a more democratic institution. If able to improve bureaucratic competence and provide enhanced contract enforcement, a country will positively distinguish itself from competitors for FDI. According to the authors, this also means that those unable to strengthen property rights protection may have to compensate by providing incentives related to taxes, discounts on land purchases, and perhaps most relevant for this thesis, exclusive access to natural resources.

Transitional economies, meaning those who are evolving into a more democratic regime, will be faced with a new challenge. As they implement more democratic institutions, the positive effect of democracy on FDI might not immediately come to fruition. This is due to processes such as power consolidating and potential conflicts with other domestic actors which can take considerable time. Countries undergoing such a transition must therefore persuade foreign investors that their property rights protection will be enhanced in the coming period, in order to increase FDI . The effect of democratic institutions can also vary due to natural resources, as democracy was found to facilitate FDI in countries where natural resources account for a small share of total exports, while the opposite holds true when exports are dominated by natural resources (Asiedu & Lien, 2011).

Others have also found that higher quality of institutions have a positive effect on FDI to SSA (Asiedu, 2006; Adegboye et al., 2020), suggesting that countries that are lacking natural resources can successfully attract FDI by improving institutions and policy environment. The role of corruption is ambiguous, as some find an increased control of corruption/less corruption to attract FDI (Makonda and Ngakala, 2021; Asiedu, 2006), others find that FDI in SSA is attracted rather than deterred by increasing levels of corruption(Gossel, 2018), while others find no clear and significant relationship (Shan et al., 2018; Cleeve, 2012). Investigating the determinants of outwards Chinese FDI in general, Buckley et al. (2009) arrived at a similar conclusion, finding that Chinese FDI seems motivated by political risk in the host country, noting further that " it is arguable that Chinese firms seek foreign investment opportunities in environments that resemble their home environment." Cheung and Qian (2009) find no significant effects of quality of institutions and risk, but both aforementioned studies were criticized by Kolstad and Wiig (2012) for using data on FDI that captured approved investments, and not actual investments (the availability and quality of data on Chinese FDI is elaborated upon further in section 4.1). For the period 2003-2006, Kolstad and Wiig (2012) finds that Chinese FDI is attracted to countries that possess a combi-

nation of both natural resources and poor quality of institutions, adding that the weaker the institutions are, the more is Chinese outward FDI attracted by natural resources.

Having now outlined Chinese FDI to Sub-Saharan African and looked at existing works that have attempted to determine the role of natural resources, as well as the importance of institutional quality, the focus from here on out will be on the empirical part.

Chapter 4

Data

In the previous chapter the reasons for Chinese investments in SSA were discussed, outlining traits making it an attractive investment opportunity. In order to answer my research question and determine the importance of natural resources and quality of institutions for attracting Chinese FDI, cross-sectional data on 44 SSA countries is used[1], compiled from several sources (The American Enterprise Institute and The Heritage Foundation, 2022; The Economist Intelligence Unit, 2021; World Bank, 2022e; World Bank, 2022d). Great care has therefore been taken by checking and comparing with the original sources several times to ensure that the data is correctly assembled.

4.1 Dependent Variable

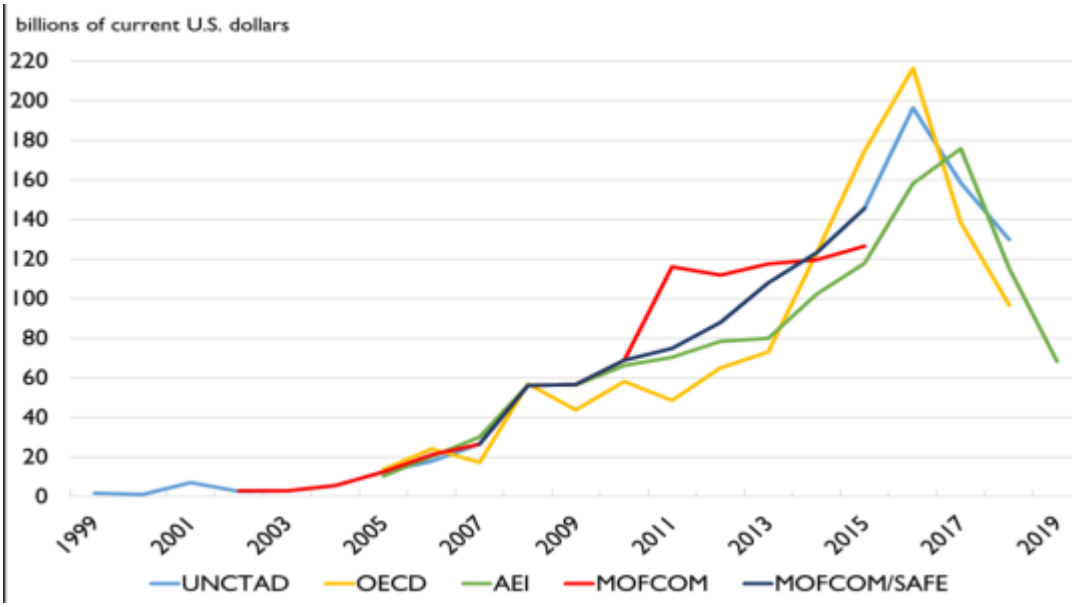
The dependent variable, *china_invested*, is a binary variable that captures whether China has invested in a country (1) or not (0).

According to Congressional Research Service (2020), there is no comprehensive, standardized or authoritative data from the Chinese government or international organizations available on Chinese overseas economic activities. This is naturally a challenge when collecting, assessing and analysing data. In figure 4.1 from Congressional Research Service (2020) the various methods used to estimate China's outward direct investments flows are illustrated. The trends are similar, yet the values can differ greatly depending on which method we use. As an example, the Ministry of Commerce of the People's Republic of China(MOFCOM) only records projects which are approved by the Chinese national government. In addition, the official definition according to the Chinese government of what an investment or construction project entails has changed over time, making trend analysis and direct comparisons challenging. It is also difficult to track investments that go through offshore financial centres, and in some years this has been the case for as much as three-quarters of China's total outward investments flows.

[1] see table B.1 in appendix

To ensure consistency in terms of data collection, only the statistics provided by the Chinese Investment Tracker, made by the American Enterprise Institute (AEI)/Heritage Foundation, will be used. The tracker contains data on Chinese investments from 2005-2022 (The American Enterprise Institute and The Heritage Foundation, 2022). The data set is widely used by others, is accessible to the public and free, such that the method can easily be replicated.

Figure 4.1: *China's Total Outward Direct Investment Flows*



There are only a few countries in SSA where China is not invested, following the method of the Chinese Investment Tracker by the America Heritage Foundation where investments $<$ \$100M are excluded. A consequence of this could be that a country which China has repeatedly invested amounts smaller than 100 million in will be excluded, even though the aggregate investments are large In that case, the country will have a lower total investment, and the criteria used for total investments/GDP to be > 0.05 in order to be considered as invested in, could result in the dependent variable *china_invested* to be equal to 0, not capturing the effect of several smaller investments. With very few observations of *not invested*, the likelihood of ending up with a flawed model increases. To remedy this, total Chinese investments in a given country are divided by GDP estimates for 2022. The ones with a ratio < 0.05 have been set as *not invested* and the result is two distinct groups, with 23 countries classified as $china\_invested = 1$ and 21 as $china\_invested = 0$

Additionally, even though reliable sources such as The World Bank are used as sources for data on natural resources, governance indicators and GDP growth, the accuracy and reliability of data for low-income countries which SSA countries tend to be, can be a potential issue. There are obviously potential problems with the governance indicators, as they are subjective or perceptions-based measures of governance. As such, they do not reflect the actual conditions in SSA, merely the perceptions of those surveyed. For a thorough review of the methodology and analytical issues related to these, see Kaufmann, Kraay, and Mastruzzi (2010).

4.2 Explanatory Variables

Natural Resources Rents

Total natural resources rents (% of GDP). The sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents. Average for period 2000-2010.

Democracy

The Democracy Index, an index compiled by the Economist Intelligence Unit. Based on 60 indicators grouped in five categories: electoral process and pluralism, civil liberties, functioning of government, political participation and political culture. Each category has a rating on a 0 to 10 scale, and the overall Index is the simple average of the five category indexes.

HDI

A composite index measuring average achievement in three basic dimensions of human development - a long and healthy life, knowledge and a decent standard of living.

Voice and Accountability

Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.

Political Stability and Absence of Violence/Terrorism

Measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.

Government Effectiveness

Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

Regulatory Quality

Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

Rule of Law

Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

Control of Corruption

Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Soviet Arms

Cumulative arms transfer deliveries from USSR to Sub-Saharan African countries for the period 1985-1989. In millions, 1990 dollars.

Years of school

Expected years of school is calculated as the sum of age-specific enrolment rates between ages 4 and 17. Data for 2018.

GDP growth

Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2015 prices, expressed in U.S. dollars. Average for the period 2000-2010

HCI

The HCI calculates the contributions of health and education to worker productivity. The final index score ranges from zero to one and measures the productivity as a future worker of child born today relative to the benchmark of full health and complete education. Data for 2018.

Descriptive statistics of all variables are presented in appendix C.1.

As the relationship between natural resources, quality of institutions and economic growth has been discussed extensively in the literature, it is useful to have an overview of how the variables are correlated. In the correlation matrix in table 4.1, the governance indicators have a rather high correlation. Natural resources and control of corruption have a negative correlation, which is interesting considering the resource curse and the hypothesis that natural resources lead to conflicts and corruption[2]. However, a positive correlation is seen between natural resources and GDP growth, giving an indication that natural resources do not necessarily hamper economic growth, contrary to much of the literature on the Dutch disease and resource curse, but in line with results in Brunnschweiler and Bulte (2008). There can of course be no conclusions drawn from this regarding causal effects, but it is useful to have an understanding of the relationships between the variables used. Multicollinearity is further discussed in appendix D.

Table 4.1: Correlation matrix

	nat_re	dem_score	HDI	voice_acc	pol_stab	gov_eff	reg_quality	rule	coc	soviet_arms	gdp_growth
nat_re	1	−0.355	0.010	−0.366	−0.092	−0.367	−0.351	−0.354	−0.397	0.360	0.463
dem_score	−0.355	1	0.592	0.863	0.660	0.724	0.773	0.835	0.772	−0.100	−0.059
HDI	0.010	0.592	1	0.421	0.645	0.591	0.570	0.617	0.481	0.002	−0.036
voice_acc	−0.366	0.863	0.421	1	0.537	0.644	0.720	0.738	0.739	−0.130	−0.133
pol_stab	−0.092	0.660	0.645	0.537	1	0.567	0.547	0.634	0.601	−0.170	0.009
gov_eff	−0.367	0.724	0.591	0.644	0.567	1	0.907	0.929	0.878	−0.037	0.067
reg_quality	−0.351	0.773	0.570	0.720	0.547	0.907	1	0.908	0.850	−0.015	0.014
rule	−0.354	0.835	0.617	0.738	0.634	0.929	0.908	1	0.907	−0.068	0.067
coc	−0.397	0.772	0.481	0.739	0.601	0.878	0.850	0.907	1	0.021	0.010
soviet_arms	0.360	−0.100	0.002	−0.130	−0.170	−0.037	−0.015	−0.068	0.021	1	0.267
gdp_growth	0.463	−0.059	−0.036	−0.133	0.009	0.067	0.014	0.067	0.010	0.267	1

[2]This is however controversial and up for debate, see Brunnschweiler and Bulte (2009)

Chapter 5

Methods

As the aim of this thesis is to evaluate the importance of natural resources and institutional quality in attracting Chinese FDI, rather than determining causal relationships, this bears similarity to previous work on discriminatory analysis. Originating in 1936 with the work of Ronald Fisher, who developed a dichotomous discriminant analysis, it is now commonly referred to and generalised as linear discriminatory analysis (LDA) or discriminatory function analysis. The aim of discriminatory analysis is to classify an observation, or several observations, into an already known group or cluster (Härdle & Simar, 2012; Venables, 2002). Its applications spans fields such as business, marketing, finance, face recognition and biomedical studies, with a famous example that illustrates its use well, being the application to bankruptcy predictions.

Published in 1968 by Edward Altman, a formula for predicting the probability of a firm going bankrupt within the next two years was derived, known as the Altman Z-score (Edward I. Altman, 1968). By applying the concepts of discriminatory analysis to a data set of 66 firms, half of which had filed for bankruptcy, Altman was able to determine a set of five variables that could give a prediction of the probability that a firm would go bankrupt. In his initial work, the Altman Z-score was found to be 72% accurate in predicting bankruptcy two years prior to the event. Later he expanded the model, increasing it to seven variables after having assessed the variables through several tests such as stepwise selection, improving the classification accuracy to 85% two years prior to bankruptcy, while also attaining a 75% accuracy as long as five years prior (E. Altman, 2000). As shown by Edward I Altman, Iwanicz-Drozdowska, Laitinen, and Suvas (2014) other models have also been devised that could constitute improvements, but testing the model on international firms shows that it performs well, as the findings suggest a prediction accuracy level of about 75%, with levels as high as $> 90\%$ reported in some countries. Whether mortgage applications are approved or not, and what factors decrease or increase the probability of being denied a loan is a similar scenario. This was examined in Munnell, Tootell, Browne, and McEneaney (1996) by use

of the Boston Housing data set, which is also used as an example in Stock and W.Watson (2019), comparing probit, logit and linear probability regressions.

Applied to my research question on Chinese FDI to SSA, results from a variant of discriminatory analysis can serve as an indication and guideline by countries wanting to attract more FDI, or it can be used by firms in competing industries, who perhaps would like to know if Chinese MNC are likely to invest in the same market or country.

Since logit and probit are methods similar to discriminant analysis, frequently compared and can be used to analyse many of the same problems, these will be used going forward. Logit and probit models produce very similar results, and in this thesis the probit model, outlined in the next section, will be used initially. The dependent variable captures whether China is invested in a country or not, based on the method described in 4.1. A linear probability model is introduced later, along with methods for variable selection such as stepwise and subset regressions. The results will be commented on briefly as the regressions proceed, a more thorough evaluation of the results will be presented at the end of the chapter, and the results will be discussed in chapter 7.

5.1 Probit Regression Model

A probit model is a specification of a binary response model, used to estimate the effects of variables on a binary response variable through maximum likelihood estimation(MLE). The Probit Regression Model with k regressors is given by $P(Y = 1|X_1, X_2, ..., X_k) = \Phi(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k)$ where Φ is the cumulative distribution function(CDF) of the standard normal distribution. In my model Y corresponds to whether China is invested or not, with $Y = 1$ meaning that China is invested, and $Y = 0$ that China is not invested.

"The likelihood function is the joint probability distribution of the data, treated as a function of the unknown coefficients. The maximum likelihood estimator of the unknown coefficients consists of the values of the coefficients that maximize the likelihood function. Because the MLE chooses the unknown coefficients to maximize the likelihood function, which is in turn the joint probability distribution, in effect the MLE chooses the values of the parameters to maximize the probability of drawing the data that are actually observed. In this sense, the MLE are the parameter values "most likely" to have produced the data" (Stock & W.Watson, 2019, pp. 404-405).

Under general conditions, maximum likelihood estimators are consistent and have a normal sampling distribution in large samples. There is no simple formula for the MLE, therefore the probit likelihood function must be maximized by use of a numerical algorithm. A more detailed mathematical explanation is given in (Stock & W.Watson, 2019, p.422).

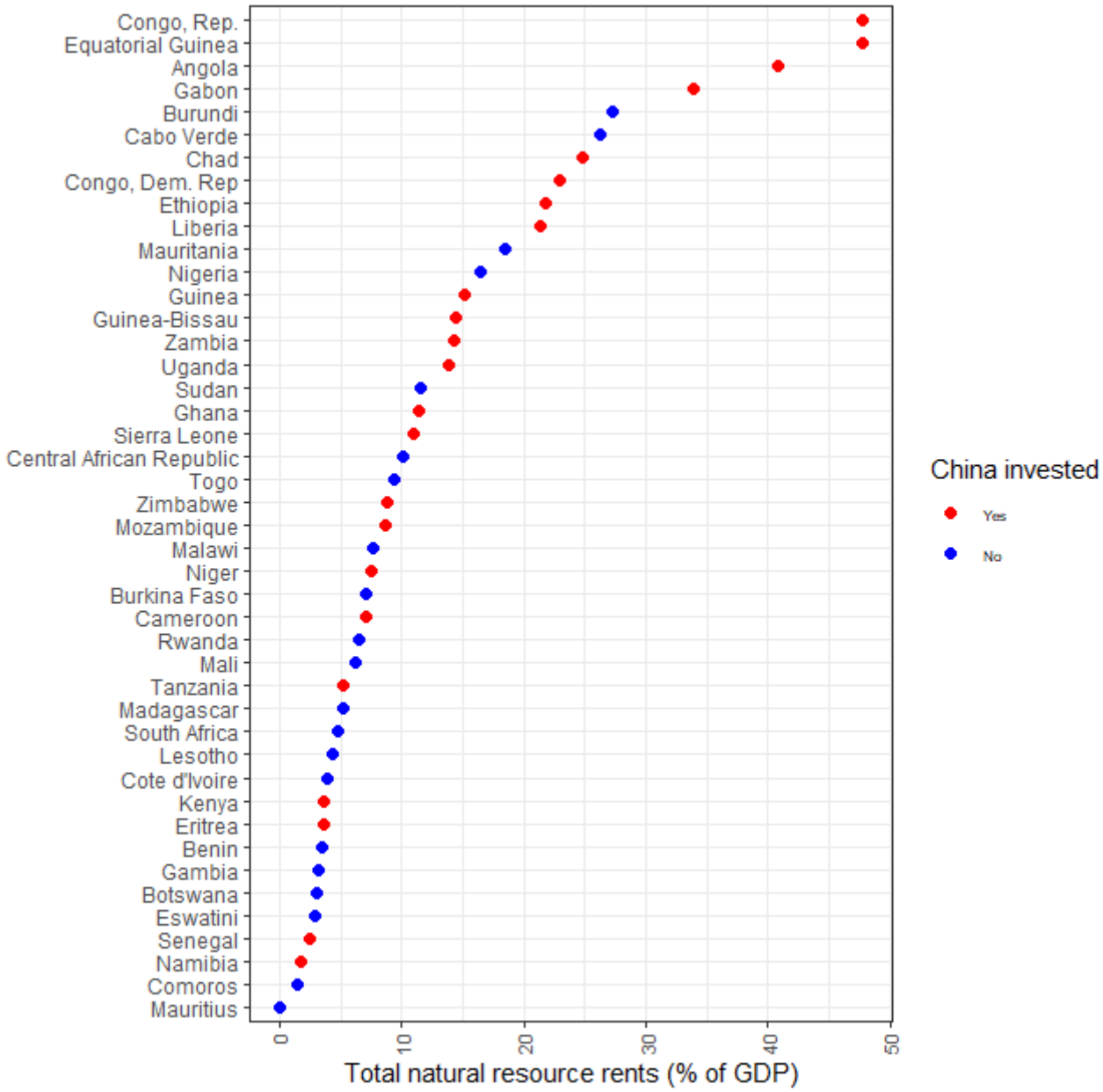
A disadvantage of the probit regression is that the coefficients give the change in the z-score or probit index(not to be confused with the Altman Z-score) for a one unit change in the predictor, and the resulting coefficients are therefore not as intuitive and easy to interpret as the coefficients in a linear probability model, and can not be interpreted the same way. Regression models usually give a coefficient that can be interpreted as the change in Y, as a result of a change in X. If Y is binary, as in this case, the conditional expectation is the conditional probability that it equals 1, so the expected change in Y as a result of a change in X, is simply the change in probability that $Y = 1$. The probability that $Y = 1$ can not be seen directly from the coefficients, but can be found either by computing the z-score, with $z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k$, and then looking up the corresponding probability in a table of the standard normal cumulative distribution function, or by using software. Although the values of the coefficients are not as easy to interpret as in a linear regressions, both the signs and statistical significance levels are interpreted as usual, such that observing whether there is a positive or negative relationship is done the same way as in a linear regression model.

Various evaluation metrics for probit models such as AIC, R^2, adjusted R^2, pseudo R^2 are used throughout, but for a more thorough explanation, as well as a brief discussion on multicollinearity, I refer to appendix D.

5.2 Regression 1: natural resources

As mentioned in the introduction, it is a common notion that China's investments in SSA are driven by a quest for natural resources, and that this subsequently leads to exploitation of natural resource rich countries. The relationship between total natural resource rents (% of GDP) and China's investments is illustrated in figure 5.1. The red dots indicate countries China is invested in, according to the method explained earlier. Among the countries on the lower end of the spectrum there is no immediately clear pattern, but note that among the top 10 in terms of total natural resource rents, China has invested in 8 of them.

Figure 5.1: *Total natural resource rents (% of GDP) for Sub-Saharan African countries*



Including a variable for *Natural Resources*, the relationship between whether a country is resource rich or not, and if China is invested, can be examined by the following simple model

$P(Invest|nat\_re) = \Phi(\beta_0 + \beta_1 nat\_re)$

Results are reported in table 5.1 below, showing that natural resources seem to be significant at a 5% level, with a p-value < 0.05.

Table 5.1: Regression Results: Natural Resources

	Dependent variable:
	china_invested
nat_re	0.048**
	(0.021)
Constant	−0.521*
	(0.306)
Observations	44
Log Likelihood	-27.243
Akaike Inf. Crit.	58.485
Note:	*p<0.1; **p<0.05

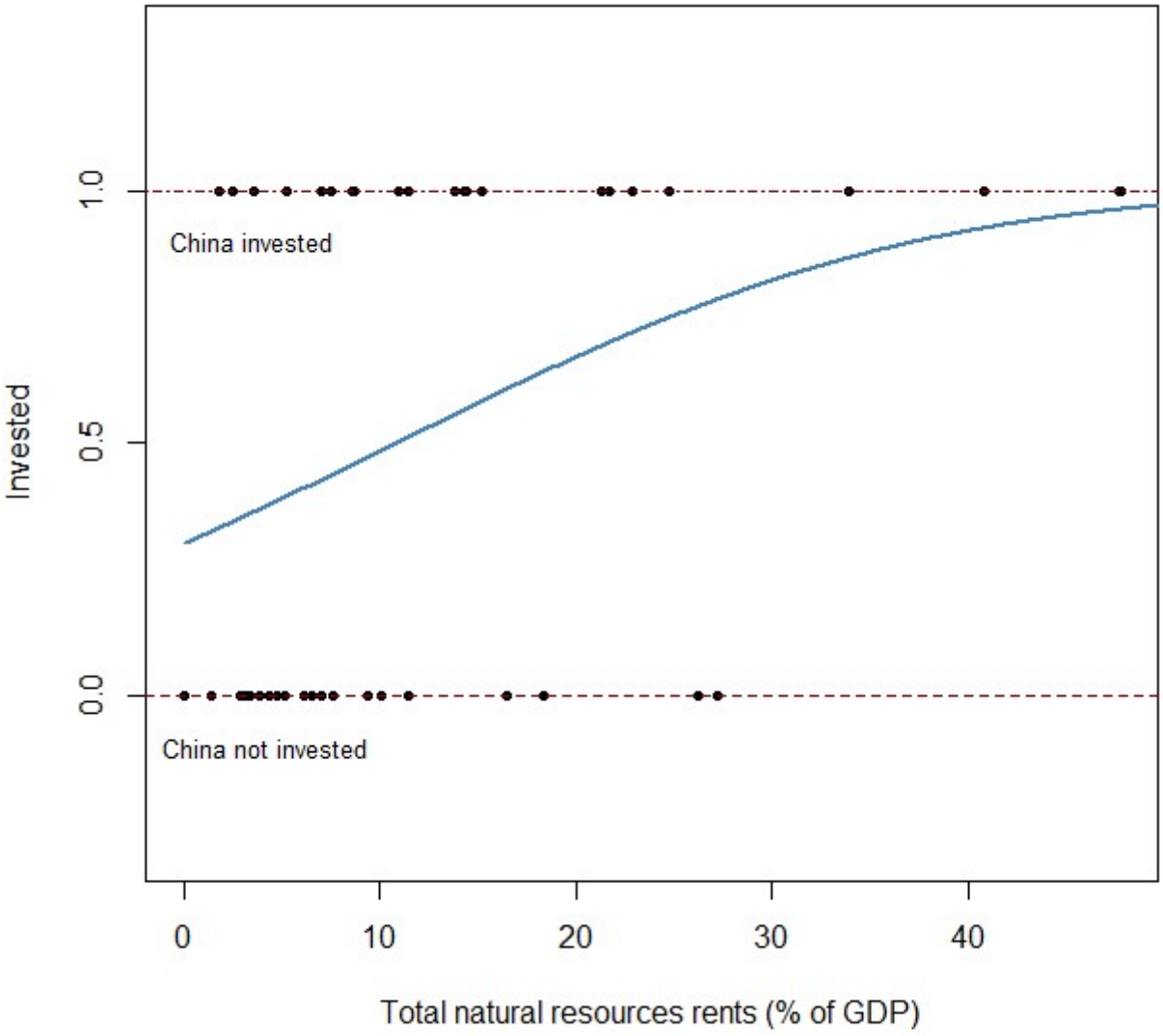
As mentioned, z-scores can not be interpreted directly in order to say something about the probability of a specific outcome given a unit change in a variable. We can instead use the `predict` function in R, to look at the predicted probability of China investing in a country, when there is a change in the natural resource variable. The median value for total natural resources rents in % of GDP is 8.697. The lowest in our sample is 0.009, and the highest is 47.777.

By evaluating the effect of a change from the median to the maximum in terms on natural resources, as well as from minimum to maximum, the following results are obtained:

- An increase in total natural resources rents from 8.697 to 47.777, **increases the probability of China being invested by 50%**.
- An increase in total natural resources rents from 0.09 to 47.777, **increases the probability of China being invested by 66%**.

Figure 5.2 shows a plot of the relationship between the probability of China investing, and the variable *nat_re*.

Figure 5.2: *Probit Model: probability of China being invested given total natural resources rents (% of GDP)*



There are several occurrences of countries with a lower natural resource rent where China is invested. As the natural resource rents increase, there are fewer cases of China not being invested. In other words, there seems to be a tendency for China to favour countries that experience large profits from natural resources when deciding where to invest. The countries with the lowest natural resource rents are also the ones China have steered away from, and among the ones with the highest, China is invested in all.

5.3 Regression 2 and 3: All Variables Included

In table 5.2 below, the results from the previous regression (1), a second with all variables included (2), and a third with two variables excluded in order to increase the number of observations back to the original 44 are included (3).

Natural resources still have a positive effect, but the variable is no longer statistically significant at neither a 1,5 or 10% level. Notice that when including all variables, the number of observations drops from 44 to 39 due to missing values. By excluding *Year of School* and *HCI 2018* from the data set, the full sample is included. As the variable *HDI* also includes similar measures, the effects can still be captured in similar fashion, without having to reduce the already small sample size further. The third regression is the probit model that will be used from here on out as the final probit model.

At the 5% level, the only variables that are statistically significant are *Government effectiveness* and *Regulatory Quality*, both part of the six governance indicators from The World Bank. *Control of Corruption* is also statistically significant, but only at a 10% level.

Based on the analysis so far, it seems that variables related to institutional quality play a larger role than natural resources in attracting Chinese FDI. The linear probability model will be introduced next, before applying methods such as stepwise and subset regression.

Table 5.2: Complete Probit Regression Results

	Dependent variable:		
	china_invested		
	(1)	(2)	(3)
nat_re	0.048**	0.054	0.035
	(0.021)	(0.043)	(0.032)
dem_score		0.098	0.069
		(0.533)	(0.421)
HDI		−0.636	−0.998
		(5.410)	(4.422)
voice_acc		0.930	0.584
		(1.224)	(0.919)
pol_stab		0.477	0.806
		(0.577)	(0.548)
gov_eff		3.484**	3.821**
		(1.656)	(1.484)
reg_quality		−2.608	−2.636**
		(1.599)	(1.330)
rule		−2.247	−1.158
		(1.929)	(1.625)
coc		−0.942	−2.074*
		(1.558)	(1.154)
soviet_arms		0.005	0.005
		(0.007)	(0.006)
gdp_growth		0.184	0.108
		(0.148)	(0.128)
year_school		−0.298	
		(0.258)	
hci2018		12.531	
		(10.286)	
Constant	−0.521*	−4.508	−1.015
	(0.306)	(4.987)	(3.320)
Observations	44	39	44
Log Likelihood	-27.243	-17.394	-19.081
Akaike Inf. Crit.	58.485	62.788	62.162
Note:		*p<0.1; **p<0.05	

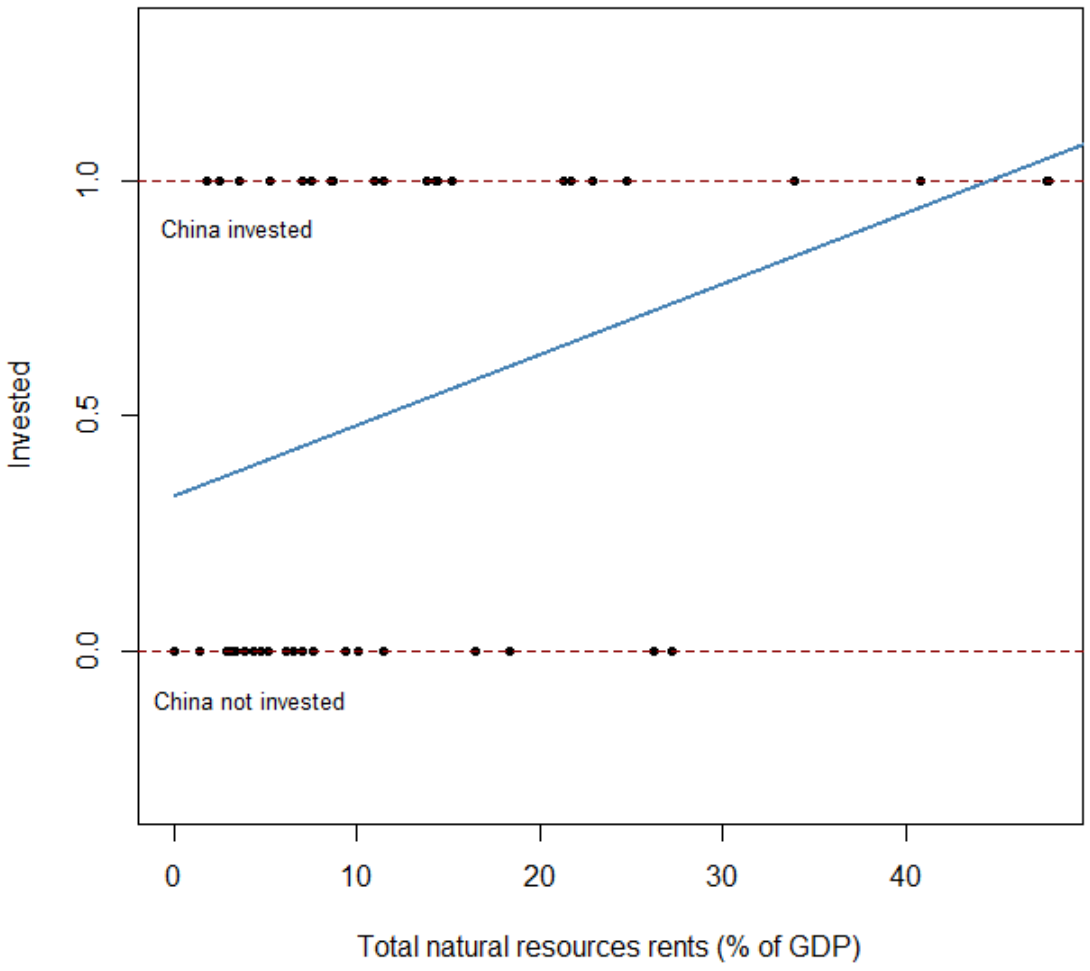
5.4 Linear Probability Model

The linear probability model is an application of OLS to binary outcomes instead of continuous, given by
$P(Y = 1|X_1, X_2, ..., X_k) = \beta_0 + \beta_1 X_1 i + \beta_2 X_2 i + ... + \beta_k X_k i$

Although easy to apply, it has several potential shortcomings. The assumptions of a linear probability model are the same as for a normal linear regression, but several of them are already violated.

In a probit model, the increase in probability of $Y = 1$ for a given change in X must be non-linear, as the probability naturally can not exceed 1. As seen in figure 5.2, for larger values of the independent variable, the change in probability of $Y = 1$ becomes smaller and smaller. In contrast, in the linear probability model, the effect of a given change in X is constant, which leads to predicted probabilities that can both drop below 0 or exceed 1. See figure 5.3.

Figure 5.3: *Linear Model: probability of China being invested given total natural resource rent (% of GDP)*



The assumption of homoscedasticity is important in OLS, and means that error terms are constant along the values of the dependent variable. Linear probability models violate the assumption of homoscedasticity, as they are heteroscedastic by nature. All values for Y are either 0 or 1, but as already mentioned the predicted values can be between 0 and 1, and also greater or smaller, such that the size of the residuals will increase or decrease, as the predicted values increase or decrease. A residuals versus fitted plot in OLS would ideally look like a random scatter of points, and as seen in upper quadrant in figure 5.4, there is both a clear pattern and large outliers. For this reason it is essential to use robust standard errors, which is what is reported for all linear regressions in this thesis.

In OLS it is also assumed that errors are normally distributed. The upper right quadrant in 5.4 displays a normal quantile plot, which serves as a check of the normal distribution of the residuals. If the points are located along the line, the residuals are approximately normally distributed. In this data set it is clear that there are several outliers and hence deviations from the normal distribution, also seen by the index plot and histogram in the lower half of 5.4. Even though residuals and error terms are not normal, this doesn't necessarily pose a problem if the sample size is large enough. A total of $N = 30$ or higher is often regarded as an accepted sample size, implying that this violation is not necessarily a problem in this model.

Correcting for heteroscedasticity can be done by Weighted Least Squares(WLS), but this relies on the assumption that the conditional variance function and the estimate of its parameters are known. Determining the functional form of the conditional variance function is challenging in practice, and even more so with multiple regressors. As argued in Stock and W.Watson (2019, pp 700-704), using robust standard errors is therefore the preferred solution. See also Williams (2015).

Although the LPM has some potentially significant shortcomings, it can none the less give an additional indication of variables that are important for my research question. Another reason for including the LPM is that a method for selecting variables by going through all possible combinations can be done by the methods of subset regression, which will be explained in chapter 5.5.2.

Figure 5.4: *Diagnostic Panels*

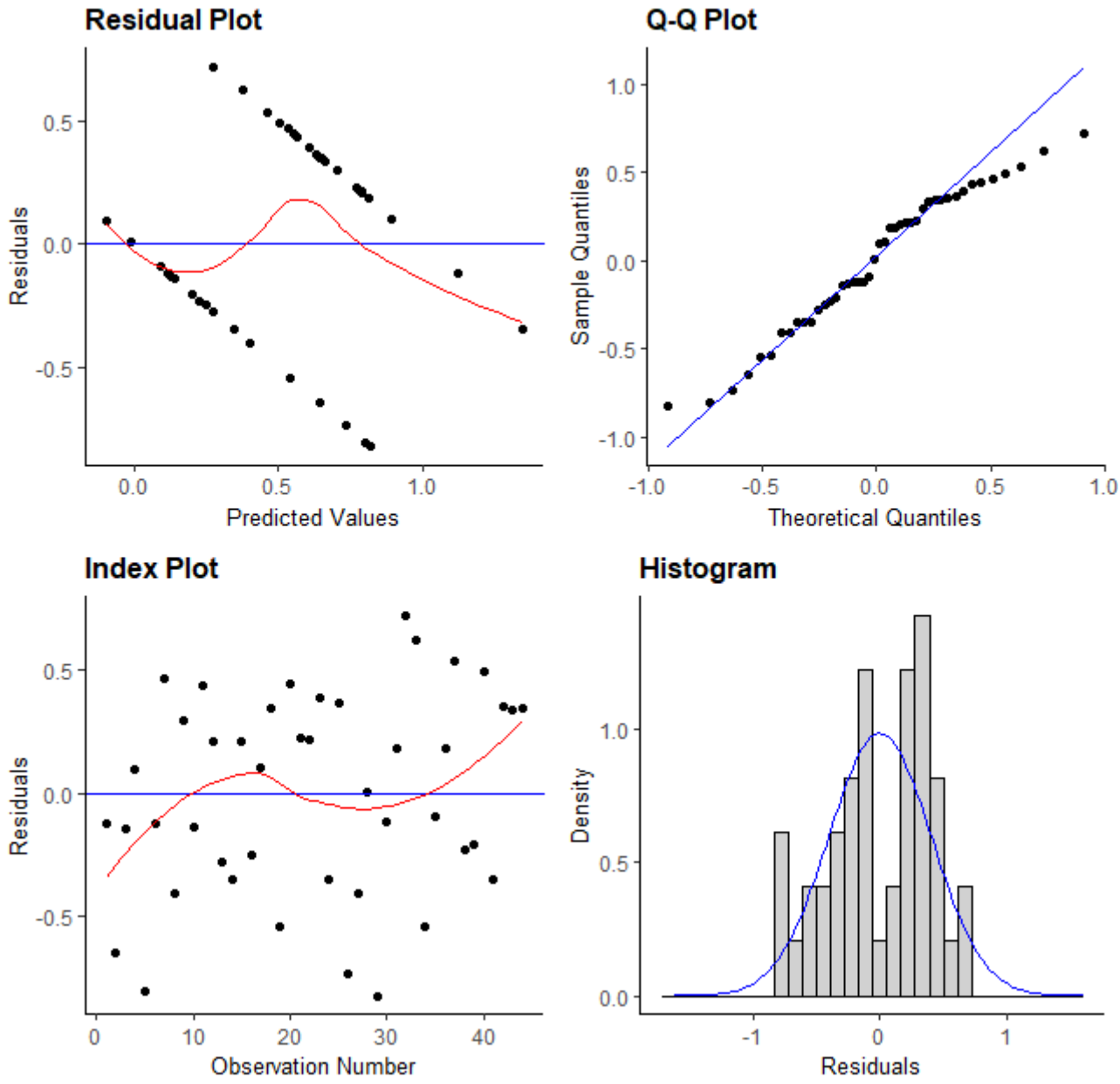


Table 5.3 display the results from the final probit regression model (disregarding the stepwise selection for now) already seen, and the linear probability model explained above.

Table 5.3: Linear Probability Model

	Dependent variable:	
	china_invested	
	Probit	*LPM*
	(1)	(2)
nat_re	0.035	0.010
	(0.032)	(0.008)
dem_score	0.069	0.120
	(0.421)	(0.118)
HDI	−0.998	−1.357
	(4.422)	(1.504)
voice_acc	0.584	−0.033
	(0.919)	(0.236)
pol_stab	0.806	0.151
	(0.548)	(0.116)
gov_eff	3.821**	1.008***
	(1.484)	(0.315)
reg_quality	−2.636**	−0.485
	(1.330)	(0.315)
rule	−1.158	−0.490
	(1.625)	(0.553)
coc	−2.074*	−0.473
	(1.154)	(0.300)
soviet_arms	0.005	0.0001**
	(0.006)	(0.00005)
gdp_growth	0.108	−0.004
	(0.128)	(0.030)
Constant	−1.015	0.506
	(3.320)	(1.120)
Observations	44	44
R^2		0.359
Adjusted R^2		0.139
Log Likelihood	-19.081	
Akaike Inf. Crit.	62.162	
Residual Std. Error		0.469 (df = 32)
F Statistic		1.631 (df = 11; 32)
Note:		*p<0.1; **p<0.05; ***p<0.01

5.5 Variable Selection

After having obtained results from both a probit and linear probability model, the focus now turns to variable selection. The aim is to separate the variables that have the strongest predictive effects, and give an additional indication of the importance of natural resources and quality of institutions for attracting Chinese FDI. While a complex model with several variables could be useful, it could also be problematic for predictions, as it can lead to overfitting, resulting in fitting the randomness in the data. All else equal, the simpler model (often referred to as the parsimonious model) is preferred, given that is has a satisfactory goodness of fit. For the probit model stepwise regression can be used, while subset regression is used for the linear model.

5.5.1 Stepwise Regression

Finding which variables to keep in the model can be done by the process of stepwise selection. By adding and removing variables several times over, while attempting to minimize the Akaike Information Criterion(AIC), it can be determined which variables should be kept in the model. AIC is an estimator of the in-sample errors, and is similar to the adjusted R^2 seen in linear regressions. Only variables related to institutional quality are included after stepwise selection, see table 5.4. This is also the same result obtained by eliminating the variable with the highest p-value, performing the regression once more, and then repeating the process.

While this intuitively might be reasonable, the method has potentially severe drawbacks. According to Smith (2018), the fundamental flaw of this approach is that an explanatory variably that does have a causal effect on the dependent variable, may happen to not be statistically significant. Likewise, variables that have no effect in reality can happen to be coincidentally significant. Consequently, stepwise regression can result in a model that may fit the data well in-sample, but do poorly out-of-sample. The question examined in this thesis is not one of causal effects, but it is still important to keep in mind that resulting models from a stepwise selection should not be followed blindly, but rather included as one of several potential indicators of which variables are most useful for predicting Chinese FDI.

Although some of the existing literature points to natural resources being a driving force behind China's FDI, the model does so far not give any indication of this. If convinced that natural resources guide Chinese investments to a large degree, and that this is not reflected in the model due to a small sample size or possible errors, it can be reasonable to add it back in. Based on figure 5.2, it seems worth examining

the role of natural resources further and not immediately dismissing its effect. Therefore the stepwise selection is run once again, but this time R is instructed to let the variable *nat_re* remain in the model, and choose the remaining variables in the same way as in the initial process. The result of both stepwise regressions is given in table 5.4

Table 5.4: Stepwise Regression

	Dependent variable:	
	china_invested	
	Stepwise	Stepwise, keeping natural resources
nat_re		0.041
		(0.032)
pol_stab	0.730*	0.669
	(0.423)	(0.449)
gov_eff	2.578**	2.777**
	(1.202)	(1.236)
reg_quality	−2.044*	−2.274**
	(1.103)	(1.140)
coc	−1.978**	−1.618*
	(0.955)	(0.919)
soviet_arms	0.005	0.006
	(0.004)	(0.004)
Constant	−0.471	−0.732*
	(0.382)	(0.445)
Observations	44	44
Log Likelihood	-21.060	-20.185
Akaike Inf. Crit.	54.120	54.370
Note:		*p<0.1; **p<0.05

Note that when forcing *nat_re* to be kept in the model, the significance level of both *pol_stab* and *coc* decrease, while *reg_quality* increases.

5.5.2 Subset Regression

The `leaps` package in RStudio, designed for linear regression, is used to perform an exhaustive search for the best subsets of the variables. The resulting combinations are illustrated in table 5.5. The first column shows that if only one variable is to be included, *nat_re* is the preferred variable. If using two, the second column shows that *nat_re* and *reg_quality* should be included in the model, and so on.

Table 5.5: Subset Regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
nat_re	*	*	*	*			*	*	*	*	*
dem_score							*	*	*	*	*
HDI						*			*	*	*
voice_acc										*	*
pol_stab					*	*		*	*	*	*
gov_eff			*	*	*	*	*	*	*	*	*
reg_quality		*	*	*	*	*	*	*	*	*	*
rule				*			*	*	*	*	*
coc					*	*	*	*	*	*	*
soviet_arms					*	*	*	*	*	*	*
gdp_growth											*

By using the `regsubsets` function from the `leaps` package, the regression that gives the highest adjusted R^2 from the various combinations above is found. While stepwise removes or adds one variable at a time, the subset regression tests all possible combinations. Total possible combinations are given by 2^K (since the order of the variables is irrelevant). In this case there are 11 independent variables, resulting in a total of $2^{11} = 2048$ possible combinations. Having the function return the combination resulting in the highest R^2, the model consisting of seven variables is chosen. The model and resulting coefficients for the selected variables are given in table 5.6, with R^2 increasing from 0.139 to 0.197, indicating an improvement in explanatory power.

Coefficients and significance levels for variables kept in the model are similar to the ones found by use of stepwise regression for the probit model in table 5.4, with the exception that *nat_re* and *dem_score* are included, while *pol_stab* is excluded. Variables that reflect the quality of institutions are, according to this method of selecting variables, again assumed to have the most significant effect on attracting FDI, but now natural resources are included as well.

Table 5.6: Subset Regression: Chosen Variables

	Dependent variable:
	china_invested
nat_re	0.010*
	(0.005)
dem_score	0.117
	(0.071)
gov_eff	0.945***
	(0.299)
reg_quality	−0.521*
	(0.268)
rule	−0.551
	(0.479)
coc	−0.333
	(0.247)
soviet_arms	0.0001***
	(0.00003)
Constant	−0.333
	(0.410)
Observations	44
R^2	0.328
Adjusted R^2	0.197
Residual Std. Error	0.453 (df = 36)
F Statistic	2.506** (df = 7; 36)
Note:	*p<0.1; **p<0.05; ***p<0.01

Having now found the various combinations that give the best predictions when using a certain number of variables, it is interesting to run these regressions in a probit model. As previously explained, the subset method only works for linear models, which is part of the reason for including the LPM in the first place. Table 5.7 shows the results when running the first seven regressions, previously seen in the subset combinations in table 5.5, but now in a probit model. By including 1-7 it can be observed that *nat_re* is excluded and replaced, and then included again. The seventh regression is the one chosen by subset previously, when asked to maximize the adjusted R^2 in the LPM, as already seen in 5.6.

Table 5.7: Probit Regression: Chosen Variables from Subset

	Dependent variable:						
	china_invested						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
nat_re	0.048**	0.041*	0.056**	0.054**			0.049
	(0.021)	(0.022)	(0.026)	(0.026)			(0.030)
dem_score							0.320
							(0.256)
reg_quality		−0.510	−2.348**	−1.863*	−2.044*	−1.951*	−2.361*
		(0.375)	(1.073)	(1.123)	(1.103)	(1.107)	(1.206)
gov_eff			1.928*	2.531**	2.578**	2.736**	3.174**
			(1.010)	(1.150)	(1.202)	(1.240)	(1.336)
rule				−1.124			−0.951
				(1.053)			(1.487)
pol_stab					0.730*	0.845*	
					(0.423)	(0.478)	
coc					−1.978**	−2.160**	−1.121
					(0.955)	(1.026)	(0.900)
soviet_arms					0.005	0.005	0.004
					(0.004)	(0.004)	(0.004)
HDI						−2.057	
						(3.816)	
Constant	−0.521*	−0.806**	−0.814*	−0.725*	−0.471	0.776	−2.645*
	(0.306)	(0.384)	(0.417)	(0.416)	(0.382)	(2.352)	(1.564)
Observations	44	44	44	44	44	44	44
Log Likelihood	-27.243	-26.277	-24.169	-23.597	-21.060	-20.919	-20.567
Akaike Inf. Crit.	58.485	58.553	56.338	57.194	54.120	55.838	57.133

Note: *p<0.1; **p<0.05

The AIC of regression (7) is higher than in (4), (5) and (6), although it has the highest adjusted R^2 in the LPM. If selecting a model based purely on AIC, model (5) would be the preferred choice, and again it can be seen that *gov_eff*, *reg_qual*, *pol_stab* and *coc* seem to be the most important to include. The change from (4) to (5) is also interesting, as *nat_re* and *rule* are replaced by *pol_stab*, *coc* and *soviet_arms*.

Although caution should be exercised when using methods such as stepwise and subset, they can give indications of which variables that potentially have a predictive effect. It is likely that the variable for natural resources captures several of the other variables as well, and if only using one or a few predictors, it should perhaps be included as it may give an accurate prediction of Chinese FDI to the SSA region, although it bears repeating that this says little about any causal effects.

From here on out, I will concentrate on the results from the probit and linear probability models with all variables included as shown in table 5.3, the stepwise regressions as shown in table 5.4 and the subset regression as shown in 5.6.

5.6 Final Probit and OLS Regressions

Table 5.8 gives a summary of the following regressions:

1. Probit model
2. Probit model, stepwise regression
3. Probit model, stepwise regression and keeping natural resources
4. Linear probability model
5. Llinear probability model, subset regression

Table 5.8: Final Probit and OLS Regression Results

	Dependent variable:				
	china_invested				
	Probit			*LPM*	
	Probit	Stepwise	Stepwise (*nat_re*)	LPM	LPM, subset
nat_re	0.035		0.041	0.010	0.010*
	(0.032)		(0.032)	(0.008)	(0.005)
dem_score	0.069			0.120	0.117
	(0.421)			(0.118)	(0.071)
HDI	−0.998			−1.357	
	(4.422)			(1.504)	
voice_acc	0.584			−0.033	
	(0.919)			(0.236)	
pol_stab	0.806	0.730*	0.669	0.151	
	(0.548)	(0.423)	(0.449)	(0.116)	
gov_eff	3.821**	2.578**	2.777**	1.008***	0.945***
	(1.484)	(1.202)	(1.236)	(0.315)	(0.299)
reg_quality	−2.636**	−2.044*	−2.274**	−0.485	−0.521*
	(1.330)	(1.103)	(1.140)	(0.315)	(0.268)
rule	−1.158			−0.490	−0.551
	(1.625)			(0.553)	(0.479)
coc	−2.074*	−1.978**	−1.618*	−0.473	−0.333
	(1.154)	(0.955)	(0.919)	(0.300)	(0.247)
soviet_arms	0.005	0.005	0.006	0.0001**	0.0001***
	(0.006)	(0.004)	(0.004)	(0.00005)	(0.00003)
gdp_growth	0.108			−0.004	
	(0.128)			(0.030)	
Constant	−1.015	−0.471	−0.732*	0.506	−0.333
	(3.320)	(0.382)	(0.445)	(1.120)	(0.410)
Observations	44	44	44	44	44
R^2				0.359	0.328
Adjusted R^2				0.139	0.197
Log Likelihood	-19.081	-21.060	-20.185		
Akaike Inf. Crit.	62.162	54.120	54.370		
Residual Std. Error				0.469 (df = 32)	0.453 (df = 36)

Note: *p<0.1; **p<0.05; ***p<0.01

Chapter 6

Summary of Results

Natural Resources Rents have a positive, but insignificant effect, both in the probit and linear model. The variable is excluded from stepwise, but is included in subset and the coefficient is significant at a 10% level.

Democracy Score has a positive, but insignificant effect, both in the probit and linear model. The variable is excluded in stepwise but kept in the subset regression.

HDI(Human Development Index) has a negative, but insignificant effect, both in the probit and linear model, and is excluded in stepwise and subset regression.

Voice and Accountability has a positive, but insignificant effect in the probit model, and negative but insignificant effect in the linear model. The variable is excluded by both stepwise and subset regression.

Political Stability and Absence of Violence/Terrorism is positive but not significant in the probit model and linear model, is postive and significant in stepwise, but excluded in subset regression.

Government Effectiveness has a positive and significant effects in all models.

Regulatory Quality has a negative and significant effect in all models, except in the linear model where the effect is still negative, but not significant.

Rule of Law has a negative, but insignificant effect in probit, linear model, and stepwise. The variable is excluded after subset regression.

Control of Corruption has a negative and significant effect in all probit models, including stepwise. Negative, but insignificant effect in linear and subset.

Soviet Arms has a positive, but insignificant effect in the probit model and both stepwise models, but a positive and significant effect in the linear model and subset regression.

GDP Growth has a positive and insignificant effect in the probit model, and a negative and insignificant effect in the linear model. The variable is dropped from all stepwise and subset regressions.

Chapter 7

Discussion

Summarizing the results from chapter 5 and 6, it is evident that regardless of which model is chosen the variables that are of statistical significance do not change drastically, and indicators related to quality of institutions appear to be the main determining variables for attracting Chinese FDI to SSA. Having used various measures of institutional quality, it is interesting to note that some of the coefficients are positive while others are negative, as other studies have also arrived at some indicators of quality of institutions having opposite effects. As for natural resources, the effect is positive in both the probit and linear models, but never significant at a 5% level. Explanations of my results, and comparisons with existing studies on the importance of natural resources and quality of institutions will be done in chapter 7.1 and 7.2, respectively. Potential weaknesses and limitations of my thesis, related to the data, method and the selected variables will be discussed in chapter 7.3 .

7.1 Natural Resources

The results obtained throughout all models used in this thesis suggest that natural resources do not have a significant effect on attracting Chinese FDI to Sub-Saharan Africa. This supports previous findings by others such as Shan et al. (2018), Y. Chen et al. (2020), and Cheung and Qian (2009). By using panel data across 22 countries for the period 2008-2014, Shan et al. (2018) found that natural resources did not play a significant role in attracting Chinese FDI. Motives of resource seeking were found to be only one of many in Cheung and Qian (2009), in which panel data for the period 1991-2005 was explored. Their results do not support the view that China has invested disproportionally large amounts in African and oil-producing countries. Similar results were found by Y. Chen et al. (2020), in which it was found through use of panel data for the period 2003-2013, that Chinese FDI is attracted to natural resources, but no more so than FDI from the West. The authors suggest that the impression of resource seeking stems from the fact that Chinese corporations have increased their investment activity on the African

continent in the last decades, giving rise to speculations of resource seeking motives. However, FDI in natural resources as a share of total Chinese FDI in Africa, is no more than that share for other countries including the West.

My findings contradict the result presented by W. Chen et al. (2016), Shoham and Rosenboim (2009), and Sanfilippo (2010), as all found natural resources to be a key factor in attracting Chinese FDI to SSA, at a statistically significant level. Buckley et al. (2009) examined the period from 1984 to 2001, using pooled ordinary least squares (POLS) and the random effects (RE) generalised least squares method. Result point to a clear shift in Chinese FDI, where natural resources are a significant determinant of FDI from 1992 and onwards. Zhang and Daly (2011) used panel data analysis for the period 2003-2009 and found that Chinese FDI seems to be directed at open economic regimes and resources-rich countries, but that a positive and significant relationship between China's outward FDI and resources was only found in 16 of the 23 countries in their sample. This study did not examine SSA countries in particular, although several are included. Results from W. Chen et al. (2016) in which fixed effects for both sectors and countries were included, in addition to several interactions terms for separating sectors based on skills and capital intensity, also point to Chinese FDI being attracted by natural resources in SSA, but not to a larger extent than Western FDI. Wei and Alon (2010) found that natural resources were one of the primary determinants of Chinese outward FDI, although this study did not examine the case of SSA in particular. Kolstad and Wiig (2012) found Chinese FDI to be attracted by natural resources, in poorly governed countries. In this study the authors interact the institutional and natural resource variables, which can cause issues related to multicollinearity. However, by computing the VIF (see appendix D for definition of, and discussion on VIF), it was seen that multicollinearity was only a problem in one of the sub-samples.As in other studies, lagged explanatory variables are used to deal with endogeneity or reverse causality. The authors also add that endogeneity problems are unlikely to matter, since Chinese FDI is still too minor in most countries to affect institutions.

Although the positive relationship between natural resources and FDI is found in my results as well, only the coefficient in subset regression is significant, and only at a 10% level.

The role of natural resources in the Belt-and-Road initiative has also been studied, again arriving at different conclusions. Results from Chang (2014) indicate that the motive of fuel extraction does not only have a positive and significant effect, but that it plays a key role in explaining Chinese FDI in African countries. Contrary to this, Liu, Tang, Chen, and Poznanska (2017) finds that countries in BRI are not

seen as natural resources providers, and that Chinese FDI is motivated by market seeking and domestic manufacturing capacity.

In this thesis natural resources rents have been used as an indicator of natural resources in a country. However, a country can be abundant in natural resources, but have strong governance and strict regulations for extraction and exports, leading to a lower level of natural resources rents. The opposite can also be true, and countries with less natural resource wealth can still have relatively high resources rents. In order to evaluate if a natural resource quest is one of the primary motivations for investing in SSA, I would argue that natural resources rents can be a good measure. Seen from a Chinese firm's perspective, if they do engage in FDI for reasons of resource seeking as mentioned in chapter 3.1, two assumptions should hold. (1) The country must possess natural resources, and (2) it must be possible to extract these and profit from them. Hence, if looking only at countries that are resource rich, without taking into consideration whether they have strict regulations for extraction, this would not be captured by the data. Previous studies of Chinese FDI to SSA have also used natural resources rents for determining the role of natural resources, (Kolstad & Wiig, 2012; Shan et al., 2018), as have studies investigating the role of natural resources on growth in SSA (Lee & Gueye, 2022). Kolstad and Wiig (2012) explicitly mentions that what would be attractive to investors are natural resource rents rather than what is in the ground. In addition, several of the countries that are frequently mentioned as being resource rich measured by other methods, such as natural wealth per capita, also have high resources rents. For the above reasons I find total natural resources rents to be a suitable measure for natural resources, and its importance for attracting Chinese FDI. The data from the World Bank on natural resources rents does, however, have a glaring weakness, as it does not include rents from diamonds, hereby resulting in the total natural resources rents being underestimated in countries such as Botswana, South Africa and Sierra Leone. Cobalt, lithium, platinum and palladium are not included either, although SSA is one of the primary regions for extraction of these minerals. In 2020 China's share of mineral exports from SSA was approximately 44% (World Integrated Trade Solution, 2020), giving reason to believe that minerals play a larger role than the data shows.

There could obviously be several reasons for why the role of natural resources does not seem to be as significant as expected, due to both the measure used and weaknesses in the data. It could also be that other characteristics are indeed more important for attracting FDI, and that quality of institutions, which will be discussed next, is a better indicator of what attracts Chinese FDI to SSA.

7.2 Quality of Institutions

Government Effectiveness is positive and significant in all models, and as previously described is a measure of the quality of public services, civil service, the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. As most firms would view a stable environment for investments and a credible government favourably, this seems intuitively reasonable. On the other hand, all these characteristics could imply that it would be more challenging to avoid transparent deals, to bribe politicians and government officials, and to exploit and take advantage of both labour and natural resources. Whether this defines China's presence in SSA or not is up for debate, but all else equal, my findings indicate that the traits of government effectiveness outlined above are important for attracting Chinese FDI. The result strengthens aforementioned findings (Asiedu, 2006; Asiedu & Lien, 2011; Adegboye et al., 2020), in which quality of institutions have a significant effect on FDI inflows to Sub-Saharan Africa. Positive and significant effects on FDI of increased government effectiveness are also in line with the previously mentioned results from Asiedu (2006).

Rule of Law was found to have a negative, but insignificant relation to Chinese FDI in W. Chen et al. (2016), in which data from MOFCOM for the period 1998-2013 was analysed. This is similar to my results, as the corresponding coefficient is negative in both the probit and linear models, perhaps indicating that countries with weaker property rights are still seen as suitable for investments. If a firm wants to extract as much of a natural resource as possible, or set up facilities at specific locations, weaker property rights could be advantageous. However, the effect is not significant at any level, indicating that rule of law is neither a very important nor defining characteristics of those countries that have attracted Chinese FDI.

Regulatory Quality is negative and significant in four out of five models, and captures perceptions of the government's ability to promote private sector development. Somewhat surprising, as a stronger private sector should be beneficial for both incumbent firms and the ones looking to enter the market. A possible explanation for this could be that the competition is fiercer as many firms are already established, and as such there could be major barriers to entry which could have a deterrent effect on Chinese FDI. This is in line with results from Shan et al. (2018).

Control of Corruption has a negative and significant effect in the three probit models, and a negative and insignificant effect in the LPM. As seen in chapter 3.6, some speculate that China favours countries similar to their own in terms of politics and governance, explaining a possible attraction to countries with weaker or less democratic institutions. Combined with a desire to avoid transparency and scrutiny, this could explain why less control of corruption could be an attractive characteristic in this setting. No significant relationship was found in (Shan et al., 2018; Cleeve, 2012). As a possible explanation for why no positive effect was found of increased control of corruption, Shan et al. (2018) suggest that as China has a high corruption level, a similarly high level of corruption in a host country might not have such a deterrent effect. Others find a positive and significant relationship (Asiedu, 2006; Makonda and Ngakala, 2021). My findings are similar to those of Gossel (2018), who further found that FDI to SSA is attracted rather by rising than falling levels of corruption when democracy is low, noting however that corruption can negatively affect FDI as democracy improves over time. In this study a generalized method of moments(GMM) was used, in the form of the Arellano-Bond estimator. By including lagged variables possible endogeneity issues can be accounted for, which described as being particularly applicable to FDI, as a result of investors tending to channel more FDI to regions that have already attracted FDI.

Political Stability and Absence of Violence/Terrorism is positive but not significant in the initial probit and LPM models, but is positive and significant in stepwise regression. As having to take into account threats of political changes that can happen quickly and the potential threat of terrorism makes for an unsuitable investing environment, this is perhaps an expected result, also found by Adegboye et al. (2020). It is also similar to results in W. Chen et al. (2016), in which the authors explained the differences in results for rule of law and political stability, by the fact that a significant share of Chinese investment deals in SSA are done state-to-state. Hence, it seems reasonable for China to be more concerned with the political stability of the government, rather than with the environment of rule of law in the domestic economy. My result contradict Shan et al. (2018), which point to a negative effect. Explaining their result, the authors suggest that the cause is probably a political one, as politically unstable African countries and China may have bilateral political agreements that help reduce the risks of Chinese investments.

Voice and Accountability is positive in the probit model, negative in the LPM, and never significant. It is also excluded from both stepwise and subset, and as seen in table 5.5 is only added in the models with ten and eleven variables. This implies that it would not lead to accurate predictions of Chinese FDI, and that it shows no clear pattern for the observations in my sample. Shan et al. (2018) found a positive and significant relationship, as did Adegboye et al. (2020) (although not examining the case of Chinese FDI in particular), explaining that challenges related to accountability would deter FDI.

Soviet Arms has a positive and insignificant effect in the probit models, and a positive and significant effect in the LPM and in the subset regression. The definition given earlier was "Cumulative arms transfer deliveries from USSR to Sub-Saharan African countries for the period 1985-1989". Needless to say, China does not invest in a SSA country because of arms deals done decades ago, but as explicitly stated several times, determining causal effects is not the aim. This variable should rather be seen as an interesting proxy, perhaps for pro-communist regimes, negative attitudes towards Western investors or obviously as a measure of conflict or civil war.

HDI and *GDP Growth* are insignificant in all models, and not part of the selected variables in stepwise and subset regressions. The coefficient for *HDI* is negative in both the probit model and the LPM, while *GDP Growth* shows a positive relationship in the probit model and a negative in the LPM. It is interesting and surprising that these seem to have little predictive ability for FDI, as it can be argued that these are the variables most related to the economy, out of all the explanatory variables included. A possible explanation could be that China is more interested in "tomorrow's winners", rather than in those who have already experienced significant growth. It can also be speculated that countries lacking economic prowess are less reluctant to trade their natural resources for much needed infrastructure. However, as none of these variables are significant in any of the models in my thesis, their importance for predicting FDI seems negligible, according to the obtained results.

Democracy Score has a positive but insignificant effect in the probit model and LPM, but is excluded from both stepwise and subset regressions. It shows a rather high correlation with some of the governance indicators, but not at a level that should be cause for concern. Examining the effect of democracy on FDI inflows in developing countries, Li and Resnick (2003) used data structured as time series and cross section (TSCS), and panel-corrected standard errors to mitigate the potential violations of assumptions such as heteroscedasticity, autocorrelation, and

contemporaneous correlation in the error term. Independent variables were also lagged, in order to control for the possible reciprocal effects of FDI inflows. As mentioned in chapter 3.6, their results show that democracy has conflicting findings on FDI- While increased democracy leads to improved property rights, which in turn increases FDI flow. However, while increasing levels of democracy can lead to improvements in the judicial systems and rule of law, these higher levels of democracy also drive foreign investors away, due to the imposed constraints on both foreign capital and the host government. This is similar to my findings for *Rule of Law*, as discussed above.

7.3 Limitations and Improvements

Potential issues as result of measurement errors in the data capturing Chinese investments, and due to governance indicators being perception-based measured, were mentioned in chapter 4.1. Data on low-income countries tends to suffer from both worse availability and less accuracy, and as such these are likely culprits of any errors in the data that deviate substantially from the true values. Although the aim of this thesis has not been to determine a causal effect, it is worth considering if there is omitted variable bias, meaning that the effect of a variable not included is attributed to one included in the model. Much has been written on the topics related to natural resources, growth and qualities of institutions, such as the Dutch disease and the previously mentioned resource curse. Whether this is only a correlation or a causal effect is difficult to determine, as discussed further in Torvik (2009). Similarly, natural resources can be correlated to many of the included variables in my model. As seen in the correlation matrix in appendix D.2, natural resources are negatively correlated to several of the governance indicators. A possible explanation for this could be that countries with weaker institutional quality also extract more of their natural resources, as a result of more grabber friendly institutions. It is therefore likely that the variable used for natural resources does not isolate the effect of natural resources entirely, but is also influenced by other variables, either included or omitted ones. This could also explain why the effect of natural resources was significant in the initial models, before adding variables for governance indicators.

As for the role of quality of institutions, various political systems are not accounted for directly, such that an effect of democracies, monarchies, authoritarian and totalitarian regimes will not be captured directly, but perhaps reflected in the democracy score. Taxes and tariffs are not included in my models, and it can be reasoned that those countries with a higher quality of institutions have a more

effective and reliable tax system, such that the effect is displayed in the variable for government effectiveness and regulatory quality instead. Under the assumption that Chinese FDI is guided by aims of political expansion and promises of support in international mattes, it is likely that this can be correlated with variables that measure corruption, or lack thereof. Religious aspects are likely to influence governance indicators such as political stability and absence of violence/terrorism, in the extreme case of religiously motivated terrorism.

Methodological improvements could likely have been achieved by use of panel data, which are also better suited to determining causal effects. The data I have used is cross sectional, as I have used average effects over time for both investments and natural resources rents. Interaction terms are also used in several of the studies, and could have been useful in an attempt to further distinguish between natural resources and quality of institutions. However, much of the conflicting results from studies examining the role of natural resources have models that are to some degree similar, as many use panel data in the form of GMM or OLS, also adding instrumental variables and interaction terms, and controlling for endogeneity. In addition the sources for natural resources differ, and the time periods observed are often overlapping, but not identical. For this reason its difficult to rank the quality of the existing literature, and compare the validity of the results across studies. They do however share similarities as mentioned, and applying some of the aforementioned methods would likely have improved the methods used in my thesis.

Using a probit model and a LPM, as well as the subsequent variations in form of stepwise and subset regressions, my results can possibly serve as an additional indicator of the determinants of Chinese FDI in Sub-Saharan Africa, although derived by less sophisticated models. The data set used in this thesis also includes investments as recent as May 2022, capturing potential changes of Chinese FDI in recent years, which can be useful starting points for further research.

Chapter 8

Conclusion

The aim of this thesis has been to evaluate the importance of natural resources and institutional quality in attracting Chinese FDI to Sub-Saharan African countries. As discussed, the results vary depending on which regression method is applied, but the variables that are of statistical significance do not change drastically, and indicators related to quality of institutions seem to be the main determining variables. My findings indicate that China prefers to invest in countries that are characterized by government effectiveness, but also those with a lower control of corruption. Natural resources seem to have a positive effect, yet a significance level of 5% is not reached in any of my models. Hence, there is little evidence in support of the prevailing notion that Chinese FDI is primarily or solely motivated by a quest for natural resources, although little can be said about the causal relationships.

These findings suggest that Chinese FDI in SSA is predominantly aimed towards countries facing problems related to corruption and weaker regulatory quality. As such, it is advisable that Chinese FDI should be subject to an increased degree of scrutiny, in order to prevent exploitation of domestic firms. Natural resources and their exact importance remains ambiguous, hence FDI inflows to the associated sectors should also be monitored closely as a preventative measure.

Future studies should attempt to further separate the role of natural resources and quality of institutions, and strive to estimate their importance for attracting Chinese FDI to Sub-Saharan Africa.

References

Adegboye, F. B., Osabohien, R., Olokoyo, F. O., Matthew, O., & Adediran, O. (2020). Institutional quality, foreign direct investment, and economic development in sub-Saharan Africa. *Palgrave Communications*, *7*(1), 1–9. doi:10.1057/s41599-020-0529-x

Ado, A., & Su, Z. (2016). China in africa: A critical literature review. *critical perspectives on international business*. Retrieved from https://www.emerald.com/insight/content/doi/10.1108/cpoib-05-2013-0014/full/html?mobileUi=0&fullSc=1

Altman, E. (2000). Revisiting the z-score and zeta®. *Predicting Financial Distress of Companies*, 2–16. Retrieved from https://pages.stern.nyu.edu/~ealtman/PredFnclDistr.pdf

Altman, E. I. [Edward I], Iwanicz-Drozdowska, M., Laitinen, E. K., & Suvas, A. (2014). Distressed firm and bankruptcy prediction in an international context: A review and empirical analysis of altman's z-score model. *Available at SSRN 2536340*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2536340

Altman, E. I. [Edward I.]. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The Journal of Finance*, *23*(4), 589–609. Retrieved November 3, 2022, from http://www.jstor.org/stable/2978933

Antràs, P., & Yeaple, S. R. (2014). Chapter 2 - multinational firms and the structure of international trade. In G. Gopinath, E. Helpman, & K. Rogoff (Eds.), *Handbook of international economics* (Vol. 4, pp. 55–130). doi:https://doi.org/10.1016/B978-0-444-54314-1.00002-1

Asiedu, E. (2006). Foreign direct investment in africa: The role of natural resources, market size, government policy, institutions and political instability. *The World Economy*, *29*(1), 63–77. doi:https://doi.org/10.1111/j.1467-9701.2006.00758.x. eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1467-9701.2006.00758.x

Asiedu, E. (2013). Foreign direct investment, natural resources and institutions. *International Growth Centre*, *47*. Retrieved from https://www.theigc.org/wp-content/uploads/2014/09/Asiedu-2013-Working-Paper.pdf

Asiedu, E., & Lien, D. (2011). Democracy, foreign direct investment and natural resources. *Journal of International Economics*, *84*(1), 99–111. doi:https://doi.org/10.1016/j.jinteco.2010.12.001

Basu, A., & Srinivasan, K. (2002). Foreign direct investment in africa-some case studies. Retrieved from https://www.imf.org/external/pubs/ft/wp/2002/wp0261.pdf

Bhattacharyya, S., & Hodler, R. (2010). Natural resources, democracy and corruption. *European Economic Review*, *54*(4), 608–621. doi:https://doi.org/10.1016/j.euroecorev.2009.10.004

Borensztein, E., De Gregorio, J., & Lee, J.-W. (1998). How does foreign direct investment affect economic growth? *Journal of International Economics*, *45*(1), 115–135. doi:https://doi.org/10.1016/S0022-1996(97)00033-0

Brunnschweiler, C. N., & Bulte, E. H. (2008). The resource curse revisited and revised: A tale of paradoxes and red herrings. *Journal of Environmental Economics and Management*, *55*(3), 248–264. doi:https://doi.org/10.1016/j.jeem.2007.08.004

Brunnschweiler, C. N., & Bulte, E. H. (2009). Natural resources and violent conflict: resource abundance, dependence, and the onset of civil wars. *Oxford Economic Papers*, *61*(4), 651–674. doi:10.1093/oep/gpp024. eprint: https://academic.oup.com/oep/article-pdf/61/4/651/14104406/gpp024.pdf

Buckley, P., Clegg, L., Cross, A., Liu, X., Voss, H., & Zheng, L. (2009). The determinants of chinese outward foreign direct investment. *Journal of International Business Studies*, *40*, 353–354. doi:10.1057/jibs.2008.102

Center for Strategic and International Studies (CSIS). (2021). China and smes in sub-saharan africa: A window of opportunity for the united states. Retrieved from https://www.csis.org/analysis/china-and-smes-sub-saharan-africa-window-opportunity-united-states

Chang, S.-C. (2014). The determinants and motivations of china's outward foreign direct investment: A spatial gravity model approach. *Global Economic Review*, *43*(3), 244–268. doi:10.1080/1226508X.2014.930670. eprint: https://doi.org/10.1080/1226508X.2014.930670

Chen, W., Dollar, D., & Tang, H. (2016). Why Is China Investing in Africa? Evidence from the Firm Level. *The World Bank Economic Review*, *32*(3), 610–632. doi:10.1093/wber/lhw049. eprint: https://academic.oup.com/wber/article-pdf/32/3/610/26003568/lhw049.pdf

Chen, Y., Zhai, R., & Zhang, K. H. (2020). Natural resources and foreign direct investment in africa: Evidence from chinese firms. *Sustainability*, *12*(22). doi:10.3390/su12229616

Cheung, Y.-W., & Qian, X. (2009). Empirics of china's outward direct investment. *Pacific Economic Review*, *14*(3), 312–341. doi:https://doi.org/10.1111/j.1468-0106.2009.00451.x. eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1468-0106.2009.00451.x

Cleeve, E. (2012). Political and institutional impediments to foreign direct investment inflows to sub-saharan africa. *Thunderbird International Business Review*, *54*(4), 469–477. doi:https://doi.org/10.1002/tie.21477. eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/tie.21477

Collier, P., & Gunning, J. W. (1999). Why has africa grown slowly? *Journal of economic perspectives*, *13*(3), 3–22.

Congressional Research Service. (2020). *Tracking China's Global Economic Activities: Data Challenges and Issues for Congress*. Congressional Research Service. Retrieved from https://sgp.fas.org/crs/row/R46302.pdf

Crescenzi, R., & Limodio, N. (2021). The impact of chinese fdi in africa: Evidence from ethiopia. Retrieved from http://eprints.lse.ac.uk/108455/

Dollar, D. (2016). *China's engagement with africa: From natural resources to human resources*. Brookings. The John L. Thornton China Center. Retrieved from https://www.brookings.edu/wp-content/uploads/2016/07/Chinas-Engagement-with-Africa-David-Dollar-July-2016-1.pdf

Dramani, J. B., Rahman, Y. A., Sulemana, M., & Owusu-Takyi, P. (2022). Natural resource dependence and economic growth in ssa: Are there threshold effects? *Development Studies Research*, *9*(1), 230–245. doi:10.1080/21665095.2022.2112728. eprint: https://doi.org/10.1080/21665095.2022.2112728

Dunning, J. H. [John H]. (1980). Toward an eclectic theory of international production: Some empirical tests. *Journal of international business studies*, *11*(1), 9–31. Retrieved from https://link.springer.com/article/10.1057/palgrave.jibs.8490593

Dunning, J. H. [John H.]. (1979). Explaining changing patterns of international production: In defence of the eclectic theory. *Oxford Bulletin of Economics and Statistics*, *41*(4), 269–295. doi:https://doi.org/10.1111/j.1468-0084.1979.mp41004003.x. eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1468-0084.1979.mp41004003.x

Dunning, J. H. [John H.]. (2000). The eclectic paradigm as an envelope for economic and business theories of mne activity. *International Business Review*, *9*(2), 163–190. doi:https://doi.org/10.1016/S0969-5931(99)00035-9

European Bank for Reconstruction and Development. (2020). Belt and road initiative (bri). Retrieved from https://www.ebrd.com/what-we-do/belt-and-road/overview.html

Fayissa, B., & Nsiah, C. (2013). The impact of governance on economic growth in africa. *Journal of Developing Areas*, *47*(1), 91–108. Retrieved from https://EconPapers.repec.org/RePEc:jda:journl:vol.47:year:2013:issue1:pp:91-108

fDi Intelligence. (2021, January). Proof chinese investment can boost african economies. Retrieved from https://www.fdiintelligence.com/content/feature/proof-chinese-investment-can-boost-african-economies-79531

Feldstein, M. (2000). Aspects of global economic intergration: Outlook for the future. (NBER Working Papers 7899).

Foster, V. (2009). *Building bridges: China's growing role as infrastructure financier for sub-saharan africa*. World Bank Publications.

Görg, H., & Greenaway, D. (2004). Much Ado about Nothing? Do Domestic Firms Really Benefit from Foreign Direct Investment? *The World Bank Research Observer*, *19*(2), 171–197. doi:10.1093/wbro/lkh019. eprint: https://academic.oup.com/wbro/article-pdf/19/2/171/4667308/lkh019.pdf

Gossel, S. J. (2018). Fdi, democracy and corruption in sub-saharan africa. *Journal of Policy Modeling*, *40*(4), 647–662. doi:https://doi.org/10.1016/j.jpolmod.2018.04.001

Green Finance & Development Center. (2022). About the belt and road initiative (bri). Retrieved from https://greenfdc.org/belt-and-road-initiative-about/

Härdle, W. K., & Simar, L. (2012). Discriminant analysis. In *Applied multivariate statistical analysis* (pp. 351–366). doi:10.1007/978-3-642-17229-8_13

Havranek, T., & Irsova, Z. (2010). *Which foreigners are worth wooing? a meta-analysis of vertical spillovers from fdi*. William Davidson Institute Working Papers Series.

Hlavac, M. (2022). *Stargazer: Well-formatted regression and summary statistics tables*. R package version 5.2.3. Social Policy Institute. Bratislava, Slovakia. Retrieved from https://CRAN.R-project.org/package=stargazer

Huang, Y. (2016). Understanding china's belt & road initiative: Motivation, framework and assessment. *China Economic Review*, *40*, 314–321. doi:https://doi.org/10.1016/j.chieco.2016.07.007

Hymer, S. H. (1960). *The international operations of national firms, a study of direct foreign investment* (Doctoral dissertation, Massachusetts Institute of Technology). Retrieved from https://dspace.mit.edu/handle/1721.1/27375

Ideue, K. (2019). Recent trends in foreign direct investment in sub-saharan africa, 43–64. Retrieved from https://www.ide.go.jp/library/Japanese/Publish/Reports/Seisaku/pdf/2018_1_10_001_ch03.pdf

International Monetary Fund. (2022). World Economic Outlook Database. Retrieved from https://www.imf.org/en/Publications/WEO/weo-database/

2022 / April / select - countries ? grp = 2603 & sg = All - countries / Emerging - market-and-developing-economies/Sub-Saharan-Africa

Izvorski, I. (2018). 7 surprising findings about resource-rich sub-saharan africa. Retrieved from https://www.brookings.edu/blog/future-development/2018/08/01/7-surprising-findings-about-resource-rich-sub-saharan-africa/

Izvorski, I., Coulibaly, S., & Doumbia, D. (2018). *Reinvigorating growth in resource-rich sub-saharan africa*. doi:10.1596/30399

Jauch, H. (2011). Chinese investments in africa: Twenty-first century colonialism? In *New labor forum* (Vol. 20, pp. 49–55). SAGE Publications Sage CA: Los Angeles, CA.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). The worldwide governance indicators: Methodology and analytical issues. *World Bank, Working Paper Series 5430*, *3*. doi:10.1017/S1876404511200046

Kolstad, I., & Wiig, A. (2012). What determines chinese outward fdi? *Journal of World Business*, *47*(1), 26–34. Focus on China Special Section. doi:https://doi.org/10.1016/j.jwb.2010.10.017

Landry, D. (2018). The risks and rewards of resource-for-infrastructure deals: Lessons from the congo's sicomines agreement. *Resources Policy*, *58*, 165–174. doi:https://doi.org/10.1016/j.resourpol.2018.04.014

Langer, W., & Luther. (2016). The assessment of fit in the class of logistic regression models: A pathway out of the jungle of pseudo-r^2s with an extension to multinomial logit models. Retrieved from https://www.researchgate.net/publication/268055438_The_Assessment_of_Fit_in_the_Class_of_Logistic_Regression_Models_A_Pathway_out_of_the_Jungle_of_Pseudo-Rs_with_an_Extension_to_Multinomial_Logit_Models

Lee, M., & Gueye, C. A. (2022). Do resource windfalls improve standard of living in sub-saharan african countries? *Applied Economics*, *0*(0), 1–19. doi:10.1080/00036846.2022.2095341. eprint: https://doi.org/10.1080/00036846.2022.2095341

Li, Q., & Resnick, A. (2003). Reversal of fortunes: Democratic institutions and foreign direct investment inflows to developing countries. *International Organization*, *57*(1), 175–211. doi:10.1017/S0020818303571077

Liu, H. Y., Tang, Y. K., Chen, X. L., & Poznanska, J. (2017). The determinants of chinese outward fdi in countries along "one belt one road". *Emerging Markets Finance and Trade*, *53*(6), 1374–1387. doi:10.1080/1540496X.2017.1295843. eprint: https://doi.org/10.1080/1540496X.2017.1295843

Makonda, J., & Ngakala, O. (2021). Natural resource endowments and foreign direct investment flows in sub-saharan african countries. *Modern Economy*, *12*, 154–173. doi:10.4236/me.2021.121008

McGrattan, E. R. (2011). *Transition to fdi openness: Reconciling theory and evidence* (Working Paper No. 16774). National Bureau of Economic Research. doi:10.3386/w16774

Medin, H., & Gåsemyr, H. J. (2021). Utenlandske direkteinvesteringer og eierskap i norge. *NUPI Working Paper*. Retrieved from https://www.nupi.no/en/publications/cristin-pub/utenlandske-direkteinvesteringer-og-eierskap-i-norge

Mehlum, H., Moene, K., & Torvik, R. (2006). Institutions and the resource curse. *The Economic Journal*, *116*(508), 1–20. Retrieved from https://academic.oup.com/ej/article/116/508/1/5089390

Michałowski, T. (2012). Foreign direct investment in sub-saharan africa and its effects on economic growth of the region. Working Papers Institute of International Business University of Gdañsk(31. Retrieved from http://bazekon.icm.edu.pl/bazekon/element/bwmeta1.element.ekon-element-000171241773

Morck, R., Yeung, B., & Zhao, M. (2008). Perspectives on china's outward foreign direct investment. *Journal of International Business Studies*, *39*(3), 337–350. Retrieved November 7, 2022, from http://www.jstor.org/stable/25483271

Morisset, J. (1999). *Foreign direct investment in africa: Policies also matter*. doi:10.1596/1813-9450-2481. eprint: https://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-2481

Munnell, A. H., Tootell, G. M. B., Browne, L. E., & McEneaney, J. (1996). Mortgage lending in boston: Interpreting hmda data. *The American Economic Review*, *86*(1), 25–53. Retrieved November 3, 2022, from http://www.jstor.org/stable/2118254

Nedopil, C. (2022). Countries of the belt and road initiative. Retrieved from https://greenfdc.org/countries-of-the-belt-and-road-initiative-bri

Nissanke, M., & Söderberg, M. (2011). The changing landscape in aid relationships in africa: Can china's engagement make a difference to african development? ui papers(2. Retrieved from https://eprints.soas.ac.uk/13323/1/Nissanke-Soderberg-_UI_paper.pdf

Nuetah, J., & Xin, X. (2019). Has china's investment pattern in sub-saharan africa been driven by natural resouce quest? *Global Journal of Emerging Market Economies*, 215–231. doi:10.1177/0974910119887065

Odenthal, L. (2001). Fdi in sub-saharan africa. (173). doi:https://doi.org/10.1787/438286177367

OECD. (2018). *The belt and road initiative in the global trade, investment and finance landscape*. doi:https://doi.org/https://doi.org/10.1787/bus_fin_out-2018-6-en

OECD. (2022, July). Foreign direct investment (FDI). Retrieved from https://www.oecd-ilibrary.org/finance-and-investment/foreign-direct-investment-fdi/indicator-group/english_9a523b18-en

Robinson, J. A., Acemoglu, D., & Johnson, S. (2003). An african success story: Botswana. In D. Rodrik (Ed.), *In search of prosperity: Analytic narratives on economic growth* (pp. 80–119). Princeton: Princeton University Press.

Sachs, J.-D., & Warner, A. (1995). *Natural resource abundance and economic growth*. Harvard - Institute for International Development. Retrieved from https://EconPapers.repec.org/RePEc:fth:harvid:517a

Sanfilippo, M. (2010). Chinese fdi to africa: What is the nexus with foreign economic cooperation?*. *African Development Review*, *22*(s1), 599–614. doi:https://doi.org/10.1111/j.1467-8268.2010.00261.x. eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1467-8268.2010.00261.x

Sebudubudu, D., & Mooketsane, K. (2016). Why botswana is a deviant case to the natural resource curse. *The African Review: A Journal of African Politics, Development and International Affairs*, *43*(2), 84–96. Retrieved October 16, 2022, from http://www.jstor.org/stable/45341722

Shan, S., Lin, Z., Li, Y., & Zeng, Y. (2018). Attracting chinese fdi in africa: The role of natural resources, market size and institutional quality. *Critical Perspectives on International Business*, *14*. doi:10.1108/cpoib-11-2016-0055

Shoham, A., & Rosenboim, M. (2009). China's new approach to odi in africa: A model for a government seeking natural resources. (pp. 216–230). doi:10.1057/9780230274181_9

Smith, G. (2018). Step away from stepwise. *Journal of Big Data*, *5*, 32. doi:10.1186/s40537-018-0143-6

Stock, J., & W.Watson, M. (2019). *Introduction to econometrics* (fourth). Pearson Education Limited.

The American Enterprise Institute and The Heritage Foundation. (2022). China global investment tracker. NW Washington. Retrieved from https://www.aei.org/china-global-investment-tracker/

The Economist Intelligence Unit. (2021). *Democracy index 2021: The china challenge*.

Todaro, M., & Smith, S. (2012). *Economic development*. Boston: Pearson Education.

Torvik, R. (2009). Why do some resource-abundant countries succeed while others do not? *Oxford Review of Economic Policy*, *25*(2), 241–256. doi:10.1093/oxrep/grp015. eprint: https://academic.oup.com/oxrep/article-pdf/25/2/241/4859648/grp015.pdf

Transparency International. (2021). Corruption perceptions index (cpi). Retrieved from https://www.transparency.org/en/cpi/2021

U.S. Arms Control and Disarmament Agency. (1991). *World Military Expenditures and Arms Transfers 1990*. U.S. Arms Control and Disarmament Agency. Retrieved from https://2009-2017.state.gov/documents/organization/185650.pdf

UNCTAD. (2022). *World investment report 2022* (2022nd ed.). United Nations. Retrieved from https://www.un-ilibrary.org/content/books/9789210015431

United Nations Development Programme. (2022). Human development index(hdi). Retrieved from https://hdr.undp.org/data-center/human-development-index#/indicies/HDI

Veall, M., & Zimmermann, K. (1994). Evaluating Pseudo-R 2 's for binary probit models. *Quality & Quantity: International Journal of Methodology*, *28*(2), 151–164. doi:10.1007/BF01102759

Venables, B. D., W. N.and Ripley. (2002). Classification. In *Modern applied statistics with s* (pp. 331–351). doi:10.1007/978-0-387-21706-2_12

Vines, A., Wong, L., Weimer, M., & Campos, I. (2009). Thirst for african oil: Asian national oil companies in nigeria and angola. London: Chatham House. Retrieved from https://www.chathamhouse.org/sites/default/files/r0809_africanoil.pdf

Wandeda, D. O., Masai, W., & Myandemo, S. M. (2021). Institutional quality and economic growth: Evidence from sub-saharan africa countries. *African Journal of Economic Review*, (2050-2021-1487). doi:10.22004/ag.econ.315816

Wei, W., & Alon, I. (2010). Chinese outward direct investment: A study on macroeconomic determinants. *Int. J. Business and Emerging Markets*, *2*, 352 to 369. doi:10.1504/IJBEM.2010.035663

Williams, R. (2015). Logistic regression, part i: Problems with the linear probability model (lpm). Retrieved from https://www3.nd.edu/~rwilliam/stats2/l81.pdf

Wooldridge, J. M. (2015). *Introductory econometrics: A modern approach*. Cengage learning.

World Bank. (2022a). *Exports of goods and services (current us) - china*. Retrieved from https://data.worldbank.org/indicator/NE.EXP.GNFS.CD?locations=CN

World Bank. (2022b). *Gdp (current us) - china*. Retrieved from https://data.worldbank.org/country/china?most_recent_value_desc=true

World Bank. (2022c). Mineral rents, average 2000-2010 (% of gdp) - sub-saharan africa (excluding high income). Retrieved from https://data.worldbank.org/indicator/NY.GDP.MINR.RT.ZS?locations=ZF

World Bank. (2022d). The worldwide governance indicators (wgi) project. Retrieved from https://info.worldbank.org/governance/wgi/

World Bank. (2022e). Total natural resource rents, average 2000-2010 (% of gdp) - sub-saharan africa (excluding high income). Retrieved from https://databank.worldbank.org/reports.aspx?source=2&series=NY.GDP.TOTL.RT.ZS&country=SSA#

World Integrated Trade Solution. (2020). Sub-saharan africa minerals exports by country in us$ thousand 2020. Retrieved from https://wits.worldbank.org/CountryProfile/en/Country/SSF/Year/LTST/TradeFlow/Export/Partner/by-country/Product/25-26_Minerals

Wu, H. X., & Li, Z. (2021). *Reassessing China's GDP Growth Performance: an Exploration of The Underestimated Price Effect* (Discussion papers No. 21018). Research Institute of Economy, Trade and Industry (RIETI). Retrieved from https://ideas.repec.org/p/eti/dpaper/21018.html

Zhang, X., & Daly, K. (2011). The determinants of china's outward foreign direct investment. *Emerging Markets Review*, *12*(4), 389–398. doi:https://doi.org/10.1016/j.ememar.2011.06.001

Appendices

Appendix A

Definition of Variables

china_invested Binary variable, indicating whether China is invested (1) or not (0).

coal Coal rents (in % of GDP) are the difference between the value of both hard and soft coal production at world prices and their total costs of production. Average for period 2000-2010.

coc Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

dem_score Democracy score from The Economist Intelligence Unit (2022).

forest Forest rents (in % of GDP) are roundwood harvest times the product of regional prices and a regional rental rate. Average for period 2000-2010.

gdp_growth Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2015 prices, expressed in U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Average for period 2000-2010.

gov_eff Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

HDI A composite index measuring average achievement in three basic dimensions of human development—a long and healthy life, knowledge and a decent standard of living.

minerals Mineral rents (in % of GDP) are the difference between the value of production for a stock of minerals at world prices and their total costs of production. Minerals included in the calculation are tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate. Average for period 2000-

2010.

nat_re Total natural resources rents (%of GDP). The sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents. Average for period 2000-2010..

natural_gas Natural gas rents (in % of GDP) are the difference between the value of natural gas production at regional prices and total costs of production. Average for period 2000-2010.

oil Oil rents (in % of GDP) are the difference between the value of crude oil production at regional prices and total costs of production. Average for period 2000-2010.

pol_stab Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.

reg_quality Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

rule Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

voice_acc Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.

Appendix B

Data Set

Table B.1: Complete data set, Sub-Saharan African countries and variables

	Country	china_invested	nat_re	dem_score	tot_inv_GDP	HDI	voice_acc	pol_stab	gov_eff	reg_quality	rule	coc	soviet_arms	oil	minerals	coal	forest	natural_gas	year_school	gdp_growth	hci2018
1	Angola	1	40.8	3.4	0.1	0.6	−0.8	−0.7	−1.1	−0.7	−1.0	−0.7	5,500	39.9	0	0	0.7	0.1	8.1	8.4	0.4
2	Benin	0	3.4	4.2	0.04	0.5	−0.2	−0.3	−0.2	−0.4	−0.6	−0.2	20	0.03	0.001	0	3.4	0	9.2	4.1	0.4
3	Botswana	0	3.1	7.7	0.04	0.7	0.5	1.0	0.4	0.6	0.5	0.7	20	0	2.4	0.3	0.3	0	8.1	4.0	0.4
4	Burkina Faso	0	7.0	3.8	0.004	0.4	−0.1	−1.6	−0.7	−0.5	−0.4	−0.1	40	0	0.6	0	6.5	0	6.7	5.6	0.4
5	Burundi	0	27.2	2.1	0	0.4	−1.4	−1.4	−1.3	−1.0	−1.3	−1.6	0	0	0.2	0	27.0	0	8.0	3.0	0.4
6	Cabo Verde	0	26.3	7.7	0.03	0.7	0.9	0.9	0.04	0.3	0.3	1.0	30	0	0	25.8	0.5	0		6.6	
7	Cameroon	1	7.0	2.6	0.1	0.6	−1.2	−1.4	−0.9	−0.9	−1.1	−1.1	0	4.5	0.03	0	2.5	0.01	8.7	4.0	0.4
8	Central African Republic	0	10.0	1.4	0	0.4	−1.2	−2.1	−1.6	−1.5	−1.7	−1.2	0	0	0.01	0	10.0	0	4.6	2.9	
9	Chad	1	24.8	1.7	0.3	0.4	−1.4	−1.3	−1.4	−1.2	−1.3	−1.5	0	18.8	0.005	0	6.0	0	5.4	10.0	0.3
10	Comoros	0	1.5	3.2	0	0.6	−0.7	−0.2	−1.8	−1.2	−1.2	−1.3	0	0	0	0	1.5	0	8.1	3.3	0.4
11	Congo, Dem. Rep	1	22.9	1.4	0.2	0.5	−1.2	−1.6	−1.7	−1.4	−1.7	−1.6	0	1.7	2.2	0	18.9	0.004	9.1	3.7	0.4
12	Congo, Rep.	1	47.8	2.8	0.5	0.6	−1.2	−0.6	−1.6	−1.4	−1.1	−1.4	90	43.7	0.005	0	3.9	0.2	8.9	5.2	0.4
13	Cote d'Ivoire	0	3.9	4.2	0.03	0.6	−0.5	−1.0	−0.5	−0.3	−0.6	−0.4	0	1.7	0.04	0	1.8	0.3	7.6	1.2	0.4
14	Equatorial Guinea	1	47.7	1.9	0.1	0.6	−1.7	−0.3	−1.2	−1.7	−1.2	−1.6	10	44.5	0.03	0	1.7	2.1		18.5	
15	Eritrea	1	3.6	2.0	0.1	0.5	−1.9	−1.0	−1.7	−2.3	−1.6	−1.2	0	0	0.02	0	3.6	0		0.6	
16	Eswatini	0	2.9	3.1	0	0.6	−1.3	−0.03	−0.7	−0.6	−0.6	−0.7	0	0	0	0.4	2.4	0	6.4	3.4	0.4
17	Ethiopia	1	21.7	3.3	0.1	0.5	−1.1	−2.1	−0.6	−0.9	−0.6	−0.4	3,600	0	0.1	0.001	21.6	0	7.8	8.5	0.4
18	Gabon	1	33.9	3.4	0.1	0.7	−0.9	−0.1	−0.8	−0.8	−0.7	−0.9	0	30.4	0.01	0	3.4	0.05	8.3	1.2	0.5
19	Gambia	0	3.2	4.4	0	0.5	−0.1	0.2	−0.6	−0.9	−0.4	−0.4	0	0	0	0	3.2	0	8.9	3.7	0.4
20	Ghana	1	11.4	6.5	0.1	0.6	0.5	0.1	−0.1	−0.2	−0.1	−0.1	5	0.5	2.3	0	8.6	0.001	11.9	5.6	0.4
21	Guinea	1	15.2	2.3	0.3	0.5	−1.0	−1.0	−0.9	−1.0	−1.1	−1.0	220	0	5.6	0	9.5	0	7.1	3.1	0.4
22	Guinea-Bissau	1	14.4	2.8	0.1	0.5	−0.2	−0.3	−1.4	−1.3	−1.4	−1.3	80	0	0	0	14.4	0		2.8	
23	Kenya	1	3.6	5.0	0.1	0.6	−0.4	−1.1	−0.3	−0.4	−0.4	−0.7	0	0	0.02	0	3.6	0	11.6	4.0	0.5
24	Lesotho	0	4.4	6.3	0.02	0.5	−0.02	−0.2	−0.9	−0.7	−0.4	−0.3	0	0	0	0	4.4	0	10.0	3.3	0.4
25	Liberia	1	21.3	5.4	0.1	0.5	−0.02	−0.2	−1.4	−0.9	−0.9	−0.9	0	0	0.1	0	21.2	0	4.2	2.1	0.3
26	Madagascar	0	5.2	5.7	0.04	0.5	−0.3	−0.6	−1	−0.8	−0.9	−0.9	120	0	0.01	0	5.2	0	8.4	2.9	0.4
27	Malawi	0	7.6	5.7	0.01	0.5	0.1	−0.1	−0.8	−0.8	−0.2	−0.3	0	0	0	0.05	7.6	0	9.6	4.5	0.4
28	Mali	0	6.2	3.5	0.04	0.4	−0.8	−2.4	−1.2	−0.6	−0.9	−0.9	120	0	3.1	0	3.1	0	5.8	5.3	0.3
29	Mauritania	0	18.4	4.0	0.03	0.6	−0.8	−0.7	−0.7	−1.1	−0.7	−0.8	0	2.7	10.7	3.3	1.6	0	7.4	3.2	0.4
30	Mauritius	0	0.01	8.1	0.05	0.8	0.7	0.9	0.8	1.2	0.9	0.5	5	0	0	0	0.01	0	12.5	4.4	0.6
31	Mozambique	1	8.7	3.5	0.2	0.4	−0.6	−1.2	−0.8	−0.8	−1.0	−0.8	825	0.05	0.01	0.01	7.4	1.1	7.3	7.4	0.4
32	Namibia	1	1.8	6.5	0.1	0.6	0.6	0.5	0.1	−0.005	0.4	0.3	0	0	1.3	0	0.5	0	9.4	4.5	0.4
33	Niger	1	7.5	3.2	0.2	0.4	−0.4	−1.6	−0.6	−0.7	−0.4	−0.5	0	0	0.2	0.1	7.3	0	5.5	4.4	0.3
34	Nigeria	0	16.5	4.1	0.03	0.5	−0.6	−1.8	−1.0	−0.9	−0.9	−1.1	30	14.2	0.003	0	1.7	0.6	10.2	7.7	0.4
35	Rwanda	0	6.6	3.1	0.03	0.5	−1.0	0.2	0.3	0.1	0.2	0.6	0	0	0.1	0	6.5	0	6.8	8.2	0.4
36	Senegal	1	2.5	5.5	0.1	0.5	0.2	−0.2	0.1	−0.3	−0.4	0.1	0	0	0.3	0	2.2	0.01	7.4	3.4	0.4
37	Sierra Leone	1	11.0	5.0	0.4	0.5	−0.1	−0.2	−1.1	−1.0	−0.8	−0.4	0	0	0.4	0	10.6	0	9.2	6.7	0.4
38	South Africa	0	4.8	7.0	0.01	0.7	0.8	−0.7	−0.02	−0.1	0.1	0.02	0	0.1	1.2	2.8	0.7	0.04	10.2	3.5	0.4
39	Sudan	0	11.5	2.5	0.03	0.5	−0.7	−1.9	−1.6	−1.5	−1.2	−1.3	0	11.4	0.1	0	0	0	7.1	4.8	0.4
40	Tanzania	1	5.3	5.1	0.1	0.5	−1.5	−0.4	−0.6	−0.6	−0.5	−0.4	270	0	0.9	0.005	4.3	0.1	7.2	6.4	0.4
41	Togo	0	9.4	2.8	0.03	0.5	−0.8	−0.8	−0.6	−0.6	−0.6	−0.7	0	0	2.5	0	6.9	0	9.3	2.0	0.4
42	Uganda	1	13.8	4.5	0.1	0.5	−0.8	−0.9	−0.6	−0.5	−0.4	−1.0	40	0	0.03	0	13.8	0	6.8	7.0	0.4
43	Zambia	1	14.3	5.7	0.2	0.6	−0.4	0.1	−0.8	−0.6	−0.6	−0.8	60	0	6.6	0.03	7.7	0	8.8	7.1	0.4
44	Zimbabwe	1	8.7	2.9	0.3	0.6	−1.1	−1.0	−1.2	−1.4	−1.3	−1.3	0	0	2.1	2.0	4.6	0	11.1	−2.9	0.5

Appendix C

Descriptive Statistics of Variables

Table C.1: Descriptive Statistics of Variables

Statistic	N	Mean	St. Dev.	Min	Max
china_invested	44	0.5	0.5	0	1
nat_re	44	12.9	12.0	0.01	47.8
dem_score	44	4.1	1.8	1.4	8.1
tot_inv_GDP	44	0.1	0.1	0.0	0.5
HDI	44	0.5	0.1	0.4	0.8
voice_acc	44	−0.6	0.7	−1.9	0.9
pol_stab	44	−0.7	0.8	−2.4	1.0
gov_eff	44	−0.8	0.6	−1.8	0.8
reg_quality	44	−0.7	0.6	−2.3	1.2
rule	44	−0.7	0.6	−1.7	0.9
corruption	44	−0.6	0.6	−1.6	1.0
soviet_arms	44	251.9	979.7	0	5,500
oil	44	4.9	11.9	0.0	44.5
minerals	44	1.0	2.1	0.0	10.7
coal	44	0.8	3.9	0.0	25.8
forest	44	6.2	6.3	0.0	27.0
natural_gas	44	0.1	0.4	0.0	2.1
year_school	40	8.2	1.9	4.2	12.5
gdp_growth	44	4.8	3.2	−2.9	18.5
hci2018	39	0.4	0.1	0.3	0.6

Appendix D

Evaluation Metrics

D.1 Multicollinearity

To check for multicollinearity, the Variance Inflation Factor(VIF) can be calculated for the probit model with all variables included.

VIF does not give a clear answer regarding for which coefficients collinearity is a problem.

Table D.1: VIF

nat_re	1.459
dem_score	9.787
HDI	2.368
voice_acc	7.275
pol_stab	3.120
gov_eff	14.287
reg_quality	10.142
rule	15.746
coc	9.016
soviet_arms	1.810
gdp_growth	1.683

By the VIF values given in table D.1, it can be seen that some variables have a higher correlation, although the VIF does not specify which correlations are the cause.

It also important to keep in mind, that although a smaller VIF is preferred, it is not a necessity. If certain variables are assumed to be of importance, one should be hesitant to drop them just because of a higher VIF. As noted in Wooldridge

(2015), " looking at the size of VIF_j is of limited use, although one might want to do so out of curiosity" (p. 98) .

Elaborating on the importance of multicollinearity, or rather lack thereof, Woolridge states that "the "problem" of multicollinearity is not really well defined" (p. 96). There is no clear cut-off for when multicollinearity is regarded as being problematic, hence there is no clearly defined value that should be set as a maximum value in regressions. In order to reduce multicollinearity, independent variables can be dropped. If only the three first variables in my model are kept and the rest removed, the VIF values for the "Democracy score" is substantially reduced from 9.79 to just above 1. It would be difficult to argue that the model with only two variables constitutes an improvement over the final model, solely as a consequence of a decrease in the corresponding VIF, especially as this can lead to omission of significant explanatory variables.

Table D.2: Correlation matrix

	nat_re	dem_score	HDI	voice_acc	pol_stab	gov_eff	reg_quality	rule	coc	soviet_arms	gdp_growth
nat_re	1	−0.355	0.010	−0.366	−0.092	−0.367	−0.351	−0.354	−0.397	0.360	0.463
dem_score	−0.355	1	0.592	0.863	0.660	0.724	0.773	0.835	0.772	−0.100	−0.059
HDI	0.010	0.592	1	0.421	0.645	0.591	0.570	0.617	0.481	0.002	−0.036
voice_acc	−0.366	0.863	0.421	1	0.537	0.644	0.720	0.738	0.739	−0.130	−0.133
pol_stab	−0.092	0.660	0.645	0.537	1	0.567	0.547	0.634	0.601	−0.170	0.009
gov_eff	−0.367	0.724	0.591	0.644	0.567	1	0.907	0.929	0.878	−0.037	0.067
reg_quality	−0.351	0.773	0.570	0.720	0.547	0.907	1	0.908	0.850	−0.015	0.014
rule	−0.354	0.835	0.617	0.738	0.634	0.929	0.908	1	0.907	−0.068	0.067
coc	−0.397	0.772	0.481	0.739	0.601	0.878	0.850	0.907	1	0.021	0.010
soviet_arms	0.360	−0.100	0.002	−0.130	−0.170	−0.037	−0.015	−0.068	0.021	1	0.267
gdp_growth	0.463	−0.059	−0.036	−0.133	0.009	0.067	0.014	0.067	0.010	0.267	1

D.2 Measure of fit

As described in Stock and W.Watson (2019), the explanation for the measure of fit is as follows: "The fraction correctly predicted uses the following rule: If $Y_i = 1$ and the predicted probability exceeds 50% or if $Y_i = 0$ and the predicted probability is less than 50%, then Yi is said to be correctly predicted. Otherwise, Yi is said to be incorrectly predicted."

Although easy to understand and implement, it does not reflect the quality of the prediction. As an example, we know that China is invested in Angola, according to the method and definition in this thesis. If the model gives a 51% probability of Y = 1, meaning China has invested, it will be seen as a correct prediction according to this measure. However, the same holds true for a 90% probability, so the problem is that the measure of fit does not reflect the quality of the prediction itself. For this reason, it is regarded as an unsuitable assessment criteria for the validity of the model.

D.3 AIC

In model selection, AIC is useful for comparing models. If two models explain the same variation, the one with fewer variables will have a lower AIC score, as it requires less information but still remains as accurate as the first. AIC rewards goodness of fit, but penalizes models for using more parameters, if these don't increase the accuracy of the model. By doing this it discourages overfitting, which is helpful as adding more parameters usually increase the goodness of the fit. AIC scores can be interpreted as rankings of models, and how likely they are to minimize the information loss. Formally the AIC is given by $AIC = 2k - 2ln(\hat{L})$, with k being the number of estimated parameters and $\hat{L}$ the maximized value of the likelihood function for the model.

D.4 Pseudo R^2 and R^2

In linear regression, R^2 is used to assess goodness of fit, since it represents the proportion of variance in the criterion that is explained by the predictors. However, for logit and probit models which are non-linear, this is not a valid measure. Instead, a commonly used tool is the pseudo R^2.

Stock and W.Watson (2019) define it in the following way: "The pseudo R^2 measures the fit of the model using the likelihood function. Because the MLE maxi-

mizes the likelihood function, adding another regressor to a probit (or logit model) increases the value of the maximized likelihood, just like adding a regressor necessarily reduces the sum of squared residuals in linear regression by OLS. This suggests measuring the quality of fit of a probit model by comparing values of the maximized likelihood function with all the regressors to the value of the likelihood with none. This is, in fact, what the pseudo does".

As there are several variants that can be applied, each with their own limitations, there is no formal consensus on which method is preferred. Calculating the pseudo R^2 for the regression results where all variables are included, as presented in table 5.2, yields the following results:

Table D.3: Pseudo R^2

CoxSnell	0.404
Nagelkerke	0.539
McFadden	0.373
McKelveyZavoina	0.967

A disadvantage of pseudo R^2 is that the values can not be immediately interpreted, and is generally only useful when comparing the fit of different models with each other. However, as Veall and Zimmermann (1994) have shown (see also Langer and Luther (2016)), the McKelvey & Zavoina R^2 is the one that bears closest resemblance to the traditional R^2, hence it is the one best able to mimic the R^2 we would obtain from an OLS regression.

In OLS regressions, a high R^2 does not necessarily mean that the model is a good fit, due to the fact that it will stay the same or increase the more variables you add, regardless of their predictive ability. This is obviously a drawback, as adding independent variables that have no effect can lead to a higher R^2 and give the impression of a better fitting model. Therefore the adjusted R^2 is used instead, which takes into account the number of independent variables used. The value of R^2 will decrease if an independent variable with no explanatory effect is added, and can therefore give an indication of whether variables should be kept or removed. As previously seen, the value of the adjusted R^2 in the linear models used in this thesis range from 0.14 to 0.20. This means that the included variables explain between 14-20% of the observed variation in the model. The rather low value does not mean that the model does not give any useful insight into possible causal effects, yet it clearly implies that there are other variables involved that are not captured by the model, as discussed in chapter 7.