Naturally cursed?

An Analysis of the Effect of Natural Resources on the Duration of Civil Wars including the Case of The Democratic Republic of the Congo

Aina Helen Bredesen

Master Thesis

Department of Political Science

UNIVERSITY OF OSLO

November 2009

2009

Naturally cursed?

Aina Helen Bredesen

http://www.duo.uio.no/

ABSTRACT

In recent years, there has been increased focus in the scholarly research on the effect of natural resources on the duration of civil wars. Some scientists argue that countries dependent on natural resources, measured as the primary commodity export ratio to the gross domestic product, are more prone to the onset of civil war. Additionally, resource dependence is claimed to prolong the duration of civil war, as both rebels and the central government do not find incentives to settle for peace. The reason is that the cost of settling for peace is higher than the alternative as long as resource extraction can take place. Other scientists emphasize the need to classify natural resources by lootability and obstructability. This argument claims that unobstructable, lootable natural resources, referring to resources that are easily extracted by unskilled labourers and easy to smuggle, will most likely benefit the rebels and prolong the duration of civil wars than compared with unlootable resources.

This thesis applies the lootability and obstructability approach and the resource dependence approach in studying the effect of natural resources on civil war. Results from the quantitative analysis indicates that resource dependence shorten civil war duration: if primary commodity export increases with 1%, the risk of civil war termination increases with 2.1%. Moreover, there is indirect support for the hypothesis that lootable resources prolong civil war duration. Furthermore, unlootable resources increase the risk of termination with 3.0% when exports of this resource group increase with 1%. The results also show that the estimates for obstructability of natural resources are positive, and similar, but not statistically significant, which implies that the obstructability approach is not a suitable method. This is highlighted in the chapter about the Democratic Republic of the Congo, a country abundant with natural resources. Although natural resources can be said to have fuelled the civil war in the DRC, it is nevertheless not the cause of it. However, most of the results are insignificant, and the results are generally weak, indicating that more precise is needed in order to firmly establish a correlation between natural resource and civil war duration.

ACKNOWLEDGEMENTS

This thesis would not have been possible to write without the great help and support from my supervisor Håvard Hegre at the Department of Political Science. I am also grateful to the girls at reading room 901 for all the encouragement and support– this thesis would have been so much harder to write without our great talks and coffee breaks. Elise McCourt, you especially deserve credit for reading through the thesis outline several times. I would also like to thank Marianne Dahl for all the help I got on managing statistics in Stata. And finally, I would also like to thank Audun, my love, for patiently giving me crash courses in Excel and for encouraging me to do my best. All the remaining errors are mine alone.

Aina Helen Bredesen
Oslo, November 2009

Word Count, including footnotes, tables and appendices: 39 689

CONTENTS

TABLES AND FIGURES

1 INTRODUCTION

After the end of the cold-war period, civil wars have come to dominate the post war period. The causal mechanisms of civil war onset are often diverse and it is hard to pinpoint one exact reason for why some conflicts seem to be everlasting. The principal explanations are that civil wars break out because of poor economic performance, weak state capacity, high level of inequality, ethnic fractionalization and war-prone neighbouring countries (Collier 1999a and 199b, Hegre & Sambanis 2006, and Elbadawi & Sambanis 2002). In turn, these underlying dimensions make it harder to end civil wars.

Since the end of the 1990s, there has been an increased focus on environmental factors in civil wars, especially after the civil war in Sierra Leone. In this conflict, it became evident that illicit trade of diamonds contributed to finance the atrocities of the rebel group, the Revolutionary United Front (RUF), which contributed to prolong the internal conflict (United Nations Environment Programme 2009). Resource abundance, especially of high-value resources such as oil and diamonds has proven to fuel internal fighting (Fearon 2005). The civil war of the Democratic Republic of the Congo is another example. The country is abundant with several resources. Coltan, a mineral used in consumer products like cell phones, is one of the more lucrative. World demand for this mineral increased the price of coltan in 2000, and rebel groups controlling the coltan mines profited substantially (Hayes & Burge 2003). Countries abundant with lucrative resources tend to become very dependent on the sale of these resources. This is because such resources generate high revenues and subsequently account for the majority of the gross domestic product.

Most of the existing scholarly research on this topic recognizes a link between the duration of civil war and economic dependence on natural resources. Yet, how this causality should be understood remains unclear. Previous quantitative studies have focused on the relationship between the risk of onset of civil war and resource dependence measured as the primary commodity export ratio to gross domestic

product (GDP) (see Fearon 2005 and Collier & Hoeffler 1998, 2004). Evidence from the scholarly work differs in the conclusions about the effect of natural resources on the risk of civil war onset. Researchers like Collier & Hoeffler (1998, 2004) and Humphreys (2005) find evidence that dependence on the sales of natural resources increases the outbreak of internal conflict. Others like Elbadawi & Sambanis (2003) and Fearon (2005) find no evidence of such a relationship. Additionally, some studies emphasize that resources like oil, gas, and diamonds account for evidence of an increased likelihood of civil war outbreak (de Soysa 2002, Fearon 2005). Furthermore, lootable minerals such as alluvial diamonds are demonstrated to have a higher probability of the onset of internal conflict by researchers like Lujala, Gleditsch & Gilmore (2005), Ross (2004b), and Buhaug & Rød (2006)

Ross (2003a) claims that natural resources may trigger the onset of civil war in several ways: by harming a country's economic performance, by financing rebel movements, and by giving people in a region abundant with natural resources an incentive to form an independent state. Even though the research on the relationship between natural resources and the duration of internal conflicts is less extensive, I still assume that Ross' (ibid) assumptions hold for the effect of natural resources on the duration of civil wars.

The scholarly findings on civil war duration are less divergent compared with studies of the onset of internal conflicts. General results indicate that resource dependence makes civil wars last longer (DeRouen & Soebek 2004). The results indicate further that high value resources create incentives for rebels to continue to fight instead of settling for peace, as the alternative may be more profitable (Collier, Hoeffler & Söderbom 2004). However, findings from Elbadawi & Sambanis (2002), Fearon (2005), and Buhaug & Lujala (2005) do not support this relationship. Moreover, researchers have found that conflicts in areas abundant with lootable resources are more difficult to terminate. This applies especially to resources like oil, diamonds, and illegal resources, for example opium and coca (Buhaug & Gates 2002, Humphreys 2005, Buhaug, Gates & Lujala 2005, and 2009, and Lujala (forthcoming).

This thesis provides a new empirical approach to studying the link between natural resources and the duration of civil wars. In addition to exploring a possible correlation between resource dependence and civil war duration, lootability and obstructability of natural resources are included. In this way, it is possible to examine the different effect they may have on civil war duration. Lootable resources are resources that can easily be extracted by unskilled labourers, are easy to transport, and do not need to be refined before transportation (Lujala 2003 and Ross 2002). The obstructability of natural resources are by Ross (2002) separated in three groups by the extent of which the resources can be transported without difficulties by a small group of people. Lootable and moderately obstructable resources are resources such as timber and agricultural products, whereas alluvial diamonds and illegal resources like opium are unobstructable, but still lootable (Ross 2002). Oil and gas are typical unlootable resources, but since onshore oil is transported through above-the-ground pipelines, making them vulnerable to terrorist attacks, onshore oil is highly obstructable, and offshore oil is thus unobstructable (Ross 2002). This is further explained in chapter 4.

I classify the most important natural resources according to their lootability and obstructability. Then I analyze the extent to which civil war duration is affected by resource dependence and these various classes of resources. In addition, the usual proxy, resource dependence measured as primary commodity export ratio to GDP, is included. Whereas previous studies only investigate resource dependence as the total export ratio of GDP, I will statistically test if there is a difference in resource dependence on resources' lootability and obstructability. Moreover, the analysis includes the primary export variable used in previous studies such as Collier & Hoeffler (2004) and Fearon (2005) in order to investigate if my new approach of defining natural resources has a different effect on the outcome of the analysis.

In this chapter, I will introduce the need for an analysis of civil wars and natural resources and present the research question. Moreover, the definitions of natural resources and the duration of civil wars will be briefly explained.

My research question is thus the following: *Does resource dependence prolong civil war duration? And does coding natural resources by their lootability and obstructability give a better empirical picture of civil war duration?*

This thesis does not aim to critically analyze if countries' possession of natural resources is correlated with the onset of civil war. Previous research has established that the onset of internal conflicts is not caused by natural resources alone. Instead, a combination of different elements like poverty, inequality, and unstable governments, combined with resource-richness, fuels civil wars (Ross 2003a). The purpose of this thesis is to analyze if and how dependence of different types of natural resources in a country experiencing civil war affects the conflict's duration. This is further explained in the following chapters. Therefore, this thesis aims to build on previous findings.

The research question is answered by statistically testing a correlation between natural resources and the duration of civil war, using Cox regression, a type of survival analysis. The applied dataset is the UCDP/PRIO Armed Conflict dataset, as used in Gleditsch et al 2009. Results from the analysis indicate that resource dependence does not lead to longer lasting civil wars as first expected. Rather, an increase of 1% of primary exports increases the likelihood of civil war termination with 0,21% when using data from the World Bank, and with 0,26% when applying data from the UNCOMTRADE. Furthermore, the results imply that it is useful to separate between lootable and unlootable resources since the two groups of resources have different effects on civil war duration. The former prolongs and the latter shortens the duration time. Additionally, the results indicate that classifying natural resources by their obstructability is not a suitable approach as the results show that both obstructable and unobstructable natural resources shorten civil war duration. Moreover, most of the coefficients from the analysis are weak and not statistically significant. This makes it difficult to firmly establish a correlation between natural resources and civil war duration. This is further discussed in chapter 5.

In addition to study this relationship statistically, chapter 6 presents a study of the Democratic Republic of the Congo (DRC). This is done in order to illustrate if different types of natural resources affect the duration of the civil war in the DRC and how these mechanisms take place. The Democratic Republic of the Congo (DRC) has experienced civil war several times, which indicates that the country's possession of natural resources might have made it difficult to permanently settle for peace. How the natural resources may have prolonged the conflict has not clearly been established. It is therefore highly interesting to explore if differences in lootability and obstructability of natural resources may affect the duration of civil wars. Moreover, studying how possible causal mechanisms may have worked in the DRC from the time of independence in 1960 and until today is additionally interesting. The DRC is a country rich with several natural resources; amongst them is coltan[1], a mineral that is both lootable and highly valuable. This is further elaborated in chapter 6.

According to King, Keohane & Verba (1994:15), there are two criteria all researchers should aim to meet. The first criterion is that the project one is looking to investigate should be a topic that is interesting and important. The causes of civil wars are arguably of interest to both scholars and people in general. If civil wars are to be prevented and peace settled easily, then it is crucial to discover the mechanisms that contribute to prolong civil war duration. By confirming such a relationship, primary commodity trade of natural resources may come under further scrutiny and there may be a demand for corporate social responsibility. In this way, the global society can try to ensure that export revenues from commodity export do not fall into the hands of rebels, which may prolong internal fighting. Studying how natural resources affect the duration civil wars as this thesis does fulfils this criterion.

Secondly, a project should contribute specifically to the existing scholarly literature. One possible way of contributing to the literature is to choose an important hypothesis that has not been studied systematically yet. Several researchers have already explored

[1] Coltan is the commonly used word for **col**umbite-**tan**talite, an alluvial (or riverine) mineral used in electronic products such as cell phones, computers and DVD-players (Hayes and Burge 2003:9).

the correlation between natural resources and civil war duration (see Collier and Hoeffler 2004, 1998, Ross 2002, 2003a and 2003b, Lujala 2003 and forthcoming). Although there are studies of how natural resources affect internal conflicts, this thesis are nevertheless an important contribution as I use recent data on civil wars that have not yet been used in the same matter. In this way, I explore another possibility to make a contribution by choosing an accepted hypothesis (that different types of natural resources affects duration of civil wars). As far as I know, this correlation has not been thoroughly confirmed. Therefore, I study it further in order to falsify or confirm it (King, Keohane & Verba 1994).

This thesis is divided into several chapters. In the first chapter, I clarify the central terms in this thesis, focusing especially on natural resources. Thereafter I present previous scholarly findings and results. In chapter 3, the theory applied in this thesis is presented. The theoretical contributions are applied throughout this thesis, particularly in the chapter about the DRC. Next, I present the research design and explain how data is collected and used in this thesis. Problems that occur when applying statistical analysis in general, and problems that have arrived with this thesis are discussed in this chapter. Chapter 5 presents the analysis, and the results from the analysis are presented and discussed in this chapter. The following chapter, chapter 6, contains the case study of the Democratic Republic of Congo. This case is analysed by using both the theoretical distributions in chapter 3, and the results from the statistical analysis. Finally, the thesis is summed up and a conclusion is reached regarding the research questions.

1.1 Definitions

In order to study the duration of civil wars, it is crucial to determine what kind of conflict may be defined as a civil war. The UCDP/PRIO dataset on armed conflicts defines civil wars as a: “contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 annual battle-related deaths” (Gleditsch et

al 2002a)[2]. In this thesis, I use the UCDP/PRIO dataset and thereby apply their definition. By using a threshold of 25 annual battled-related deaths, the possibility of more statistically significant results opens up. The duration of civil wars is defined as the time span of the conflict (Gleditsch et al 2002b). The data used in this thesis will be commented in chapter 4. Furthermore, I will use the terms civil war, violent conflict, and internal conflict interchangeably to describe internal violence between the ruling government and rebel groups.

Natural resources are resources such as minerals and energy that are produced by nature, and they are often grouped into renewable and non-renewable resources. Renewable resources are resources that in a human time scale are regenerated, like water, fish, and forests. According to Lujala (2003: 6), these resources belong together in an ecological system, which means that each resource is dependent on the other. Non-renewable resources, on the other hand are not similarly dependent on other resources. Examples of non-renewable resources are crude oil and natural gas (ibid). There are however no clear guidelines for classifying natural resources, but there are several attempts in the existing literature. These can be narrowed down into three approaches: (1) the primary commodities exports ratio to GDP approach, (2) the lootability approach, and (3) the geographic mapping approach.

The first approach looks exclusively at the total primary export share of the GDP in the discussion of how natural resources may prolong civil wars. This approach is arguably too narrow as it only tells if natural resources fuel civil wars. According to Lujala (2003), it is also necessary to study why, how and to what extent natural resources affect the duration of civil war. Recognizing that natural resources will

[2] This is not the only definition of civil war. Collier, Hoeffler & Söderbom (2004:6) provide a different definition drawing on the Correlates of War project, defining civil wars as: "violent conflicts that resulted in at least 1,000 battle-related deaths per annum." Additionally, the conflicts are internal and rebel groups account for at least 5 % of the deaths. Fearon (2004:278) is even more particular when classifying civil wars by the following criteria: (1) fighting took place between the state and organized rebel groups seeking to overthrow the ruling government, take control of a region or change the government's policy using violence, (2) the death toll reached a minimum of 1,000 people with an average of at least 100 per year and (3) on both sides, at least 100 people were killed. This last criterion is added to rule out massacres by unorganized and ineffective oppositions, e.g. the genocide in Rwanda in the latter part of the 1990s.

affect rebel and state motivation in addition the nature of civil wars is crucial in order to correctly infer about the effect of natural resources on civil war duration (ibid). The lootability approach takes this into consideration when differentiating between natural resources than can easily be extracted by unskilled labourers (lootable) and resources that require advanced technology and security in order for the mineral to be extracted (unlootable) (ibid). By separating between lootable and unlootable natural resources, the risk of diluting results of a statistical analysis is reduced since the different types of natural resources may affect the duration of natural resources differently and even in opposite directions (ibid: 4). How natural resources are geographically distributed in a conflict country is additionally important as the availability of natural resources may shape the nature of the conflict. However, this provides several challenges. It is not always clear which resources are spread over vast areas and is available and which are concentrated in small areas.

This thesis combines the first and the second approach, recognizing that although the total primary export ratio to GDP is a suitable proxy when investigating how natural resources affects the duration of civil wars, it is not adequate. Previous studies (see Collier & Hoeffler 1998, 2004 and Fearon 2005) have applied the World Bank data (The World Bank 2009) on the total value of primary exports. The World Bank does not separate between the different natural resources, and does not provide information about which primary commodities they have defined as natural resources. For this reason, I have collected export data from 1962-2004 on 55 separate natural resources for all the countries in the UCDP/PRIO dataset. As argued above, natural resources should be classified by their distinction of lootability and obstructability in order to say something more about the direct effects of natural resources on civil war duration. In addition, the classification is necessary in order to thoroughly examine how natural resources affects civil war, as some may prolong the duration of civil war where as other shortens conflict time (Lujala 2003: 3-5). If the World Bank data is applied, it is not possible to decide which resources are lootable and which are unlootable. By gathering data on all 55 natural resources for all the countries in the dataset, it is thus possible to separate a large group of natural resources by lootability and

obstructability. This is done by thoroughly examining the qualities of each of the resources, consulting several sources and applying guidelines and classification schemes designed by researchers like Lujala (2003) and Ross (2002). As far as I know, collecting data for 55 separate natural resources for all conflict-years and countries and then separating these individually by lootability and obstructability has not been done before. This is further discussed in the next chapters of the thesis.

2 PREVIOUS FINDINGS

The literature on the causes of civil wars is plentiful, and to single out a specific cause is difficult. There is rarely one single cause that triggers internal conflict, and the causal mechanisms are complex. Studies of the relationship between natural resources and civil wars have increased rapidly since the 1990s. Some of these studies find a correlation and conclude that natural resources have an important role to play (Ross 2003a). This is backed up by empirical evidence: According to the United Nations Environment Programme (UNEP), at least 18 civil wars in the past 20 years have been fuelled by natural resources (United Nations Environment Programme 2009). In this chapter, I present the main findings from the scholarly research.

The main focus in the existing literature is on the onset of civil wars, especially when analyzing the effect of natural resources. According to the scholarly research, natural resources may trigger the onset of internal conflicts in several ways. First of all, presence of natural resources may harm a country's economic performance through resource dependence. This may result in weak governments, making these societies prone to civil war (Ross 2003a). One of the principal explanations for this is the Dutch disease phenomenon. The argument is that resource-rich countries, particularly those that export oil, performs economically poorly because new discoveries of favourable price changes in one sector, like petroleum, cause low relative prices in other sectors, such as agricultural production, in which agriculture and industrial production is discouraged (Karl 1997, see also Collier & Hoeffler 2005). This is evident in the case of the DRC where thousands left agricultural production in order to mine coltan instead, causing economic and humanitarian distress (see chapter 6 for further elaboration).

Collier & Hoeffler (1998, 2004 and 2005) state that resource dependent states have an increased risk of civil wars breaking out because of: "the taxable base of the economy constituting an attraction for rebels wishing to capture the state" (Collier & Hoeffler 1998: 571). Not all resource abundant countries experiences civil war though. Scholars

argue that when income from natural resources reaches a very high level, the risk of onset of civil war is reduced. The reason for this is that with very high incomes from natural resources, the government has an increased financial capability to defend itself against rebellions through increased military expenditures amongst other measures (ibid). Brunnschweiler & Bulte (2009) also find evidence of a correlation between resource dependence and civil wars. Instead of increased dependence leading to a higher risk, they find that resource dependence lowers the risk of civil war onset. In addition, Humphreys (2005) finds support for a relationship between natural resources and the risk of civil war, but that the risk of civil war onset depends on past natural resource production. This can further be explained partly by the weak state mechanism (Humphreys 2005).

Fearon & Laitin (2003) on the other hand find no support for such relationship. Fearon (2005) claims that it is weak state capacity, not resource dependence that makes states more prone to civil war. Although he finds support for some resources to increase the likelihood of civil war outbreak, these resources, such as oil, cannot account for the resource dependence mechanism claimed by Collier & Hoeffler article from 2004 (Fearon 2005). Instead, oil is an exemption. Moreover, oil is rather associated with the risk of civil war onset because oil-exporting countries on the average have less accountable government and a weak state capacity. In turn, this may increase the likelihood of outbreak of civil war. Additionally, oil abundance may give stronger incentives for people living in a region abundant with natural resources (such as oil) to form an independent state (Fearon 2005 and Fearon & Laitin 2003). According to Fearon (2005) and Ross (2003a), secessionist movements are linked to the risk of civil wars and this, not resource dependence, cause civil wars (Fearon 2005). This is also supported in some degree by De Soysa & Neumayer's study from 2003 which cannot find support for Collier & Hoeffler's claim of resource dependence being linked to the risk of civil war onset. Other researchers like Elbadawi & Sambanis (2002) have replicated Collier & Hoeffler's study from 2004, but have produced mixed results.

Finally, natural resources are a source of revenues for rebels who can finance their operations by the sales of natural resources. In turn, this may increase the likelihood of civil wars (Ross 2003a). This applies especially for lootable resources, which increase the incentives for belligerents to seek out rebellion. The reason for this is that lootable resources are easily extracted with no need for specialists, and often have a high price to weight ratio. This further implies that these types of resources are highly profitable at low costs for rebel movements (Ross 2002 and Lujala 2003). Scholars such as Humphreys (2005), Buhaug & Rød (2006) and Lujala (forthcoming) provide quantitative findings on this correlation. These scholars focus especially on alluvial diamonds. Buhaug & Gates (2002) find in their study of civil wars in Africa that diamond abundant areas have a higher probability of outbreak of internal violent conflict. This is also supported by findings from Lujala, Gleditsch & Gilmore (2005). Moreover, Lujala's (forthcoming) results imply that countries with alluvial diamond production have a 40% higher risk of experiencing civil war. This is not however supported by Humphreys (2005) whose findings rather support a relationship between agricultural commodities and civil war onset.

The obstructability of natural resources has not been studied statistically. There have only been conducted qualitative studies on the obstructability of natural resources as far as I know. These studies have concluded that the obstructability of natural resources affects civil war duration. Furthermore, lootable and unobstructable resources are concluded to provide a means for rebels to finance their activities (see Ross 2002). Moreover, there are no quantitative studies that classify natural resources by lootability and obstructability as it is done in this thesis.

Table 1 summarizes the main quantitative scholarly work on the onset of civil wars.

Table 1. Quantitative Analyses of Natural Resources and the Onset Civil Wars

Quantitative Analyses of Natural Resources and the Onset of Civil Wars			
Studies	**Data**	**Variables**	**Findings**
Collier & Hoeffler (1998)	Singer & Small dataset, 1960-1992 (Correlates of War)	Primary commodity export ratio to GDP	Dependency on natural resources increases the risk of onset and duration of civil war in a curvilinear matter
Elbadawi & Sambanis (2002)	Singer & Small dataset, 1960-1999 (Correlates of War)	Primary exports ratio to GDP	The likelihood of civil war onset increases and then falls with the degree of natural resource dependence, but when modifying the variables because of missing, the results are weakened
De Soysa & Neumayer (2003)	UCDP/PRIO Armed Conflicts Dataset, 1989-2000 and Fearon & Laitins data from 2003, 1945-1999	General trade dependency (import and export ratio to GDP	Curvilinear relationship, but not significant. When adjusting data, results show evidence against the view that resource dependency raises the hazard of civil war
Fearon & Laitin (2003)	Own data on civil war, 1945-1999	Primary commodity export ratio to GDP and oil exportation	Primary export ratio to GDP has no significant effect, oil exportation increases the likelihood of civil war
Humphreys (2005)	Fearon & Laitins data from 2003, 1945-1999	Diamonds and oil production and reserves, and agricultural value as share of GDP	Oil production increases the risk of civil war breaking out, oil reserves and diamond production does not have a significant effect
Collier & Hoeffler (2004)	Singer & Small dataset, 1960-1999 (Correlates of War)	Primary commodity export ratio to GDP in five year intervals	Higher risk of onset of war, but only the oil dummy variable was significant when commodities was categorised into four

			groups
Fearon (2005)	Replication study of Collier & Hoeffler (2004)	Replication study of Collier & Hoeffler (2004), adds country-year for primary exports ratio to GDP	Using Collier& Hoeffler's data, no strong of robust association. Some association when adding oil variable, is instead an indicative of weak state, which increases likelihood of onset of civil wars.
Lujala, Gleditsch & Gilmore (2005)	Fearon & Laitins data from 2003, 1945-1999	Diamond deposits and production	Diamonds matter for civil war incidence, but do not generally affect the risk of conflict onset
Buhaug & Rød (2006)	Civil wars in Africa: UCDP/PRIO Armed Conflicts dataset and GIS[3] , 1970-2001	Geographic resource variables: distance to petroleum and diamonds	Diamond-abundant areas have higher probability of onset of internal conflict
Brunnschweiler & Bulte (2009)	Dataset from Collier & Hoefflers' article from 2004	Primary commodities ratio to GDP as proxy for resource dependency and estimated net present value of rents of countries' natural capital stock as proxy for resource abundance	Resource dependency endogenous variable to conflict, negative significant relationship between resource abundance and the onset of civil war
Lujala (forthcoming)	UCDP/PRIO Armed Conflicts Dataset, 1946-2003	Petroleum and diamonds reserves and allocation	Onshore oil production increases risk of onset, offshore oil has no effect

There is little reason to believe that the causes of the onset of civil war are not related to civil war duration. Previous research on the effect of natural resources and the duration of civil wars indicate that lootable and high-value resources contributes to longer-lasting civil wars. Collier, Hoeffler & Söderbom (2004) find that rebellions

[3] GIS, or Geographic Information System is a system that enables scientists to analyze and manage data on all form of geographic referenced information. For further information, visit http://www.gis.com/.

take place when the costs are low and the profit is high. This is regularly the case for rebels in areas abundant with lootable natural resources. In turn, this creates incentives for rebels do continue to fight, as the alternative would mean less profit and higher cost when rebels have access to these types of resources (ibid). Fearon's (2004) findings favour this approach, indicating that civil wars where belligerent groups receive revenues from the sales of lootable contraband goods like opium last longer (ibid). The studies by Buhaug, Gates, & Lujala (2009) and Lujala (forthcoming) also support this. Their findings imply that conflicts in areas abundant with lootable resources, especially diamonds, are harder to settle and that sales of lootable resources secure rebels with a high revenue income (ibid).

Results from quantitative analysis of resource dependence and the duration of civil wars are also mixed. As with the onset of civil wars, Elbadawi & Sambanis (2002) find weak or not significant results in several different model specifications. The results from the study by Buhaug, Gates & Lujala (2009) indicate that civil wars in areas abundant with natural resources are harder to settle and that conflict where diamond production takes place are more durable. Other studies, like Collier, Hoeffler & Söderbom's study from 2004, conclude that internal conflicts are shortened when there is a decline in price of exported primary commodities (ibid). DeRouen & Soebek's (2004) findings additionally support a relationship between natural resource exports and duration of civil wars. Their results indicate that rebel access to natural resources, measured as primary commodity export ratio to GDP, increase the probability of government victory. Moreover, it does little to help rebels winning a war (ibid). Humphreys (2005), on the other hand, find that production of natural resources such as oil, diamonds and agricultural products a more likely to end quickly with a military victory for one of the conflicting partners instead of ending as a result of a cease-fire agreement and peace agreement.

Table 2 sums up the main results on the quantitative research on the correlation between natural resources and the duration of civil wars.

Table 2. Quantitative Analyses of Natural Resources and the Duration of Civil Wars

Quantitative Analyses of Natural Resources and the Duration of Civil Wars			
Studies	**Data**	**Variables**	**Findings**
Collier & Hoeffler (1998)	Singer & Small dataset, 1960-1992 (Correlates of War)	Primary commodity export ratio to GDP	Dependency on natural resources increases the risk of onset and duration of civil war in a curvilinear matter
Buhaug & Gates (2002)	UCDP/PRIO Armed Conflicts Dataset, 1946-2000	Geographic resource variables: geographic characteristics of resources	Longer-lasting conflicts encompass larger areas
Elbadawi & Sambanis (2002)	Singer & Small dataset, 1960-1999 (Correlates of War)	Primary commodity export ratio to GDP	Varying results do to specification processes with the data. All in all, results are weak or are not significant
Collier, Hoeffler & Söderbom (2004)	Correlates of War, 1960-1999	Primary commodity export ratio to GDP and change in commodity price index	Conflicts are shortened with decline prices of exported primary commodities and external military intervention
DeRouen & Sobek (2004)	Data from Doyle & Sambanis (2000), 1944-1997	Primary commodity export ratio to GDP as a measure of resource availability	Primary commodity exports increase probability of government victory
Fearon (2004 and 2005)	Data from Fearon & Laitin (2003), 1945-1999	Contraband resources controlled by rebel groups (cocaine, gems and opium)	Civil wars where rebels receive revenues from contraband goods last longer
Buhaug & Lujala (2005)	UCDP/PRIO Armed Conflicts Dataset, 1946-2001	Geographic resource variables: gemstones, coca, cannabis, opium, diamonds and primary exports ratio to GDP	Resource dependency as primary exports ratio to GDP is not significant, civil wars in areas with natural resources are harder to end
Humphreys	Fearon & Laitins	Diamonds and oil production and	Resource conflicts are more

(2005)	data from 2003, 1945-1999	reserves, and agricultural value as share of GDP	likely to end quickly with military victory for one side
Buhaug, Gates & Lujala (2009)	UCDP/PRIO Armed Conflicts Dataset, 1946-2005	Geographic resource variables: GIS: oil, gas, gemstones and diamond location	Conflicts with gemstones and petroleum production are more durable
Lujala (forthcoming)	UCDP/PRIO Armed Conflicts Dataset, 1946-2003	Petroleum and diamonds reserves and allocation	Resources located in conflict zone doubles the duration whether or not there has been production (oil and gas)

As shown, the focus is largely on the onset of civil wars. To sum up, there are five aspects previous studies have derived different conclusion about: (1) whether or not natural resources influence the onset and the duration of civil wars, (2) whether natural resources affects all types or just specific types of civil wars (e.g. separatist wars), (3) whether all types natural resources affects civil wars or just specific types (e.g. oil, diamonds) and (4) what causal mechanisms are related to civil wars (Ross 2004a: 338). This thesis focuses on the first and third aspect. Additionally, the last aspect is included in the construction of the theoretical framework, which are based on the scholarly writings presented in the previous tables. The theoretical perspectives are presented in the following chapter.

3 THEORETICAL PERSPECTIVES

The applied theory in this thesis is largely based upon previous writings and inferences concerning the relationship between natural resources and the duration of civil wars. It is important to note that natural resources themselves are never the only source of conflict. Rather, civil wars are caused by a set of events like ethnicity, weak governments, and unstable regimes (Ross 2003b). Still, studies reviewed in the previous chapter have found that the presence of natural resources affects the nature of internal conflict: The chance of breakout of civil war increases and the conflicts are even harder to settle. Even though conflicts can be said to be a resource conflict, to conclude that civil war would not have taken place if it were not for the resources is problematic. This is because not all resource-rich countries experiences civil war (Ross 2003b: 19 and United Nations Environment Programme 2009). It is nonetheless of interest to study how and if natural resources affect civil war duration.

The theoretical framework of natural resources and civil wars is divided into three parts. The first part describes how resource-rich countries dependent on income from natural resources tend to underperform economically, have weak democratic institutions, and additionally have high levels of corruptions caused by dependence on revenues from resource exports. The link between specific types of natural resources and the duration of civil war is outlined in the second part. The argument is that difference in lootability and obstructability of natural resources affects civil war differently. Finally, both rebels and government have motives leading up to civil war, these motives being influenced by natural resources.

This chapter presents the theoretical perspectives and discusses how they are related to the research questions. From this discussion, I derive four hypotheses to be tested statistically.

3.1 Resource Dependence

The first mechanism concerns how resource abundance and resource dependence in general affect the duration of civil wars. Resource abundance was in the aftermath of the Second World War regarded as an opportunity to lift countries out of poverty through the sales of natural resources (Le Billon 2005). However, history and experience has shown that this did not always take place. Instead, resource dependent states have fallen under the infamous resource curse (or Dutch disease) used to describe the economic, democratic, and social outcomes of resource dependence (Le Billon 2005 and Karl 1997). The main argument is that countries dependent on income from the sales of natural resources will be more prone to internal violent conflict than non-dependent countries. This is because the resource sector undermines governance and economic performance (Le Billon 2008: 347-348).

The economy in resource dependent countries is affected by resource dependence in several ways. In some instances, poverty increases and economic growth is reduced, both increasing the likelihood of civil war breaking out (Ross 2003b). The reason for this is that rioting against the government in power is more likely to happen when a country performs economically poorly (ibid). Economic underperformance in resource dependent countries may also result in low per capita income. Scholars such as Collier, Hoeffler & Söderbom (2004) show that low per capita income cause and lengthen civil wars (Collier, Hoeffler & Söderbom 2004). In addition, with high unemployment rates and increased poverty rebels find it easier to recruit discontent protesters to fight for their cause. For potential rebels, fighting together with belligerent groups is more attractive than omitting (Ross 2003b: 21).

In addition, resource dependent countries tend to be more corrupt and are characterized by unaccountable governments (Le Billon 2005 and Ross 2003b). Corrupt government pocket revenues from resource exports themselves with little benefits for the population. These resource dependent states, abundant with resources to sell, tend to have weaker governmental institutions and are not able to handle

economic and social problems associated with resource dependency (Ross 2003b: 24, Ross 2001, Wantchekon 2002, Sandbakken 2006 and Tsui 2005). A discontented population with a high degree of inequality is more prone to protest than in countries with a higher degree of equality amongst the population. Having a weak and inefficient state bureaucracy hinders a country to solve social conflicts. Lastly, resource dependent countries tend to be less democratic and thus less accountable (Ross 2003b: 20-27). In addition, resource-rich countries are able to build up strong armies, clamping down on human rights in order to secure a certain degree of stability to secure exploitation of natural resources (Le Billon 2005). All these factors make resource dependent countries more prone to the outbreak of civil war. This is because rebel groups will form to protest and seek control over resources and benefit themselves instead of the government (Ross 2003b: 20-27).

A common proxy of resource dependence and abundance in relation to civil war is primary commodity export ratio to gross domestic product (GDP) as described in the previous chapter (See Le Billon 2008:348, Collier & Hoeffler 1998, 2004, de Soysa 2002, Fearon 2004, 2005, and Humphreys 2005). Internal conflict is argued to be shortened if the country in which a civil war takes place experiences a sharp decline in the prices of the country's exported primary commodities (Collier, Hoeffler & Söderbom 2004: 268). Large rents from natural resources will thus influence the duration of civil wars. If engaging civil war is profitable for rebels not only during, but also after the fighting period, then: "the duration of civil war should be increased by the extent of pre-conflict primary commodities exports" (Collier, Hoeffler & Söderbom 2004: 254). For instance, the price ratio to GDP may decrease during a fighting period compared with the price ratio to GDP before the conflict broke out as civil war may sustain resource extraction. Another explanation may be that rebel groups have seized control over a commodity and mining site, thus profiting from direct sales of the primary commodity. This may evolve into a separatist conflict over the control over a limited territory abundant with lucrative resources, not only increasing the risk of civil war onset, but also prolonging their duration (Ross 2003b).

From this discussion, the first hypothesis may be derived:

H1: Civil wars in countries that are dependent on natural resources last longer than countries that are not dependent on natural resources, ceteris paribus.

3.2 Lootability and Obstructability of Natural Resources

According to the United Nations Environment Programme, the existence of natural resources may "alter the dynamics of conflict itself by encouraging combatants to direct their activities towards securing the assets that enable them to continue to fight" (United Nations Environment Programme 2009: 11). Resources that prolong conflicts are mainly oil, hard-rock minerals like coltan, diamonds, gold, and gemstones, in addition to timber (Ross 2003b). Illegal drugs can also be added to the list of natural resources. These resources have additionally played a crucial part in linking conflicts with natural resources, although sales of drugs are illegal, and revenues from these types of resources are difficult to measure (Ross 2003b 17-18). These resources are all classified as lootable resources. A resource is lootable when unskilled workers can easily extract the resource themselves and thus sell and smuggle it. In addition, the government or rebel groups may be able to interfere with the transportation of the resource. For instance, rebels can hold the transportation of a resource back and demand a beneficial ransom that will finance continuous fighting. This is possible if the resource is highly or moderately obstructable, like onshore oil (Ross 2003b). Obstructable and lootable resources in a country with an ongoing internal fighting may in this way affect the dynamics and the duration of internal conflict (Le Billon 2003, 2005, 2008, Ross 2002, 2003a, 2003b, and Lujala forthcoming). The difference between lootability and obstructability is discussed further in chapter 4.

There are several methods involving lootability and obstructability in which rebels receive revenues from natural resources. Highly obstructable resources such as onshore oil can become a target for extortion and kidnapping of skilled workers (Ross 2002 and Ross 2003b). Countries with onshore oil and gas have kilometres of exposed

pipelines above ground and this type of resource is thus highly obstructable, meaning that others than skilled worker can easily attack these pipes. In Colombia, kilometres of pipelines run through the country, transporting oil to the coast for further transportation. Taking advantage of this, rebel groups bombed the pipelines 98 times in 2000 and received an estimated 140 million USD from extortions and threats of further attacks. The National Liberation Army (ELN) has particularly benefitted from this. By using these revenues, the group has grown from a mere 40 members in the mid 1980s to approximately 3000 members in beginning of the 2000s (Dunning & Wirpsa 2002 and Ross 2003b: 33).

Rebels can also receive revenues from natural resources through direct looting and selling of resources, which they have taken control over (Ross 2004b and 2003b: 31). According to Ross (2002), lootable resources, for example alluvial diamonds, prolong internal conflicts because these kinds of natural resources have a tendency to profit rebel groups (Ross 2002: 66-67). This is also supported by the study of Addison, Le Billon, and Murshed (2003). In their description of African civil wars, civil wars are prolonged when looting of natural resources is the primary motivation of rebel fighting. Civil wars located in countries with lootable resources involve therefore a security aspect since rebels will strive to keep the control of natural resources in their possession. Moreover, unlootable resources will also have an effect on rebels group and the duration of internal conflict. Even though a resource is not lootable, rebels may still want to prolong conflicts if the future price of the resource is large enough. For instance, rebels might believe that they will net a substantially higher sum of the sales of oil in the future than at the present time (Lujala forthcoming).

An example of how lootable natural resources prolong civil war is the case of Angola. The rebel group, the National Union for the Total Independence of Angola (UNITA), received revenues from gold, timber, and alluvial diamonds, all lootable resources. They maintained access to the diamond fields because of their strategic geographic

location, the means of production and because of a poorly regulated marked[4] (Le Billon 2001b). The UNITA's revenues came especially from the sales of alluvial diamonds, which where difficult for the government to control. According to Le Billon (2001b), during the 1990's UNITA is estimated to have received on average about 500 million USD per year through the sales of alluvial diamonds (Le Billon 2001b: 62). The government also benefitted from the sales of natural resources. Most of their income was based on the sales of offshore oil, an unlootable resource that they had almost exclusive access to. Government revenues from the sale of oil are estimated to be on average 1,8 billion USD per year during the same period (Le Billion 2001b: 62). Since both the rebels and government in Angola had a constant flow of high revenues, the conflict in Angola persisted for almost 30 years according to the dataset applied in this thesis (Gleditsch et al 2009).

To statistically test how lootablity and obstructability of natural resources affects the duration of civil war, the following hypotheses are constructed:

H2: Lootable natural resources make civil wars last longer than unlootable natural resources, ceteris paribus.

H3a: Moderately obstructable and highly obstructable natural resources shorten civil war duration, ceteris paribus.

H3b: Unobstructable natural resources make civil war last longer than highly obstructable resources, ceteris paribus.

3.3 Motivations and Profitability

Motivations and incentives for rebels and government are important driving forces that prolong civil wars. Although some rebels claim to fight for freedom and political

[4] Regulations to hinder illicit trade of the so-called "blood diamonds" did not come into place until the Kimberly Process Certification Scheme (KPCS) was established in 2000. By then, the conflict in Angola had officially been declared over (Le Billon 2005: 76-77), although fighting still continued at the end of 2004 according to Gleditsch et al 2009.

rights, some may be directly motivated by the profitability of natural resources (Lujala forthcoming). The opportunity for rebels to receive financial gains from controlling resources can create incentives to keep up the fighting in which the incentive lies in the payoffs during the conflict. This is also known as the rebellion-as-business approach. This approach argues that rebels want to sustain civil war when the profits surpass the costs of fighting (Collier, Hoeffler & Söderbom 2004). According to Collier, Hoeffler & Söderbom (2004) rebellions occur only when they are profitable, and the costs are low. When rebels receive high revenues from the sales of natural resources, which they control, conflict is expected to last longer (Collier & Hoeffler 1998, 2004 and Collier, Hoeffler & Söderbom 2004).

Le Billon claims that conflict resources are "natural resources whose control, exploitation, trade, taxation or protection contribute to, or benefit from the context of, armed conflict" (Le Billon 2003:216). This approach identifies resources as a means of financing armed conflicts and as providing financial opportunities motivating violent rebels. Natural resources are a lucrative source of finance because extraction of resources may produce large profits. Additionally, the production of resources takes place at a specific location, which is difficult to move (Le Billon 2008, Fearon 2004 and Ross 2003b). In this way, the resource sector rewards rebels, implying that it is more profitable for soldiers or their leaders to continue looting during the conflict than to settle for peace. As a result, the conflict may last longer. This means that wealth of resources discourage peace settlements since rebels' access to valuable resources gives them revenues to buy arms and pay soldiers (Le Billon 2008:347-349, Fearon 2004 and Ross 2004a, 2004b, 2003b: 30-31). The existence of easily extractable natural resources does not only make funding of further fighting feasible, it may also alter the conflict dynamic by providing rebels with motives to secure their assets. This in turn provides them with revenues to continue insurgencies. In this way, the violence may be a result of greed, resulting in more difficulties of settling for peace since the rebels' payoff of war or victory is higher than settling for peace (United Nations Environment Programme 2009).

Both the government and rebels may be motivated by the profitability of natural resources, and the lootability of natural resources affects both groups. According to Ross (2003b), lootable resources will most likely benefit rebels, whereas revenues from unlootable resources usually benefit the government (Ross 2003b). The part that controls a resource-abundant area is most likely to benefit from it. However, if this area is mostly filled with unlootable resources, for example copper and oil, the government will most likely benefit more than rebels (ibid). This is because unlootable resources require skilled labourers and security guarantees of extraction and production. The government is more able to obtain and maintain this than rebel groups. This does not mean that rebels will not benefit at all from controlling unlootable resources. By blocking government revenues in this matter, the rebels have in possession a means to execute pressure, causing the government to comply to rebel demands (ibid).

Moreover, Ross (2003b) claims that unlootable resources will still be of less value than lootable resources. He argues that the net change in the government's income when rebels control the unlootable resource is the amount of annual income lost in the exploitation of the unlootable resource, in addition to the amount of annual revenue gained by the rebel. The latter is however zero since the rebels normally do not have the means necessary to extract the resource (ibid). If the rebels instead take control over a lootable resource from the government, then the rebels are able to extract the resource. In this way, they will gain revenues, doubling the loss of the government. Thus, lootable resources are more lucrative for rebel groups than unlootable resources, both types motivating the involving parties (ibid).

Alluvial diamonds and illegal resources like coca, both lootable, exhibit: "low production costs and high prices (due to cartels or supply constraints) confer especially high rents that are insensitive to even significant rises in production costs or transport costs" (Auty 2004: 42). The high value of lootable resources makes these resources highly attractive for rebels and government to seize control over and use as a source of finance their activities. Civil wars will become harder to end as rebels may have little

to gain from ending the war once a monopoly of power over lootable resources have been established (Auty 2004: 43). According to Lujala (2003), lootable resources have a high value to weight ratio since they are easily smuggled and transport.

Rebels can also receive revenues from the sales of future rights to resources that they do not yet control, but hope to do during the time of war. In addition, they can receive revenues by selling the rights to resources that have not been extracted yet. This is also known as "booty futures" and is operated so far only in Africa (Ross 2003b: 32). Although potentially profitable, booty futures also involve a certain risk. By selling future rights, the rebels show signs of being in a weak position compared to rebel groups who sell natural resources directly. This source of income can prolong civil wars, as a fighting party is able to pay soldiers and buy arms. Instead of being defeated or forced to negotiate a ceasefire agreement, rebel groups or the army are not only able to continue fighting. They have in addition an incentive to fight, as the payoffs of civil war by selling booty futures are higher than settling for peace.

An example of this is the civil war in 1997 in the Republic of Congo, also know as Congo-Brazzaville[5], where sales of future exploitation rights to the country's oil reserves funded Denis Sassou-Nguesso's private militia. The sales of future rights, estimated to be a figure of 150 million USD paid by a European oil company, enabled Sassou-Nguesso to buy weapons and replace the serving president, Pascal Lissouba. Moreover, the conflict escalated to a bloody war which over a period of four months cost about 10 000 lives (Ross 2003b: 33). Rebels' dependence on the sales of natural resources can also shorten the duration of civil wars. This because the international community can execute pressure or credible threats, as the rebels are dependent on access to international markets in orders to sell natural resources (Auty 2004: 43). However, rebels can solve this by illicit trade, which will be further discussed in chapter 6.

[5] Not be confused with the Democratic Republic of the Congo, which also goes by the name Congo-Kinshasa, adding the name of the capital in order to differ between the two countries.

It would be desirable to measure how the profitability of natural resources motivates involving conflicting parties, but this is unfortunately not feasible. Although profitability of natural resources is elaborated in the previous sections, this is such a biased element that measuring it statistically is not possible. To compensate, the primary export ratio to GDP separated by lootability and obstructability is included in the thesis in addition to examining the price to weight ratio for the natural resources. This is seen as an appropriate measure of profitability and motivation of rebels and governments.

From this discussion, the last hypothesis may be derived:

H4: Civil wars in countries with natural resources with a high price to weight ratio last longer than countries with a low price to weight ratio, ceteris paribus.

Le Billon (2001) stresses the importance of the geographic approach to natural resources. Crucial to the shaping of economic networks in armed conflict economies and conflicts are the nature and geography of natural resources. This is because rebel groups will more easily control and exploit resources close to a border. Additionally, they will use this as a source of financing the cost of war and consequently prolong civil war duration. However, it is far more difficult to seize control over resources that are close to the capital. This is also known as the proximity-distance approach (Le Billon 2001a). Furthermore, the location of rebel and government forces can both increase and lower the relative military capabilities of the belligerent parties. Intrastate conflicts in the periphery of the country are longer lasting (ibid, Buhaug, Gates & Lujala 2009 and Buhaug & Gates 2002). Moreover, conflicts in rugged terrain is considered to favour insurgencies in the way that the effectiveness of conventional forces are reduced which in turn makes it easier for rebels to sustain oppositions. If fighting takes place in areas abundant with lootable natural resources, the fighting parties will have incentives to sustain fighting (Buhaug, Gates & Lujala 2009). Conflicts located near the capital and the area of the fighting zone also matter in addition to the adjacencies of an international border (Buhaug & Gates 2002).

Geographic dimensions are not added to the dataset, and this factor is for this reason not analysed statistically. The geographic factors are nevertheless included and are discussed when analyzing the case of the Democratic Republic of the Congo in chapter 6.

Table 3 sums up the hypotheses that will be statistically tested.

Table 3. Hypotheses to be tested statistically

Hypotheses to be tested statistically
H1: Civil wars in countries dependant on natural resources last longer than countries that are not dependant on natural resources, ceteris paribus.
H2: Lootable natural resources make civil wars last longer than unlootable natural resources, ceteris paribus.
H3a: Moderately obstructable and highly obstructable natural resources shorten civil war duration, ceteris paribus**.**
H3b: Unobstructable natural resources make civil war last longer than highly obstructable resources, ceteris paribus.
H4: Civil wars in countries with natural resources with a high price to weight ratio last longer than countries with a low price to weight ratio, ceteris paribus.

4 RESEARCH DESIGN AND DATA

According to King, Keohane and Verba (1994: 3) research design is about: "how to pose questions and fashion scholarly research to make valid descriptive and causal inferences." Moreover, a research design is a detailed plan of how the research question is answered. More specifically, research design is about how data is collected and the analysis is conducted, and how the inferences from the results of the analysis are related to the specific research question and the hypothesis.

The research question in this thesis is answered by using quantitative methods of research. Quantitative method of research implies that the researcher systematically collects comparable information about the objects of interest and then expresses this information in numbers. Thereafter the researcher derives hypothesis about the question he or she seeks to answer. Next, statistical analysis is conducted in order to test whether or not these hypotheses can be confirmed. Finally, inferences are drawn from the result of the statistical analysis (Hellevik 2003:13). In order to conduct a statistical analysis, theoretical concepts must to be operationalized so that data can be collected and analysed.

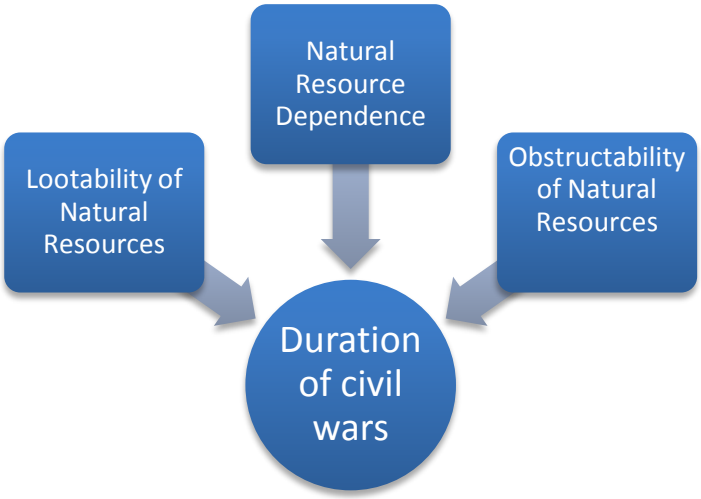
This chapter first explains how data are collected, and how the dependent and the independent variables are operationalized. Next, it describes how natural resources are selected and classified. Then an explanation of natural resources' lootability and obstructability is presented. Finally, methodological challenges that occur when conducting statistical analysis, such as data's validity and reliability with regards to lootability and obstructability, are discussed.

4.1 The Model

The purpose of this thesis is to establish if and how natural resources affect the duration of civil wars. The thesis also tries to establish if there is any difference between the different aspects of natural resources' obstructability on the duration of

fighting. Additionally, the lootability of natural resources is included in order to observe if this element of natural resources affects the duration of civil war. This is illustrated in figure 1:

Figure 1. Possible Effects on the Duration of Civil Wars



4.2 Units of Analysis

Conflicts are the units of analysis where the calendar years make up the sub-unit of every observation (Gleditsch et al 2002b: 3). Conflicts taking place in the same year in the same country are separated. If a conflict between June and November results in 30 causalities, then that given year will be registered as a year of conflict. If the same number of casualties occurred between November and February, and the conflict does not fulfil the 25 battle related deaths in neither of the two calendar years, then neither year will be recorded as a conflict (ibid).

According to Ross (2004a: 347), there are four datasets on which the majority of recent studies have drawn upon: The Collier and Hoeffler dataset, the Fearon and Laitin dataset, the Sambanis dataset and finally the Gleditsch et al dataset, also known as the UCDP/PRIO Armed Conflict Dataset. These scholars put forward different definitions of civil war, which have produced different results (see chapter 2). Gleditsh et al (2009) provide data on the duration of civil wars in this thesis. Their data are

based on Gates & Strand (2006) using the UCDP/PRIO criteria of 25 annual related battle deaths as described in chapter 1. Conflicts are in the UCDP/PRIO dataset outputted as years, and the dataset separates between different conflicts that take place in the same year, in the same country. Moreover, there are 275 conflicts in the dataset. Of all the observations in the dataset, there are 246 failures. This means that 246 conflicts have failed to persist. More precisely, 246 conflicts ended in a peace agreement (Gleditsh et al 2009).

4.3 Operationalization of the Variables

An important part of any analysis is the operationalization of the research question and the variables. The operationalization of theoretical concepts is also referred to as the measurement validity, meaning how the researcher has operationalized the concepts that he or she seeks to measure (Adcock & Collier 2001). This chapter describes how both the dependent and the independent variables are operationalized in order to conduct a statistical analysis. Data's validity and reliability are further discussed in chapter 4.5.

4.3.1 Dependent Variable: Duration

As mentioned previously, duration data are taken from Gleditsch et al (2009). The scholars collecting the data provides in most cases the start and end date of the conflict, and if not, at least the month. Duration is coded as conflict years and the dataset consist of conflicts that took place between 1946-2004. Conflicts that took place before 1946 and those that where still continuing by the end of 2004 are subsequently censored. This is further explained in chapter 4.4

4.3.2 Independent Variable: Natural Resources

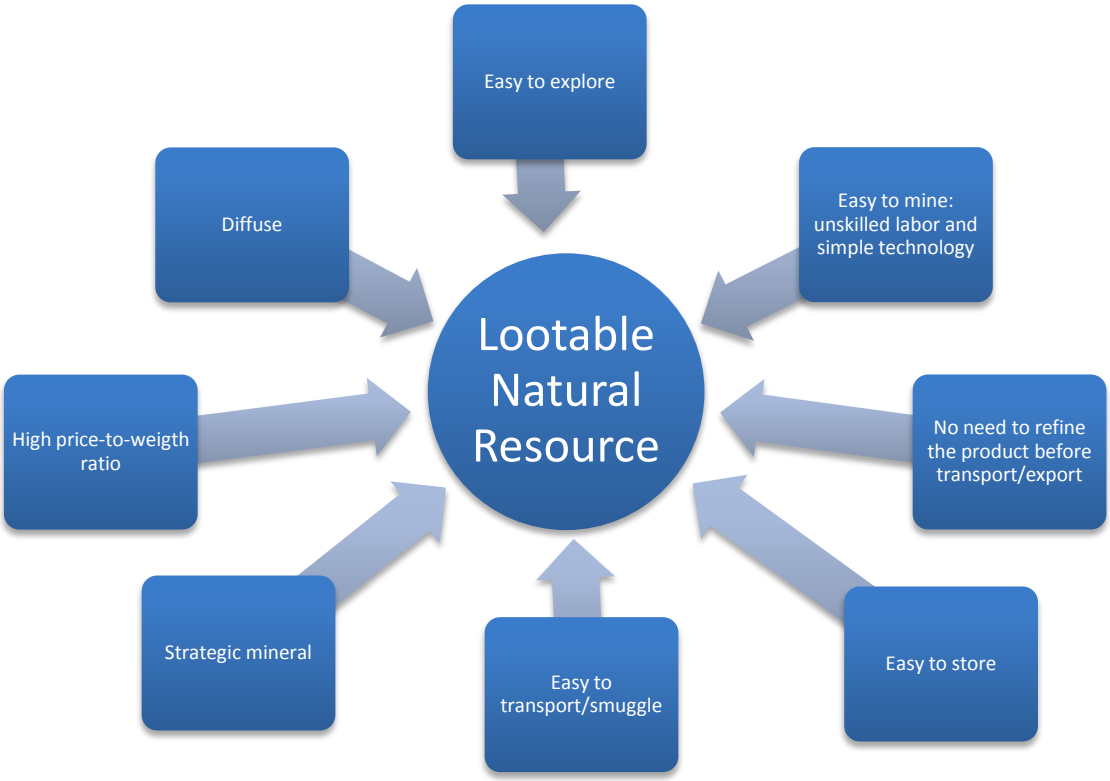
As mentioned in the introduction, there are no clear guidelines of defining and grouping natural resources. Scholars researching this topic have used different approaches in order to identify the significant importance of natural resources and hence produced different conclusions (Ross 2004a: 337-340).

There are three main approaches of classifying natural resources. Most of the studies described in chapter 2 apply the export value of natural resources as a measurement for resource dependence (Collier & Hoeffler 2002). This is measured as primary commodity export ratio to the Gross Domestic Product (GDP) (ibid). Problems occur by only applying this measure in order to study this relationship. Ross (2004a) points out that the causal arrow between the export of natural resources as a part of GDP and the onset of civil wars may go the other way. Internal conflict may lead to resource dependence. This is because resource dependence forces a country's production sector to run off while leaving the immobile natural resource sector the major component in the country's economy by default (ibid).

Geographic mapping is another approach of classifying natural resources, separating between resources that are concentrated in small areas (point) and resources that are spread over vast areas (diffuse). This approach is also known as the point-diffuse distinction, as used by Buhaug & Gates (2002) and Le Billon (2001 and 2008). Both measures are somewhat coarse according to Lujala (2003:6-8). The first attempt does not separate between the different types of resources, making it hard to distinguish between the different effects of natural resources on civil war. Furthermore, by using the point-diffuse approach, the researcher will have problems with deciding which natural resources are point and which are diffuse.

A third approach of measuring natural resources is by distinguishing them by their "lootability." A resource is defined as lootable if unskilled workers or individuals easily can appropriate it (Ross 2002:47). Both Ross (2004b: 46-49 and 2002: 54-56) and Lujala (2003:4) prefer this approach since it is easier to determine how and when a resource is valuable for a rebel group (Lujala 2003:9). The conditions that need to be fulfilled in order for a resource to be lootable are illustrated in figure 2.

Figure 2. Natural Resource Classification Scheme



Source: Lujala 2003: 13.

A resource is then unlootable when the extraction of the resource requires complicated technology and skills, when the resource has a low value to weight ratio, and when transportation of the resource is both difficult and costly. A lootable resource, on the other hand, is easy to transport and smuggle, has a high price to weight ratio or revenues from the resource can easily fall into rebels hand. This makes it a main source of financial incomes to provide further violent fighting.

Furthermore, Ross (2002) has constructed a table of classification of natural resources. He does not only group resources by their lootability, but distinguishes as well between resources' legality and obstructability. If the transportation of a resource can be blocked without difficulties by a small, armed group of people, then the resource is obstructable. A resource that can only be blocked by many soldiers and heavy equipment is thus classified as unobstructable (ibid). What is more, resources with a high value to weight ratio like gems, opium and coca, which can be flown out of remote areas, are classified as unobstructable, as blocking transportation and illegal

smuggling is difficult. Timber, agricultural products, and minerals have a lower value to weight ratio and are moderately obstructable since they most often have to be transported by truck or train at long distances. Highly obstructable resources are resources like natural gas and onshore oil. The reason is that these resources are transported at long distances in liquid form through pipelines above the grounds since pipelines always bear a risk of disruption along the pipes' entire length. The obstructability of a resource is correlated to its lootability as described in Lujala's figure above (Ross 2002:54).

Table 4. Natural Resources Classified

	Lootable	Unlootable
Highly Obstructable	———	Onshore, remote oil and gas
Moderately Obstructable	Agricultural products Timber	Deep-shaft minerales
Unobstructable	**Coca** **Opium** Alluvial gems	Deep-shaft gems Offshore oil and gas

Source: Ross 2002:55. **Bold** denotes illegal resources (Ross 2002:55).

Natural resources in this thesis are classified by combining the different approaches mentioned above. The resources are classified by their lootability and obstructability accordingly to both Lujala's figure (Lujala 2003) and Ross' table (Ross 2002). By looking at both measures, the qualities of different natural resources come into focus. I suspect that the occurrence of unlootable, unobstructable natural resources such as offshore oil will affect the duration of civil wars differently than lootable, unobstructable resources like alluvial diamonds. Additionally, the natural resource's export ratio to GDP is used as a proxy of resource dependence and determines the importance of each resource for the countries' economy. Furthermore, the export price ratio to exported kilograms of primary commodities are added, and applied in the case study of the DRC in chapter 6.

Data on export value and exported weight in kilograms for all the natural resources are taken from the United Nations Commodity Trade Statistics Database

(UNCOMTRADE), where more than 140 countries' export and import data are provided from 1962 until 2008 (United Nations Trade Statistics Database 2009a, 2009b, and 2009c). Export values have been collected for all the selected natural resources for all the countries in the dataset, and for all conflict-years. In the dataset, resource dependence is measured as percentage of GDP in order to substantially interpret how changes in primary commodity exports affects civil war duration. Additionally, the trade value in relation to the economy in conflict-countries is the main interest, and therefore measuring primary commodity exports ratio to GDP in percentages is considerate a more suitable approach. The price-weight ratios for the natural resources are divided into three groups: low, medium, and high. Resources that are exported in litres, like oil and gas, are also included, both classified as having a low price to weight ratio. In addition, the UNCOMTRADE does not report of the exported kilograms for silver and uranium. Nevertheless, it is reasonably to assume that these two resources have a high price to weight ratio. Therefore, they are placed in this group.

Conflicts and conflict-years that took place before 1962 are additionally excluded from the analysis. In addition, the UNCOMTRADE does not have observations for all the reported conflict years. This may be because primary commodity exports was sustained during the conflict years, or that the UNCOMTRADE have not succeeded in obtaining data.

Data on the countries' GDP for all years at current prices and constant 2005 prices in US Dollars are taken from Penn World Tables which contains data on about 30 variables for about 167 countries over some or all the years 1950-2004 (Heston, Summers and Aten 2009a, 2009b and 2009c). Penn World Table does not include data on former countries like the Soviet Union. Moreover, Myanmar is entirely excluded, the argument being that national accounts in constant and current prices to link national accounts estimates to the present are not available. In addition, China is listed in two versions in the data. In this thesis, I only apply one version, "China II" since this data, according to the contributors: "provide a more consistent recent economic

history of China relative to other countries[6]" (ibid). After all the exclusion processes, I am left with 236 conflicts compared with the initially 275 conflicts to analyse.

Geographic mapping is not included, since defining natural resources as point or diffuse is not only difficult, but also beyond the scope of this thesis. The focus lies on income from different types of natural resources as a means of financing rebel fighting and resource dependence affecting the duration of civil wars.

4.4 Selecting Natural Resources

The CIA World Factbook is the main source of information of which natural resources the countries in the datasets possess (CIA World FactBook 2009). The Factbook offers a table, which consists of more than 70 natural resources that are grouped into their respective country. Illegal natural resources such as opium and coca have not been included in this thesis. Although these resources may indeed prolong internal fighting, reliable data on these resources are hard to find. Therefore, only legal natural resources listed in the CIA World Factbook are included. This list includes natural resources such as minerals, petroleum, hydropower, and other resources of commercial importance.

From the World Factbook, natural resources are sampled out. Only resources that the countries in the dataset possess are included. From this group, some resources are excluded. Resources like arable land, fertile soil, and similar resources that cannot be classified as a primary commodity that can be exported are excluded. By primary commodity, I refer to "[…] unprocessed raw materials of agricultural and mineral origin […]" that can be traded (Oxford Advanced Learner's Dictionary 2000 and Radetzki 2008:7). Agricultural products like rice is not included in the CIA World Factbook list, and the CIA does not offer any further elaboration of their selection

[6] The Penn World Table (PWT) Version 6.3 offers users a choice of 2 Chinas in PWT6.3. "China I" uses the official growth rates for the whole period as in PWT 6.2. In "China II" PWT 6.3 uses the recent modifications of official Chinese growth rates for the period before 1990, and apply the modification of the official rate from 1995-2000 to the official rate after 2000.

criteria. Rice is nevertheless added in the data as I find it to be an important natural resource despite CIA's exclusion. Furthermore, natural resources that either has not been found at all or an appropriate code has not been found in the UNCOMTRADE database are also excluded. Additionally, some of the resources have coincidental names, meaning that the World Factbook have listed them twice, but under different names. One example of this is aluminium, listed as both bauxite (the name of the concentrated ore) and aluminium. In addition, some of the natural resources are separate resources, but are grouped together in the export data[7]. The final selection of natural resources is listed in the table 5 below in which the resources also have been classified according to their lootability and obstructability.

After the exclusion process, I am left with 55 different resources. Note that diamonds, precious stones, petroleum, and gas are listed more than once: diamonds and precious stones are listed as alluvial and deep shaft. Gas and petroleum are listed as onshore and offshore commodities. In addition, data for industrial diamonds are included. Since there is a difference in lootability and obstructability for these types of resources, these crude resources are listed as illustrated in table 5. Several sources of information have been consulted in order to define a natural resource's lootability and obstructability accordingly to the table presented above. These are all listed in the reference chapter of this thesis.

4.5 Selecting SITC Codes

The natural resources are classified according to the Standard International Trade Classification (SITC) in order to collect information about the resource's export value (United Nations Commodity Trade Statistics Database 2009a, 2009b, 2009c). The SITC is a system that covers every single commodity that is exported and imported in

[7] Excluded natural resources are the following: antimony, arable land, asphalt, chicle, coastal climate, diatomite, emeralds, fertile soil, forest, gemstones, gold, hydropower, kaolin, lignite, methane, natron, nitrates, pyrites, scenic beauty, shrimp, silica, soda ash, tar sand, timber, wildlife and zircon. Natural resources that have the same name are not included in this overview. For further information, go to the CIA World Factbook: https://www.cia.gov/library/publications/the-world-factbook/fields/2111.html?countryName=&countryCode=&regionCode=%C5%92 and check the appendix for a complete overview.

the world from 1962. The SITC divides all commodities into nine main groups: (0) food and live animals, (1) beverages and tobacco, (2) crude minerals, inedible, except fuels, (3) mineral fuels, lubricants and related material, (4) animal and vegetable oils and fats, (5) chemicals, (6) manufactured goods classified chiefly by material, (7) machinery and transport equipment, (8) miscellaneous manufactured articles and (9) commodities and transactions not classified according to kind (ibid 2009a). These main groups are once more divided into subgroups. Each natural resource is correlated with the suitable commodity and thereafter is assigned a unique SITC code. For example, iron has been given the code 281.3, the code for iron ore, belonging to the second group in the classification. This means that iron is a crude mineral. This is done in order to easily identify data on export value and similar variables (ibid 2009b and 2009c).

There exists four versions of this code system, and these versions do differ somewhat from each other. The latest version (Rev.4) covers only the period of 2007-2008. Since the time period in question for this thesis is from 1946-2004, this version is consequently excluded (ibid 2009a, 2009b, 2009c). Version number two, Rev. 2 is also excluded since it only provides data from 1976. The first version (Rev.1) gives a coarser grouping of the commodities, whereas the third revision is far more detailed. For this reason, it would be desirable to use the third revision (Rev.3). The third revision does not however cover the entire time period this thesis seeks to examine, as it only provides data from 1988 (ibid). Therefore, Rev.1 is applied throughout the thesis and the natural resources are classified according to this version. The selected resources are mainly all crude minerals. A crude mineral is defined as an unprocessed substance, which is naturally present in the earth or chemicals substance obtained in chemical processes (Oxford Advanced Learner's Dictionary 2000).

Two of the resources are not crude: platinum and cobalt. They are by-products of a crude mineral. They have still been included as I find them important, and are placed in the category six and five of the SITC, coded respectively 681.21 and 513.54. Two other important resources are excluded: tar sand and gold. An appropriate SITC code

has not been found for these resources in the UNCOMTRADE database. Tar sand is listed, but as a by-product of other sand types. This mineral is not commonly found in nature, and according to the CIA World Factbook (2009) the only country in the dataset that possess tar sand is Madagascar. Gold, however, is present in several countries in the dataset. I have not succeeded to find pure gold in the UNCOMTRADE database or a similar classification; only manufactured goods containing gold are listed. Gold has for this reason been excluded from the analysis in spite of its assumed high ratio of the export value of primary resources. In addition, missing values of primary commodities from the UNCOMTRADE are coded as 0. This is because I assume that missing values implies that the given country does not export the specific commodity at all, or that the specific commodity was not exported in the time periods that are outputted as missing.

Moreover, the UNCOMTRADE and the SITC system do not separate between exports that come from onshore and offshore oil and gas, and alluvial and deep shaft diamonds and precious stones. This information is crucial in order to identify the effect lootability and obstructability of natural resources has on the duration of civil wars. In order to compensate, data on diamonds, and oil deposits for the countries in the dataset have been added. In this way, it is possible to separate these resources. Although there exists specific dataset for precious stones or gemstones, data on diamond deposits is used to distinguish what kind of stones the countries in the dataset have. This is because data on gemstones does not separate between alluvial and deep shaft stones[8]. By using this method to compensate for the lack of distinction from the SITC and UNCOMTRADE, resources can be classified in accordance with lootability and obstructability. Since there is no precise data that separates between offshore/onshore gas and oil, and alluvial/deep shaft diamonds and stones, this method is considered to be sufficient for the purpose of this thesis. Country data for diamond deposits are taken from the Gilmore, Gleditsch, Lujala & Rød (2005a and 2005b). Data on oil and gas deposits are taken from Lujala, Rød &Thieme (2007a, 2007b and 2007c).

[8] See Lujala 2009.

In some cases, countries are reported to have both alluvial (secondary diamonds) and deep-shaft[9] diamonds (primary diamonds) (Gilmore, Gleditsch, Lujala & Rød 2005a and 2005b). This also occurs for oil and gas. In these cases, the dominating type of deposit is used. The number 1 has been added to the SITC code for onshore oil and onshore gas, and the number 2 has been added to the SITC code for offshore oil and offshore gas. This is additionally done for precious stones and diamonds, where the number 1 identifies alluvial diamonds and stones, and the number 2 identifies deep shaft diamonds and stones. For example, Angola is reported to have two large deposits of alluvial diamonds, and one deposit of kimberlite diamonds. Hence, Angola is set to have alluvial diamonds. Export revenues from diamonds for Angola is accordingly identified to come from alluvial deposits. The SITC code for diamonds is normally 667.2 and the code for alluvial is set to 1, meaning that exports data for diamonds from Angola is thus coded 6672.1. There is unfortunately a discrepancy between the reported data from the UNCOMTRADE (2009c) and the data collected by Gilmore, Gleditsch, Lujala & Rød (2005a and 2005b) and Lujala, Rød & Thieme (2007a, 2007b and 2007c). For instance, the UNCOMTRADE reports of several other countries than those listed by Lujala, Rød & Thieme (ibid) exports oil, diamonds, precious stones, and gas. Countries that according to the UNCOMTRADE export both oil and gas, but are only recorded as exporting oil by the scholars, have been classified as exporting both resources. Countries that are not mentioned in the data provided by researchers are excluded from the analysis, as there is impossible to identify the lootability and obstructability of the resources in these countries. A complete list of how oil, gas, diamonds, and resources are classified is reported in Appendix II.

The natural resources analysed in this thesis are presented in table 5.

[9] Also called kimberlite referring to rocks that contain diamonds in subsoil deposits (Gilmore, Gleditsch, Lujala & Rød 2005a).

Table 5. Natural Resources by Lootability, Obstructability, and SITC codes

	Lootable	Unlootable
Highly Obstructable	———	Natural gas in the gaseous state, onshore (SITC 341.11) Petroleum oils, onshore (SITC 331.1)
Moderately Obstructable	Calcium (SITC 514.94) Chalk (SITC 276.91) Clay (SITC 276.21) Coal, wether or not pulverized, but not agglomerated (SITC 321.) Cocoa (SITC 072.1) Coffee, wether or not roasted (SITC 071.) Crude rubber (SITC 231.1) Feldspar SITC 276.54) Fish (SITC 031.) Flourspar (SITC 276.54) Granite (SITC 273.13) Gypsum (SITC 273.21) Limestone flux (SITC 273.22) Marble (SITC 273.12) Mercury (SITC 512.83) Mica (SITC 276.52) Palm Oil (SITC 422.2) Peat (SITC 321.7) Potassium hydroxide (potash) (SITC 513.63) Pumice (SITC 275.23) Quartz (SITC 276.51) Rice (SITC 042.) Salt (Sodium chloride) (SITC 276.3) Slate (SITC 273.11) Stone,Sand & Gravel (SITC 273.) Sulphur (SITC 512.81) Talc (SITC 276.95)	Aluminium ores and concentrates (SITC 283.3) Arsenic (SITC 512.82) Asbestos (SITC 512.82) Cobalt (SITC 513.54) Diamonds, industrial (SITC 275.1) Graphite (SITC 276.22) Magnesite (SITC 276.24) Manganese ores and concentrates (SITC 283.7) Molybdenum ores and concentrates (SITC 283.93) Natural barium sulphates (barytes) (SITC 276.93) Nickel ores and concentrates (SITC 283.21) Niobium, tantalum and vanadium ores and concentrates (SITC 283.93) Phosphates, phosphinates (SITC 514.26) Platinum (SITC 681.219 Silver ores and concentrates (SITC 285.) Tin ores and concentrates (SITC 283.6) Titanium ores and concentrates (SITC 283.93) Tungsten (or wolfram) ores and concentrates (SITC 283.92) Uranium ores and concentrates (SITC 286.) Chromium ores and concentrates (SITC 283.91) Copper ores and concentrates (SITC 283.11) Lead ores and concentrates (SITC 283.4) Iron ore and concentrates, not agglomerated (SITC 281.3) Zinc ores and concentrates (SITC 283.5)
Unobstructable	Diamonds, other than industrials (alluvial) (SITC 667.21) Precious and semiprecious stones, alluvial (SITC 667.31)	Diamonds, other than industrial (deep shaft) (SITC 667.22) Natural gas in the gaseous state, offshore (SITC 341.12) Petroleum oils, offshore (SITC 331.2) Precious and semiprecious stones, deep shaft (SITC 667.32)

This thesis thus provides an entirely new empirical approach in studying natural resources' effect on the duration of civil wars by combining the approaches by Collier and Hoeffler (2004), Lujala (2003) and Ross (2002). Whereas previous studies have used the total primary export value for the combined group number 0,1,2,3,4, and 68 (Fearon 2005, Collier & Hoeffler 2004) of the SITC codebook, this thesis has defined each one of the 55 resources by their respective code. These are then divided into five groups, separating the resources between lootability and obstructability: (1) highly obstructable and unlootable, (2) moderately obstructable and lootable, (3) moderately obstructable and unlootable, (4) unobstructable and lootable and (5) unobstructable and unlootable. This strengthens the data validity, as each resource's export value is

added, not just the total export value of all of the combined commodity groups. By identifying each natural resource, the qualities of the resources will become more evident in the case of lootability and obstructability. To strengthen these believes the total export of primary export ratio to GDP is compared with the group of five. In addition, data from the World Bank used by previous studies on the total primary export for the combined SITC groups (0-4 and 68) (see Fearon 2005 and Collier and Hoeffler 2004) is added to the dataset (The World Bank 2009).

4.6 Control Variables

Control variables are added in order to control for spurious effects and hold confounding factors constant so that the impact on the explanatory variables can be studied for given control groups (Skog 2004: 41-45). When researching if natural resources affect the duration of civil wars, it is easy to infer wrongly if not controlling for other variables that might lead to the result presented by the data.

The first control variable is level of development. This variable is added as it easy to assume that developed countries possess more resources to put in use in order to hinder rebellion and formation of small-armed guerrilla groups. This is also correlated with the level of democracy. In democracies, the opposition may have a stronger voice than in authoritarian regimes, meaning that in the former the likelihood of rebellion is lower than in the latter. Also, developed countries are suspected to settle internal fighting faster than developing countries. The reason for this is that the latter lack the resources sole internal disputes and conflicts, even though the country is abundant with natural resources and experiences high incomes from the sale of crude minerals. According to the results in Collier, Hoeffler, and Söderbom's 2004 article, prolonged civil wars are correlated with a low per capita income (Collier, Hoeffler and Söderbom 2004).

Level of development is measured in this thesis as GDP per capita, measured in constant 2005 USD. Data are taken from the Penn World Table Version 6.3 (Heston,

Summers and Aten 2009b and 2009c). It can be argued that this measure is to a certain extent too coarse. The United Nations Development Programme (UNDP) has taken this into consideration when constructing the Human Development Index[10]. The HDI does not however provide data for all years; data are only available from 1975-2005 in five-year intervals. GDP per capita is nevertheless an unbiased measure and although missing data occur, the data are still considered to be of high reliability. Therefore, the HDI have been eliminated as a measure of level of development, and GDP per capita is considered an appropriate measure.

The second control variable is regime type. Regime type is added since previous studies have shown that there is a high correlation between resource dependence on crude minerals such as petroleum oils and the level of democracy. Resource rich countries are claimed to have authoritarian regimes since it is easier for leaders in countries wealthy on natural resources to stay in power when oppressing the people by spending these riches on the population. Previous regression analysis show that the more oil that is discovered, the less democratic the oil-rich country becomes (Ross 2001, Tsui 2005 and Wantchekon 2002). It is also more likely that democracies will end civil wars through diplomacy and negotiations, as this regime type is dependant on support from the population in order to stay in power. Put differently, leaders in democratic regimes have high incentives to heed demands from the population and thus negotiate to cease internal fighting. Gleditsch and al (2009) provide data on regime type, using the Polity IV index developed by Gurr, Jaggers & Marshalls (2009). The Polity IV index set the level of authoritarianism along a spectrum from fully institutionalized autocracy, mixed, incoherent authoritarian regimes to fully consolidated democracies measured on a scale from -10 to +10 (Gurr, Jaggers & Marshalls 2009).

Ethnic diversity is also believed to affect the duration of civil wars and is therefore included in the analysis. Ethnic diversity may take the form of ethnic political

[10] The UNDP constructs the HDI by calculating the level of development by adding up data on life expectancy at birth, level of education and GDP per capita (UNDP Human Development Reports 2009).

cleavages where the majority may find the ethnic diversity as an opportunity to take advantage of the minority (Collier & Hoeffler 2004 and Collier, Hoeffler & Söderbom 2004). Moreover, ethnic dominance may cause the feeling of grievance in ethnic minority groups, which may not only trigger civil wars, but also prolong them. The 40-year-old ethno-religious civil war in Sri Lanka serves as an example. In their article from 2004, Collier, Hoeffler & Söderbom comes to the conclusion that the one aspect that prolongs the duration of internal conflict is a moderate ethnic division (Collier, Hoeffler & Söderbom 2004). A common measure for ethnic diversity is ethno-linguistic fractionalization, in which the probability of two randomly drawn persons belonging to the same ethnic group are measured (Collier and Hoeffler 2004). Data on ethno- fractionalization are also taken from Gleditsch et al (2009) who have collected this data from Roeder (2001) (Gleditsch et al 2009: 173).

Finally, population is added as a control variable as it may be reasonable to assume that the size of a population will have an effect on the duration of war. Data on population size is taken from the Penn World Table Version 6.3 (Heston, Summers and Aten 2009b and 2009c).

4.7 Statistical Methods

Duration is analysed using the method of event history analysis or survival analysis, a type of analysis that is used when examining events that represent a transition of state (Box-Steffenmeier & Jones 2004:1). A linear model of OLS regression becomes problematic when event history data is analysed. This is because duration data must be positive, which usually means that the response variable will show evidence of asymmetry, especially if some of the observations have remarkably long duration times (ibid: 16). A common solution to this problem is to log-transform the response variable and then apply OLS. According to Box-Steffensmeier & Jones (2004), the new model mitigates the skewness problem, but does not solve other problems like failing to observe the termination or onset of a spell whose observation took place before the starting time set by the researcher (ibid: 16). For example, if a researcher

wants to investigate civil wars between 1960 and 1980, she has to be aware that some of the ongoing conflicts in the dataset may have been initiated before 1960. By conducting survival analysis, these problems are solved by right censoring and through left truncation. This means that observations that did not experience an event during the time span of the study and observations with history prior to the first observation point is unobserved is accounted for. OLS regression is therefore not compatible with duration analysis as it may produce biased samples, leading to incorrect conclusions (Box-Steffenmeier & Jones 2004: 15-20).

Event history analysis consists of units like individuals, countries, and dyads: "observed at some natural starting point or time-of origin." This type of analysis is also referred to as survival model, referring to how long it takes for a unit to experience a certain event. Put differently, "as something persists—as it survives—what is the risk it will subsequently end?" (Box-Steffenmeier & Jones 2004: 3+7). This event is called "failure," which in this thesis refers to when a conflict ceased to exist (that it "failed" to last) (Hamilton 2009: 308). After this event has taken place, the unit is no longer at risk of experiencing another kind of event, or are no longer observed (Box-Steffenmeier & Jones 2004: 3+7). This means that when failure has not occurred to a given observation by the time data collection ends, that observation is then " right censored" (Hamilton 2009: 308-310). In this case, when a conflict did not experience an event during the time span of the dataset (1946-2004), the conflict is right censored. The UCDP/PRIO dataset reports after the exclusion of non-matching cases of 236 conflicts in which 207 conflicts experienced an event. This means that 207 conflicts ceased and ended in a cease-fire.

When there is a good reason to expect that the duration dependency exhibit some particular form, parametric models of analysis like Weibull and Gompertz, which yields monotonic hazards, are desirable (Box-Steffenmeier & Jones 2004). In research generally, and in this thesis also, the focus is on the relationship between the outcome and the covariates of interest. Moreover, researchers do not always know what kind of form the duration dependency might display, and a flexible model is thus of better use.

This thesis therefore applies the Cox proportional hazard model, better known as the Cox model. The advantage of this model is that it is a fully flexible duration model where the estimates of the covariates a researcher is interested in is obtained and the particular form of the duration dependency is left unspecified (Box-Steffenmeier & Jones 2004: 47-48).

The Cox hazard function is written as follows:

$$h_i(t) = \exp(b_i X_{1i} + b_2 X_{2i} + ... + b_k X_{ki}) h_0(t),$$

where $h_i(t)$ is the hazard rate at time (t) for unit i . b_1 is the regression parameter for the covariate X_1, and h_0 is the baseline hazard function (ibid: 48-49). The baseline hazard rate, $h_0(t)$ is not specified in the parametric part of the Cox model, and consequently the model does not have an intercept term, b_0. This is instead absorbed into the baseline hazard function (ibid: 49). In this thesis, the hazard rate is thus the probability that a conflict will end in a cease-fire at time (t) while the conflict is at risk for this event to occur (ibid). More specifically, the hazard rate is the unobserved rate at which events happen and it controls both the timing and the occurrence of events (UCLA: Academic Technology Services, Statistical Consulting Group 2009).

A key assumption in the Cox model is proportional hazards. The hazard function for each observation must follow the same pattern over time (Box-Steffensmeier & Jones 2004). If not, the model will overestimate the impact of variables whose associated hazards are increasing. In addition, the coefficient estimates for covariates in which the hazards are converging will be biased towards zero. For this reason, the assumption of proportional hazards must be tested (Box-Steffensmeier & Jones 2004: 132). Testing for non-proportional hazards can be done in several ways. One possibility of checking the proportional hazards assumption is to test if there is a relationship between the residuals bases on the Schoenfeld residuals (Cleves, Gould & Gutierrez 2004: 178).

Results from the Schoenfeld test of proportional hazard assumption for all models indicate that all of the variables except two fulfil the assumption of proportional hazards. This is the log-transformed variable of population and the variable for regime type. Box-Steffensmeier & Jones (2004) suggest that when a variable does not fulfil the assumption of proportional hazards, an interaction variable with time (t) should be generated and applied in the analysis instead. This will result in a variable that fulfils the assumption (Box-Steffensmeier & Jones 2004: 136-137). This solves the problem with the regime type variable, but it does not solve the problem of proportional hazard for the log-transformed variable of population. The new interaction variable of log-transformed population and time still does not fulfil the assumption. However, since population is not the main variable of interest, but a control variable, the assumption of proportional hazards for this variable is ignored. Moreover, when comparing results from analyses including and excluding the interaction variable of the log-transformed population variable, the coefficients hardly change, indicating that colinearity is not a problem. Since the interaction variable makes the model fit the data better than with the original population variable, and since neither fulfil the assumption of proportional hazards, the interaction variable for populations is included in the analysis as this variable has no impact on the overall conclusion in this thesis.

4.8 Methodological Challenges

Methodological challenges always arise when researchers seek to answer to their research questions through statistical analysis. Statistical analysis will always try to increase both validity and reliability of the data in order to conduct analysis as precisely as possible.

Missing data must be taken in consideration when applying statistical analysis. Some countries in the dataset are former states of countries today. In these cases, data on the successive state is used if no exact data exist for the previous state formation. Some countries also rule over smaller colonies. These are excluded in this thesis since the UNCOMTRADE reports this data separately and not as export values from the

administrative country[11]. Moreover, the UNCOMTRADE does not offer any export data before 1962. These are subsequently excluded, as there are no available data. In addition, the UCDP/PRIO dataset reports of conflicts where the UNCOMTRADE does not report of any exports to have taken place, thus defining these instances as missing.

Missing also applies for the Penn World Table, which does not offer data on former countries like the Soviet Union. Moreover, one existing country is also excluded: Myanmar. The Penn World Table argues that figures from Myanmar are questionable, and does not offer any data on the country (Heston, Summers & Aten 2009c). In addition, I have not been able to identify what kind of precious stones, diamonds, gas, and oil 76 of the countries in UNCOMTRADE statistical database have. These countries are not excluded from the analysis- the other natural resources may still have an effect the nature of the civil war in these countries.

Data's validity is defined as the: "degree of correspondence between the theoretical meaning of a variable in the causal model and the measure used for the variable in the empirical analysis." In other words, validity is the relevance of the data for the research question. When the theoretical definition corresponds with the operationalization, then face validity is fulfilled (Hellevik 1988:120 and Hellevik 2003: 53). The definition of natural resources is unquestionable since the resources cannot be anything else than what they are: natural resources. Yet, what kind of resources can be classified as being natural can be problematic. For instance, resources such as rice have been excluded from the CIA World Factbook. The most common perception of natural resources is that they are produced in nature, as explained in the first chapter of the thesis. Most of the resources in this thesis are natural and crude, with some exceptions. When it comes to natural resources, I find that face validity is fulfilled.

The issue of validity with regard to civil wars and their duration on the other hand are more problematic. The general perception of the term is internal conflict between the

[11] These small states are Macao, Hong Kong, Guadeloupe, Reunion, Montserrat, Sabah, and Mayotte.

government and a rebel group. However, scholars define civil wars and measure duration differently, which may lead to divergent results and inferences. Still, the basic criteria remain similar in the different datasets, so whichever dataset I choose, I assume that the measure used in the dataset corresponds well enough with the empirical perception of the term. In this thesis, the UCDP/PRIO dataset is applied, and thus their definition of civil war being conflicts with a 25 annual battled related deaths is applied.

Validity of lootability and obstructability is also not straightforward. What makes a resource lootable and when can a resource be classified as obstructable? Researchers like Ross (2002) and Lujala (2003) have constructed tables and measures, without ever classifying natural resources other than diamonds, oil, and gemstones according to their schemes. Lootability and obstructability is classified as far as possible in accordance with Ross (2002) and Lujala's (2003) measures, leaving it highly challenging to classify other resources than oil, diamonds, and gemstones. Underground minerals, for example, copper, iron, and silver and crude minerals like petroleum and gas are classified as unlootable, whereas alluvial minerals and agricultural products are classified as lootable. The obstructability of these resources has also been difficult to classify. According to Ross (2002), most natural resources are moderately obstructable. Only oil, gas, diamonds and gemstones can be separated by the degree of obstructability, and these resources have thus been easily classified.

Even though several sources have been consulted in order to categorize the resources, a geologist for instance would perhaps not agree with my classification. In addition, the classification is based on the general occurrence of the resource-some resources come in very different form in different countries. Coltan, a tantalum ore in the DRC is an example of this. This resource can be defined as both lootable and unlootable, but since the resource belongs in a SITC code with other resources[12], it has been classified as unlootable. In the DRC on the other hand, it appears in streambeds, and can be

[12] In Rev1 of the SITC, tantalum, the ore coltan origins from, is classified as SITC code 238.93 "Niobium, tantalum and vanadium ores and concentrates."

easily dug out and is thus a lootable resource. This will of course affect the conclusion of this thesis, but an appropriate alternative in studying the effect of natural resources on civil war duration have not been found. Considering the scope of this thesis, I consider the validity of lootability and obstructability fulfilled. Nevertheless, natural resources should be utterly explored in order to enhance the validity of the data.

In addition, oil, gas, diamonds, and precious stones come in different forms, and are classified as either deep-shaft/alluvial or onshore/offshore. Unfortunately, the SITC does not differ between these categories, and using external data to determine this means is not desirable, but acceptable. What is more, some countries are listed to have both. Moreover, some countries are not reported to have oil and diamond reserves according to the scholarly data although the UNCOMTRADE reports that they do. Deciding which type of resource a country has by comparing onshore/offshore and alluvial/deep-shaft deposits is not desirable, but sufficient for the scope of this thesis as no such data for export exists. In the future, precise data should be obtained in order to increase the validity. Considering the lack of appropriate data and the scope of this thesis, I conclude that data's validity is sufficiently fulfilled.

Reliability is defined as the: "degree to which data are free of random measurements errors" (Hellevik 1988:120). By conducting reliability tests, the possible impact of measurement errors may be assessed (ibid: 110). With quantitative analysis, the inferences I draw can easily be reproduced and tested by other researchers. This can be done by performing the very same analysis I have conducted in order to test the reliability. This is far more difficult than when using qualitative methods where measurements errors are harder to discern.

Additionally, the relationship between natural resources and internal conflict may be spurious. It is possible that another variable affects both civil war and resource dependence, e.g. weak rule of law or level of development. Resource-rich countries with weak rule of law may find it difficult to attract foreign investment and thereby become more dependent on exporting natural resources. The correlation between

natural resources and internal conflict can therefore become significant statistically, but this correlation may not be true in the real world, as the one factor may not cause the appearance of the other (Ross 2004a: 338). In order to compensate for this, control variables that are assumed to possibly affect this relationship are added. Analyses are conducted first with the control variables, then without. The change in the results will tell if there may be a spurious effect or the result may become not significant at all. This is further explained in chapter five.

4.9 Data Summary

Table 6 describes the variables in the dataset where duration is the only dependent variable. Four control variables are added, and two of these are added as squared in order to check for a possible non-linear relationship. These are population size, level of development measured as GDP per capita in constant 2005 USD, regime type and level of ethno-linguistic fractionalization. The independent, or the explanatory variables are total primary commodity export ratio to GDP using data from the UNCOMTRADE and the World Bank in addition to the variables that separates natural resources by lootability and obstructability. Furthermore, the variables of price to weight ratio is added, keeping low price to weight ratio as the reference category. Two variables for oil and one for alluvial diamonds are added. This is further explained in chapter 5.1 (see table 9). Overall, this gives me a total of 1440 observations.

Table 6. Data Summary, Descriptive Statistics

Variable	N	Mean	Std. Dev.	Min.	Max
Duration	1440	.14375	.3509579	0	1
Total Primary Commodity Exports/GDP (UNCOMETRADE)	1214	1.173225	3.205432	0	56.78261
Total Primary Commodity Exports/GDP (World Bank)	1211	2.325278	4.746984	0	81.97636
Highly Obstructable & Unlootable Exports/GDP	1214	.3992078	2.52357	0	56.77941
Moderately Obstructable & Unlootable Exports/GDP	1214	.0270386	.1986114	0	5.968539
Unobstructable & Unlootable Exports/GDP	1214	.2202538	1.317773	0	17.38292
Moderately Obstructable & Lootable Exports/GDP	1214	.491835	1.381095	0	21.52271
Unobstructable & Lootable Exports/GDP	1214	.0348894	.1330467	0	2.407262
Lootable Exports (sum of all lootable)/GDP	1214	.5267244	1.389555	0	21.52271
Unlootable Exports (sum of all unlootable)/GDP	1214	.6465002	2.842367	0	56.77943
Unobstructable Exports (sum of all unobstructable)/GDP	1214	.2551432	1.366227	0	17.38292
Obstructable Exports (sum of all obstructable)/GDP	1214	.9180814	2.897679	0	56.7826
High Price/Weight Ratio	1214	.3262602	.7377107	0	6.812894
Medium Price/Weight Ratio	1214	.3630889	1.539183	0	17.4568
Low Price/Weigth Ratio	1214	.4832696	2.57427	0	56.78136
Alluvial Diamonds Exports/GDP	793	.0474781	.1596542	0	2.407262
Onshore Oil Exports/GDP	793	.5029881	2.801035	0	55.74444
Offshore Oil Exports/GDP	793	.3063506	1.552104	0	17.34719
Population (ln)	1266	10.10862	1.659598	5.399515	149378.2
Population Interaction (lnpop * _t)	1266	29402.01	29489.16	5.399452	13.88827
GDP Per Capita, Constant USD (ln)	1214	7.873075	.9080472	5.031514	10.61389
Ethnic-lingustic Fractionalization (cen)	1440	.009245	.2468721	-.570605	.4023951
Ethnic-linguistic Fractionalization (cen) (sq)	1440	.060989	.064431	.0000705	.32559
Regime Type	1240	-.875	6.939356	-10	10
Regime Type Interaction (polityiv * _t)	1240	-1105.203	31802.79	-85928	149750
Regime Type (sq)	1240	48.88145	26.01039	0	100

5 ANALYSIS AND RESULTS

Does resource dependence lead to longer lasting wars? And is there a difference between the effect of lootable and unlootable natural resources on the duration of civil war? This chapter presents the results and the findings from the statistical analysis. First, the multivariate results are presented and shortly commented. Thereafter, the findings are summarized and discussed in accordance with the theory presented in chapter 3.

5.1 Results from Cox Analysis

A multivariate analysis is conducted in order to control for confounding factors. In this chapter, the control variables described in chapter 4.3.3 are added to the analysis. In other words, the effect of the variables of natural resources on the duration of civil war is analysed, keeping all the other factors constant. The control variables included in the multivariate analysis are level of development (GDP per capita in constant 2005 USD), regime type, and ethno-linguistic fractionalization. The results are mainly in line with the applied theory described in chapter 3. However, in some cases, the results are quite weak, and the coefficients are on average not statistically significant.

Table 7. Multivariate Results

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	b (SE)	exp (*b*)	*b* (SE)	exp (*b*)	*b* (SE)	exp (*b*)	*b* (SE)	exp (*b*)	*b* (SE)	exp (*b*)	*b* (SE)	exp (*b*)	*b* (SE)	exp (*b*)
Total Primary Commodity Export/GDP (UNCOMTRADE)	.026 (.016)	1.026												
Total Primary Commodity Export/GDP (World Bank)			.021** (.009)	1.022										
Highly Obstructable & Unlootable Exports/GDP					.029* (.018)	1.030								
Moderately Obstructable & Unlootable Exports/GDP					.381*** (.143)	1.464								
Unobstructable & Unlootable Exports/GDP					.011 (.049)	1.011								
Moderately Obstructable & Lootable Exports/GDP					-.011 (.050)	.989								
Unobstructable & Lootable Exports/GDP					-.101 (.647)	.904								
Lootable Exports (sum of all lootable)/GDP							-.009 (.051)	.991						
Unlootable Exports (sum of all unlootable)/GDP									.030* (.016)	1.030				
Unobstructable Exports (sum of all unobstructable)/GDP											.014 (.046)	1.014		
Obstructable Exports (sum of all obstructable)/GDP													.027 (.0168)	1.027
Population Interaction (lnpop * _t)	-.001 (.001)	.910	-.001 (.001)	.910	-.001 (.001)	.910	-.001 (.001)	.910	-.001 (.001)	.910	-.001 (.001)	.910	-.001 (.001)	.910
GDP Per Capita, Constant USD (ln)	.103 (.114)	1.108	.101 (.116)	1.107	.105 (.113)	1.111	.149 (.111)	1.161	.114 (.114)	1.120	.147 (.111)	1.160	.122 (.113)	1.130
Ethnic-lingustic Fractionalization (centred)	-.144 (.415)	.866	-.057 (.415)	.945	-.204 (.427)	.815	-.139 (.417)	.871	-.169 (.409)	.845	-.168 (.410)	.845	-.199 (.406)	.820
Ethnic-linguistic Fractionalization (centred) (sq)	-.802 (1.592)	.448	-.522 (1.587)	.594	-.580 (1.600)	.550	-.286 (1.572)	.751	-.580 (1.574)	.550	-.317 (1.560)	.729	-.694 (1.585)	.500
Regime Type	-.015 (.013)	.985	-.014 (.013)	.987										
Regime Type Interaction (polityiv * _t)					-8.25e-06 (5.03e-06)	.910	-9.12e-06 (4.97e-06)	.910	-8.21e-06 5.02e-06	.910	-9.08e-06 (4.98e-06)	.910	-8.67e-06 (4.99e-06)	.910
Regime Type (sq)	-.001 (.003)	.910	-.002 (.003)	.998	-.001 (.003)	.910	-.001 (.003)	.910	-.001 .003	.910	-.001 (.003)	.910	-.001 (.003)	.910
df	7		7		11		7		7		7		7	
LR	-635.97218		-625.1673		-632.95422		-636.18034		-634.87333		-636.15226		-635.1681	
N	1024		1022		1024		1024		1024		1024		1024	
* = p<0.10, ** = p <0.05, *** = p <0.01														

Table 7 presents the result from the multivariate analysis for model 1 through 7. The remaining models are displayed below.

Three estimates are listed in all of the models. The first coefficient, *b*, is the log hazard ratio, which describes the change in the risk a unit has of conflict end over a time period (t, t+1), given that the duration has lasted up to t (Box-Steffensmeier & Jones 2004: 15). The hazard rate can in this way be referred to as the termination rate, a term that will be used henceforward. If the coefficient is positive, then the termination rate is interpreted as increasing. This means that with positive coefficients civil wars have a shorter survival time (ibid: 59). A negative coefficient, on the other hand, indicates that the termination rate is decreasing. This implies that with a negative coefficient civil wars last longer, that is they have longer survival times before failures occur (ibid).

The next estimate, SE(*b*), written in parenthesis below the coefficient *b*, is the standard error of the parameter estimate. The standard error is the standard deviation of the probability distribution for the *b* estimate, and is an indicator of how much the estimate will deviate from the correct parameter value (Skog 2004: 135). The *p*-score is the probability of obtaining the observed parameter estimate, *b*, if the true value of *b* is zero. The *p*-value is calculated based on the parameter estimate and the standard error, and it used to test statistical significance of the variables in order for hypothesis to be confirmed or rejected. The researcher herself sets the *p*-value that is the level of significance. If the results show that the *p*-value is lower than the selected level of significance, the null hypothesis is rejected (Skog 2004: 177-178).

The level of significance required to reject a null hypothesis is the result of personal preference. The researcher concludes that there is no relationship between the variables if he or she cannot reject the null hypothesis. If the truth is that there is a relationship, the researcher commits a type II error. This means that he or she wrongly concludes that there is no effect between the variables. If the level of significance is too high, the researcher may wrongly reject the null hypothesis and conclude that there

is a relationship between the variables. This is a type I error and the probability of committing a type I error is decided by the level of significance set by the researcher. The probability of making a type II error, on the other hand, is determined by the level of significance, the sample size, and the distribution of the population of units (Skog 103+207-208). In the following analysis, I apply a 5% level of significance, meaning that the *p*-value is $p = 0.05$. This means that estimates with a *p*-value higher than 0.05 is not statistically significant and are subsequently excluded from the analysis and the interpretation of the findings. Two stars indicate significant coefficients at a 5% level as shown in table 7. In addition, significant coefficient at a 10% level is indicated by one star, and three stars indicate significant results at a 1% level.

The last estimate is the exp(*b*), the exponential regression coefficient, which expresses the hazard ratios. More specifically, the exp(*b)* is the relationship between two hazard rates. This ratio is interpreted as the changes in the hazard, or risk, that a conflict ends when the independent variable increases by one unit. Hazard ratios between zero and one means that the risk of civil war determination decreases when the dependent variable increases, which leads to longer lasting civil wars. For example, a exp(*b*) = 0.30 indicates a 70 % lower risk of civil wars lasting longer, meaning that the risk of determination decreases with 70 % when the covariate increases by one unit of measure. Positive hazard ratios, on the other hand, are ratios larger than one, which means that the risk of termination increases with the dependent variable. This indicates that internal conflicts do not last for a long period of time. If the analysis results in a exp(*b*)= 1.30, the risk of determination when the covariate increases by one unit is predicted to be 30 % (Box-Steffensmeier & Jones 2004: 50, 60-63).

Model 1 contains the variable for total primary exports ratio to GDP based on the UNCOMTRADE data in addition to the control variables. The control variables are also listed as squared in order to uncover possible non-linear relationships. Results from the analysis show that the log hazard ratio (*b)* for total primary export ratio to GDP is positive. This means that resource dependence has a positive effect on the termination rate of civil war, indicating that civil wars are shortened. Increasing

primary commodities export ratio to GDP by one standard deviation, other factors kept constant, predicts an 8.6% increase in the termination rate[13]. Moreover, in model 1, the hazard ratio for a one-unit increase is 1.026 when other factors are kept constant. This further indicates that when resource dependence increases with one unit of measure, that is when export of primary commodities increases with 1%, the likelihood of civil war termination increases with 2.6 %. This is reflected from the low value of the coefficient, also indicating that this covariate has little effect on civil war duration. However, none of the coefficients in this model are statistically significant[14], and the hypothesis can thus not be confirmed. In addition, the coefficient is quite small, indicating that resource dependence, based on data from the UNCOMTRADE have a weak impact on civil war duration. To sum up, there is no support for hypothesis *H1: Civil wars in countries dependent on natural resources last longer than countries that are not dependent on natural resources, ceteris paribus* when applying data from the UNCOMTRADE.

In model 2, data from the UNCOMTRADE on total primary export ratio to GDP is replaced by data on primary exports from the World Bank. As with the former model, the coefficient in model 2 is positive, and there is insignificant difference between the *b* estimates for the UNCOMTRADE and World Bank data. This implies that civil wars have a shorter duration time in countries dependent on natural resources, and that the effect when applying the World Bank data are close to identical when applying the UNCOMTRADE data. In this model, however, the coefficient is statistically significant. Table 7 demonstrates this further where the results show that the standard error for the coefficient for the World Bank data is substantially lower than the UNCOMTRADE standard error. Raising primary export ratio to GDP based on the World Bank data by one standard deviation when other factors are kept constant indicates an 11% increase in the termination rate. The hazard ratio for this covariate is also positive at 1.021, other factors kept constants. This indicates that when export of

[13] This is calculated as exp(0,0260*3,205)=1,086. See table 6 for standard deviations for all variables.
[14] The interaction variable for the log transformed population with time is statistical significant in all models. However, since this variable does not fulfill the assumption of proportional hazards, it is therefore not included in the discussion of significant effects, and is not indicated as being significant in all of the models.

primary commodities increases with 1%, the risk of civil war termination increases with 2.1%. Hazard ratios close to 1 are interpreted as the coefficient having no effect on increasing or decreasing the hazard of event (Box-Steffensmeier & Jones 2004: 63). The results from the Cox analysis can be used to infer about the hypothesis, although the effect is relatively weak. To summarize, the results contradict hypothesis *H1* when applying the World Bank data. Thus, dependence on natural resources reduces civil war duration when applying data from the World Bank.

Model 3 includes all the variables of lootability and obstructability[15]. Compared to the coefficient for moderately obstructable and unlootable resources, the rest of the coefficients are relatively smaller, indicating weaker effects on civil war duration. Results from the analysis indicate that the estimate for highly obstructable and unlootable natural resources, like offshore oil, is positive. The hazard ratio for this estimate when other factors are kept constant is 1.029. This indicates that when exports of highly obstructable and unlootable resources increases with 1%, the risk of civil war termination increases with 2.9%. Increasing this variable by one standard deviation, other factors kept constants, predicts a 7.6% increase in the termination rate.

For unlootable and moderately obstructable resources, the effect on civil war duration is much stronger. Moderately obstructable and unlootable resources such as deep-shaft minerals have additionally a positive effect. The risk of termination increases with 46%, other factors kept constant, when exports of this group of resources increase with 1%. Raising moderately obstructable and unlootable natural resources by one standard deviation indicates an 8% increase in the termination rates when other factors are kept constant. The last group of unlootable resources, that is resources that are unobstructable and unlootable, for instance onshore oil, also have a positive effect. For these type of resources, an exports increase of 1% increases the risk of termination of civil wars with 1.1% when other factors are kept constant. Increasing this variable by

[15] In order to control for colinearity, each of the variables for obstructability and lootability have been analysed in separate models. This reveals that the estimates are almost identical, implying that there is not a problem of colinearity in the estimates. The results are displayed in Appendix V.

one standard deviation, predicts a 1.5% increase in the termination rate when other factors kept constants.

Turning to lootable resources, which are argued in chapter 3 to prolong civil war duration, the results indicate that lootable resources have a negative effect on civil war duration, thus prolonging them. For moderately obstructable and lootable resources, like sands and agricultural products, the risk of civil war termination decreases with 1.1%, other factors kept constant, when exports of this group of resources increases with 1%. Increasing moderately obstructable and lootable resources by one standard deviation, other factors kept constants, predicts a 1.6% decrease in the termination rate. For lootable, but unobstructable resources like alluvial diamonds, the effect is stronger, but still negative. If exports of alluvial diamonds and similar unobstructable and lootable resources increases with one unit, that is the export increases with 1%, the risk of termination of civil wars decreases with 9.7%, other factors kept constant. Raising this variable by one standard deviation, other factors kept constants, predicts a 1.4% decrease in the termination rate. This implies that unobstructable and lootable resources prolong civil war duration to a larger extent than moderately obstructable and lootable resources. However, the only statistically significant estimates are the coefficients for highly obstructable and unlootable resources and moderately obstructable and unlootable resources. Nevertheless, there is support for *H3a: Moderately and highly obstructable natural resources shorten civil war duration, ceteris paribus.*

In order to get a more substantial interpretation of the effect of lootable resources opposed to unlootable resources and the degrees of obstructability, the variables for lootability and obstructability have been grouped together as displayed in model 4 -7. The estimates for lootable natural resources are displayed in model 4. The coefficient is negative, indicating that lootable resources prolong civil war duration. Increasing lootable resources with one standard deviation predicts a 1% decrease in the termination rates, other factors kept constant. The hazard ratio for this covariate is 0.99, indicating a 1% lower risk of civil wars lasting longer. Put differently, when

other factors are kept constant, the risk of termination decreases with 1%, when exports of lootable resources increase with 1%. This hazard ratio is however so close to 1 that it should rather be interpreted as having no effect on increasing or decreasing the hazard of event, as argued by Box-Steffensmeier & Jones (2004: 63). Moreover, none of the coefficients are statistically significant, thus *H2: Lootable natural resources make civil wars last longer than unlootable natural resources, ceteris paribus* cannot be rejected or confirmed.

Model 5 contains the estimates for unlootable natural resources. The coefficient is in this model positive at 0.029, indicating that unlootable resources have a stronger effect on civil war duration, and that the survival time for civil war shortens. Raising unlootable resource exports by one standard deviation, other factors kept constants, indicates an 8.8% increase in the termination rates. The hazard ratio in this model is 1.030, which means that the risk of termination of civil wars when exports of unlootable resources increase with 1% is predicted to be 3.0%, other factors kept constant. Moreover, this coefficient is statistically significant at a 10% level. Although the coefficient for lootable resources is not statistically significant, results from model 5 nevertheless indicate that unlootable resources shorten civil war duration, which is in line with the theory presented in chapter 3. Thus, there is indirectly support for *H2*, and this hypothesis is therefore confirmed.

The second last model in table 7, model 6 contains the estimates for unobstructable natural resources. In this model, the coefficient is positive, indicating that unobstructable resources shorten the duration of civil wars. The effect is relatively weak, but as only diamonds, precious stones, offshore gas, and offshore oil fall into this category, this is expected. Increasing unobstructable resources by one standard deviation indicates a 1.9% increase of the termination rate when other factors kept constant. Moreover, the hazard ratio is 1.014, which means that the risk of termination of civil wars when other factors are kept constant increases with 1.4% when exports of unobstructable resources increase with 1%. Results from table 6 indicate that there is no support for *H3b: Unobstructable natural resources make civil wars last longer*

than moderately and highly obstructable natural resources. However, since none of the coefficients in model 6 is statistically significant, the hypothesis cannot be rejected or confirmed although the results indicate a positive, not negative correlation.

Obstructable resources are analysed in model 7. As in model 6, the coefficient is positive, and implies that obstructable resources shorten civil war duration. This effect is stronger compared to the coefficient in model 6, but as this group contains a substantially larger number of natural resources, this is again expected. Increasing the this estimate by one standard deviation, other factors kept constant, the termination rate is predicted to increase with 8.1%. The hazard ratio for obstructable resources indicates that with an increase of 1% of export of obstructable resources, other factors kept constant, the risk of civil war termination increases with 0,2%. Moreover, none of the coefficients are statistically significant, which means that although civil war duration is reduced with exports of obstructable resources, *H3a* cannot be rejected or confirmed.

Table 8. Multivariate Results, Price/Weight Ratio

	Model 8	
	b **(SE)**	**exp (*b*)**
High Price/Weight Ratio	-.052 (.106)	.950
Medium Price/Weigth Ratio	.006 (.047)	1.006
Low Price/Weigth Ratio	.034** (.016)	1.035
Population Interaction (lnpop * _t)	-.001 (.001)	.910
GDP Per Capita, Constant USD (ln)	.089 (.114)	1.094
Ethnic-lingustic Fractionalization (centred)	-.071 (.425)	.931
Ethnic-linguistic Fractionalization (centred) (sq)	-.859 (1.560)	.424
Regime Type	-.013 (.013)	.987
Regime Type (sq)	-.001 (.003)	.910
df	9	
LR	-635.28548	
N	1024	
* = p<0.10, ** = p <0.05, *** = p <0.01		

Table 8 contains the model in which price to weight ratio is analysed. The results are indirectly in line with the theoretical perspectives: natural resources with a high price to weight ratio have a negative coefficient, indicating a negative effect on the termination rate. Civil war duration is thus prolonged. Resources, for example diamonds and coltan (tantalum), which belong to this group, will in this way prolong civil war duration as argued by Ross (2003b). When export of resources with a high price to weight ratio increases with 1%, other factors kept constant, the risk of termination of civil wars decreases with 5%. Moreover, increasing this estimate by one

standard deviation, other factors kept constants, indicates a 4% decrease in the termination rate. Model 8 also contains estimates for resources with a medium and a low price to weight ratio. Resources with a medium price to weight ratio are resources like fish, and cocoa, whereas rice, natural gas and sands are resources with a low price to weight ratio.

The effect of medium price to weight ratio compared with the coefficients for low price to weight ratio indicates that medium price to weight resources have a weaker impact on civil war duration. Increasing medium price to weight ratio by one standard deviation, other factors kept constants, indicates a 0.9% increase in the termination rate. Both medium and low price to weight ratio are positive. The results indicate further that for medium price to weight resources, other factors kept constant, the risk of termination increases with 0.6% when exports of this group of resources increases with one unit, that is 1%. Since the hazard rate is 1.006, and thus very close to 1, this coefficient has negligible impact on the increasing or decreasing hazard of event, as outlined by Box-Steffensmeier & Jones (2004).

Low price to weight resources, on the other hand, have a stronger effect compared with the estimate for natural resources with a medium price to weight ratio. Increasing this estimate by one standard deviation predicts a 9.1% increase in the termination rate when other factors are kept constant. Furthermore, the results indicate that with low price to weight ratio, other factors kept constant, civil war termination increases with 3.5% as exports of resources with a low price to weight increases with 1%. Moreover, this is the only significant estimate. Since the other two coefficients are not statistically significant, *H4: civil wars in countries with natural resources with a high price to weight ratio last longer than in countries with a low or medium price to weight ratio* cannot be directly confirmed or rejected. However, since low price to weight ratio are significant, there is support for *H4*, and *H4* are thus indirectly confirmed. See chapter 5.3 and table 10 (page 71) for further explanation.

In addition to running regression analysis in order to test the hypotheses, I have chosen to analyse the effect of oil and alluvial diamonds on the duration of natural resources. There are several reasons behind this choice. First of all, previous studies have shown that these resources in particular fuel civil war duration as they inhibit different qualities of obstructability and lootability. In addition, collected data from the UNCOMTRADE reveal that these resources are high-value resources, which I believe cause incentives for rebels and government to not settle for peace, thus prolonging civil wars. Although it would be desirable to analyse the direct effect of deep shaft diamonds, this type of natural resources have very few observations and are thus excluded. The results from the Cox regression for these resources are displayed in table 9.

Table 9 Multivariate Results, Diamonds & Oil

	Model 9		Model 10	
	b **(SE)**	**exp (*b*)**	***b*** **(SE)**	**exp (*b*)**
Alluvial Diamonds	-.111 (.689)	.895		
Petroleum Oil, Onshore			.033* (.019)	1.033
Petroleum Oil, Offshore			.013 (.052)	1.013
Population Interaction (lnpop * _t)	-.001 (.001)	.910	-.001 (.001)	.910
GDP Per Capita, Constant USD (ln)	.037 (.162)	1.037	-.038 (.167)	.963
Ethnic-lingustic Fractionalization (centred)	-.341 (.556)	.711	-.411 (.553)	.663
Ethnic-linguistic Fractionalization (centred) (sq)	-.224 (1.910)	.799	-.690 (1.929)	.501
Regime Type	-.025 (.016)	.975	-.018 (.0171)	.982
Regime Type (sq)	.001 (.004)	1.001	.001 (.004)	1.001
df	7		8	
LR	-375.76546		-374.57858	
N	710		710	
* = p<.10, ** = p <.05, *** = p <.01				

Model 9 contains the coefficient for alluvial diamonds exports measured as percentage of GDP. The results show that this coefficient is of satisfactory size and negative. The hazard ratio is estimated to be 0.89, implying that the risk of civil war termination, other factors kept constant, decreases with 11 % as alluvial diamond exports increases 1%. In this model, however, none of the coefficients are statistically significant and cannot be used as support for a relationship between alluvial diamonds and civil war duration.

The different effects between onshore and offshore oil is displayed in the last model, model 10. Both onshore and offshore oil are classified as unlootable and are in accordance with the previous findings. Moreover, the coefficient for this variable is positive, indicating that with oil exports, civil wars have a shorter duration time. Increasing onshore oil exports by one standard deviation indicates a 9.6% increase in the termination rate when other factors are kept constant. With onshore oil, the risk of civil war termination, other factors kept constant, increases with 3.3 % when onshore oil exports increase with 1%. Offshore oil, on the other hand, indicates the same. Increasing onshore oil exports by one standard deviation indicates a 2% increase in the termination rate when other factors are kept constant. Furthermore, the hazard ratio is 1.013, implying that the risk of termination increases with 1.3 % when offshore oil exports increase with 1% when other factors are kept constant. The hazard ratio for both of these variables are quite close to 1, meaning that it can be argued that these resources may not have an effect at all. Onshore oil is additionally the only statistically significant variable, but at a 10 % level. This means that it cannot be concluded with statistical significance that offshore oil affects the duration of civil war as this may be as well caused by the control variable, none of which becomes significant.

5.2 Discussions and Summary

A possible correlation between natural resources dependence and civil war duration has been under scrutiny in the regression analysis described above, and the results are mixed. First, the theoretical arguments from previous researchers stating that resource

dependence makes civil wars last longer have been analysed. When analysing data on total primary export ratio to GDP based on data from UNCOMTRADE, the coefficient does not become statistically significant. When applying the World Bank data, the coefficient is statistically significant, but to some extent weak. These findings are thus similar to those of Elbadawi & Sambanis (2002) and Buhaug & Lujala (2005) who find no statistical relationship or get weak results.

Although data on primary exports from the World Bank and GDP data from Penn World Table is the same as applied in studies by Collier & Hoeffler (1998), my results (although barely) go in the opposite direction. As indicated in table 7, resource dependence measured as the commodity primary export ratio to GDP in percentages indicates that resource dependence shortens the duration of civil wars. There may be several reasons for this. First of all, the World Bank data contains data for all primary commodities, but which natural resources this is, is not given. This is evident with the UNCOMTRADE data where I have chosen which primary commodities are classified as natural resources. For this reason, the World Bank data may contain more than 55 natural resources. In addition, it may include primary commodities, which I may have excluded. This can explain why only the estimate based on the World Bank data becomes statistically significant.

Moreover, both data from the World Bank and UNCOMTRADE are a collection of reported data from the countries in the dataset. It is reasonably to assume that the reported export data apply mainly for government revenues and not rebel income. In this way, the data from both institutions may be biased as it catches the effects for the government more easily than for the rebels. If more precise data on rebel export were available, results might be less biased and we might observe lootable resources to prolong civil war duration, as argued by researcher mentioned in chapter 2 and 3 (See Lujala forthcoming, Ross 2002, 2003a, 2003b, and Collier & Hoeffler 1998, 2004). As argued by Ross (2002), both the government and rebels benefit from natural resource exports. Furthermore, resource dependence is more likely to result in civil war victory for the government, according to DeRouen & Sobek (2004). The argument is that

primary commodity exports in most instances favour the government. In addition, the government will have incentives to put an end to internal fighting as discussed in chapter 3. Moreover, by selling primary commodities, the government will gain large revenues, are thus able to finance a strong military force. In turn, this may shorten civil war duration, as the government are able to stop riots and rebellions by the use of military force. To conclude, dependence on resources for the government only cannot be argued to fuel civil war and prolong duration. Instead, as natural resource exports measured as ratio to GDP in percentages increases, the risk of termination of civil war increases.

Additionally, it can be argued that it would have been more suitable to use exports data from before the conflict instead of the ongoing conflict year as is done in this thesis. The argument is that exports may be stalled during a conflict, and that the real trade value and profitability of the resources is not revealed when using data from the conflict years. However, since this thesis explores only duration of civil wars in the conflict years provided by the UCDP/PRIO dataset, this is found to be sufficient. Nevertheless, it is of interest to explore the changes in the exported trade value as it may reveal the nature of the correlation between civil war duration and primary commodities exports.

Model 3 analysed the different effects between lootability and obstructability. Since there is reason to believe that the lootability accounts for the effect of obstructability, model 4-7 was created in order to substantially interpret and separate between the direct effects of lootability and obstructability. The results from the analysis indicate an indirect support for the hypothesis that lootable resources prolong civil war duration, as only the coefficient for unlootable resources became statistically significant. The reason for this may as well be that exports data apply mainly for the government, causing data to be biased, as it does not account for, or to a little extent account for rebel revenues. However, the results are in line with the theoretical framework outlined in chapter 3. According to Lujala (forthcoming), lootable resources such as alluvial diamonds prolong civil war duration, and unlootable

resource, like oil, are most likely to benefit the government whose incentives is most often to clamp down on rebel insurgencies, thus shorten civil war duration (see Ross 2002). This also follows the arguments of Fearon (2004 and 2005). He argues that lootable contraband resources, for instance opium and coca, when controlled by rebels provide them with a means of finance, consequently prolonging civil wars since the rebels can in this way pay soldiers and by arms.

In sum, unlootable resources shorten civil war duration as unlootable resources, like oil, mostly benefit the government since they can provide the technology, the finance and logistic to extract unlootable natural resources. As argued earlier, the revenues the government receives by exporting these types of natural resources can be used to build up strong armies that will clamp down on rebel movements. In this way, unlootable resources shorten civil war duration. Lootable natural resources, on the other hand, will to a larger extent benefit the rebels more than unlootable resources. This is because unskilled labourers at low production costs can easily extract the former compared with the latter. In this way, rebels can finance further insurgencies and can pressure the government to heed their claims. Accordingly, lootable natural resources will prolong civil war duration.

It can be questioned whether or not it is sensible to separate between different levels of obstructability, as both of the coefficients for unobstructable and unlootable resources when analysed in model 6 and 7 are positive and quite similar in size. Moreover, most of the natural resources belong to the moderately obstructable group, the only resources that are highly obstructable or unobstructable are diamonds, oil, gas, and precious stones. It is more likely that any differences between these groups are caused by the lootability of the resources. This is evident when comparing the unobstructable resources in model 3 and model 6. In model 3, the coefficient for unobstructable and unlootable is positive and in the same model, the coefficient for unobstructable and lootable is negative. Comparing these coefficients with model 6 which analyses only unobstructable resources, the coefficient is positive and the effects for all the estimates from model 3 and 6 are almost the same. Moreover, results from model 6 and 7 show

that both unobstructable and obstructable resources shorten civil war duration, and that there are little differences between the effects of these two coefficients. Furthermore, none of the estimates in model 6 or 7 are statistically significant, which supports the notion that separating natural resources by obstructability provides little substantial interpretation of the effect of natural resources on civil war duration.

Profitable resources measured as price to weight ratio have also an effect on civil war duration. As with lootable resources, there is indirect support for the hypothesis that high price to weight resources prolong civil war duration, as the only significant coefficient in model 9 is the coefficient for low price to weight ratio. Again, illicit trade of resources by rebels can explain this. Resources like coltan (tantalum) and diamonds have a high price to weight ratio, whereas oil and gas have a low price to weight ratio. As argued earlier, the export data from the UNCOMTRADE and the World Bank may be biased as it mainly contains export revenue data for the government and not for the rebels. Nevertheless, since there is indirect support for *H4*, it is reasonable to conclude that the profitability of natural resources matter for the nature of civil wars. Natural resources with a high price to weight ratio, although there are only indirectly support for this, prolong civil war duration. If rebels control these resources, they will in this way be able to finance further operations. Natural resources with a low or medium price to weight ratio on the other hand, like oil, are more likely to benefit the government and thus shorten civil war duration as these types of resources may not be considered to be profitable for rebels.

Fearon (2005) argues that resource dependence does not affect civil war duration as argued by Collier & Hoeffler (1998, 2004). He argues that what accounts for a relationship between natural resources and civil wars is oil, but this is again related to very specific effects of oil on the nature and quality of government institutions (see Ross 2001, Tsui 2005 and Wantchekon 2002). In order to see if this argument holds true, analysis including only diamonds and oil are conducted. In model 10, the results showed that alluvial diamonds have a negative effect on civil war duration. Since none of the coefficients was statistically significant, it cannot be concluded that alluvial

diamonds prolong civil war duration. When it comes to oil, onshore and offshore oil is included, but both types are unlootable. Only onshore oil exports are statistically significant. This result is nevertheless in accordance with previous findings: oil does not prolong civil war duration. Rather, oil, being an unlootable resource, its extraction and production requires knowledge, skills, and large-scale investments, which the government are more likely to be able to provide than rebel groups. The revenues from exporting oil may give the government capabilities of building up large armies that can stop rebel insurgencies at an earlier time in civil war duration than government in countries not abundant or not dependent on natural resources. Moreover, governments that are dependent on primary exports sales have incentives to ensure that production continues, and that new extraction and investment from foreign companies take place. If a resource dependent country experiences civil war, then production and investments may end, as civil war does not make it lucrative for foreign investment. This is another way of not finding support for Collier & Hoeffler's (1998 and 2004) findings. Instead, resource dependence, illustrated with the case of oil, shortens the duration of civil war.

Table 10 sums up the main results.

Table 10. Hypothesis and Results Summary

Hypotheses to be tested statistically
H1: Civil wars in countries dependent on natural resources last longer than countries that are not dependent on natural resources, ceteris paribus.
No, opposite results when using data from the World Bank. **No significant results when using UNCOMTRADE data.**
H2: Lootable natural resources make civil wars last longer than unlootable natural resources, ceteris paribus**.**
No direct support, but indirect support. Unlootable resources shorten civil war duration, insignificant results for lootable resources.
H3a: Moderately and highly obstructable natural resources shorten civil war duration, ceteris paribus.
Yes, in model 3. When only analysing obstructability in model 6 and 7, no difference in the effects and no significant results
H3b: Unobstructable natural resources make civil war last longer than highly obstructable resources, ceteris paribus.
No significant results, cannot be rejected or confirmed, but results indicate prolonged civil war duration.
H4: Civil wars in countries with natural resources with a high price to weight ratio last longer than countries with a low price to weight ratio, ceteris paribus.
No direct support, but indirect support. High price to weight resources prolongs civil war duration, low and medium price to weight ratio shorten civil war duration, only significant results for low price to weight ratio.

6 THE DEMOCRATIC REPUBLIC OF THE CONGO

This chapter investigates the case of the Democratic Republic of Congo[16] (DRC) in order to illustrate how environmental factors may affect the duration civil war, and to see if the findings from the statistical analysis can inform us about the case of the DRC. The DRC, particularly the Kivu provinces in the east, is abundant with natural resources, some of which are crucial for the current electronics industry today. Natural resources have been exploited in the DRC ever since colonial time, and in recent years illicit trade with several resources during wartime such as cobalt, coffee, diamonds, gold, and timber have been initiated. There is one mineral in particular that is said to fuel the war, and this chapter focuses on this resource: coltan (Winer & Roule 2003: 201).

6.1 The DRC and Civil War

In the late 19th century, the DRC emerged as a colony, controlled by the Belgian King Leopold II. The colony was gravely exploited due to the massive amounts of natural resources and potential labour force. Congo gained independence in 1960, and the country's military leader, Mobutu Sese Seko, seized control over the state apparatus through a coup d'état shortly after (Hayes & Burge 2003: 25 and Bøås 2009:5). Political instability characterized the country throughout the 1990s as civilian refugees fled the 1994-genocide in the neighbouring country of Rwanda to the DRC. In addition to civilian refugees, Rwandan Hutu militia, and rebels from Burundi and Uganda crossed the Congolese border (Hayes & Burge 2003: 25 and Bøås 2009:5). These groups were allowed to continue their political and military organizations in the refugee camps, which resulted in the formation of the FDLR[17].

[16] The name Congo and the DRC is used interchangeably throughout this chapter for simplicity and convenience. The name refers to the Democratic Republic of the Congo, formerly known as Zaïre.
[17] Forces démocratiques de libération du Rwanda.

In 1997, a rebel movement called ADFLC[18], profoundly supported by Rwandan and Ugandan armies, surfaced from Eastern Congo and overthrew Mubutu. The rebel leader, Laurent Desire Kabila, did not meet any particular resistance. Nevertheless, a year later conflict broke out again in the east of Congo, worsening the environmental circumstances and creating a large-scale humanitarian disaster (Hayes & Burge 2003: 25 and Bøås 2009:5). Rebellions took place in the provincial capital of Goma, North Kivu, and Kabila went to measures to pre-empt a coup. The conflict escalated as the Rassemblement Congolais pour la Démocratie (RCD), a Rwandan and Ugandan-backed rebel group fought to replace Kabila as president of the country (Jackson 2003:22). Trying to save the Kabila government from collapsing, Angola and Zimbabwe entered the conflict, later to be joined by Namibia, Chad, and Sudan which later became known as the Great African War, starting in 1998 (Olsson & Fors 2004:325).

A cease-fire agreement was signed in 1999 in the Zambian capital, Lusaka, which established the largest peacekeeping operation in the world (the United Nation's Mission in the Democratic Republic of Congo, MONUC) and the involving countries accordingly deployed their armed troops from the DRC (International Crisis Group 2003, Bøås 2009:5 and Hayes & Burge 2003:26-27). In 2001, Kabila was assassinated which created an opportunity for peace as his son, Joseph Kabila, replaced his father. Despite these encouraging signs, fighting stilled continued in the Kivu provinces, especially in North Kivu. This was most likely the result of the political vacuum that arose as Rwanda and Uganda withdrew their armies, leaving rebels to hold power in towns, airstrips, and important mines (Hayes & Burge 2003: 27-28). The fighting escalated in 2008, characterized by attempts of coups and sporadic violence. Militias clashed with government forces, and although the rebel General Laurent Nkunda signed a peace deal, clashes still broke out again. In January 2009, the government appealed to Rwandan troops to remove the rebel Rwandan Hutu militias, FDLR, in the Kivu provinces, including General Nkunda. Despite this success, the situation for the

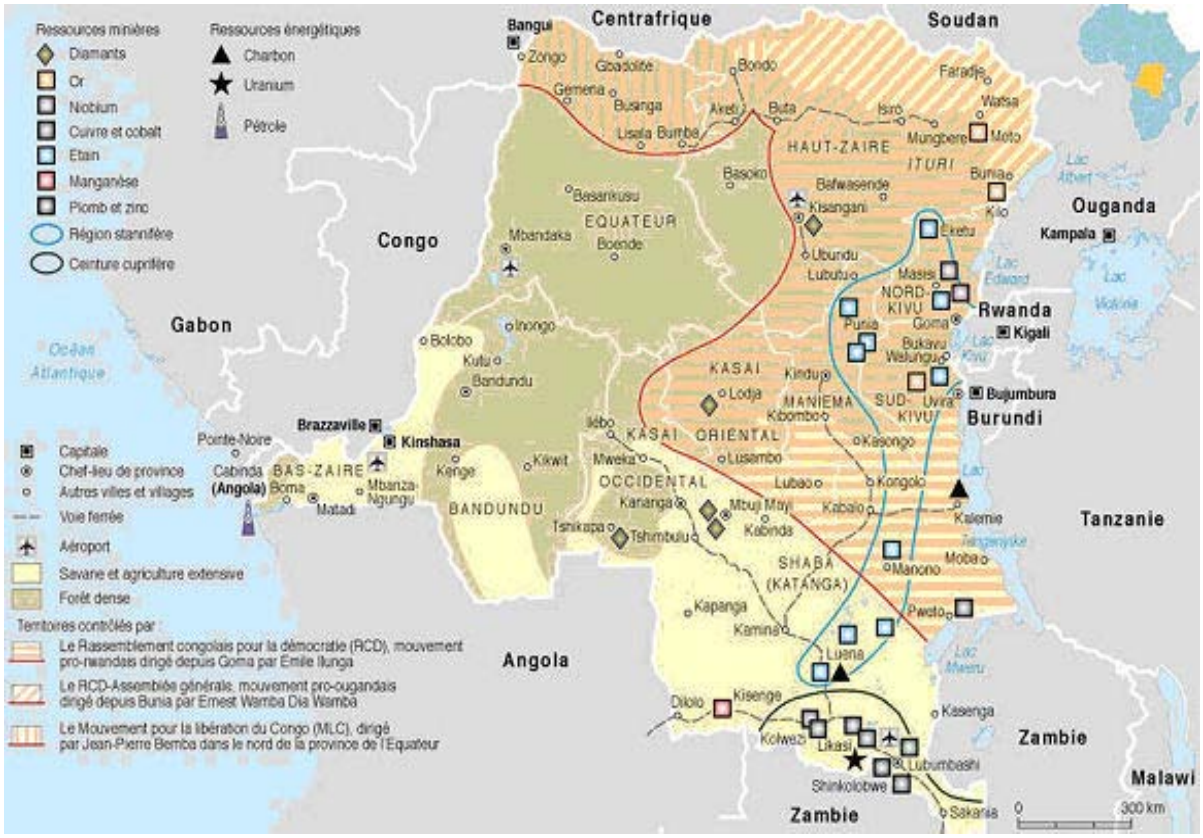
[18] Alliances de Forces pour la Libération de Congo/Zaïre.

civilian population in the Kivu provinces has not improved much. There are still armed rebels in the area and violence, especially raping of women, continues (BBC News 2009).

6.2 The Kivus

The Kivus is mainly referred to as the Congolese provinces of North Kivu, South Kivu, and Maniema, which is located in the eastern part of the DRC as figure 3 illustrates (International Crisis Group 2003). Internal fighting has mainly been concentrated here, and this area will subsequently be the focus of analysis in the following chapter. As the map illustrates, natural resources are abundant in the Kivus, and the provinces have additionally fertile lands and mountains (Bøås 2009: 7).

Figure 3. Map of the DRC and the Kivus



Source: http://journal.heinz.cmu.edu/media/img/figures/congofigure.jpg

While the rest of the country mainly speak Lingala, the people in the Kivus are Swahili speakers, and belong culturally to East Africa. Immigrants have influenced the region substantially, and in the backdrop of foreign dominations, the Kivus' identities have been formed (International Crisis Group 2003: 1-3). In addition to the indigenous minority of the Kivus, there exists a large group of immigrants of Hutu and Tutsi origin from Rwanda, called the Bayarwanda, who started to arrive in eastern Congo from the 18th century until the present (ibid: 4). Moreover, immigrants from the other neighbouring countries are also present in the Kivus. The Bayarwandas speak Kinyarwanda, adding another language to the linguistic mix (ibid). Although quite different in ethnic and linguistic terms, these people have in common a contested citizenship status with questions regarding the right to land, to vote, and to run for election. (Bøås 2009: 7). In the aftermath of the Rwandan genocide in 1994, these questions have become more disputed as access to land has decreased, a consequence of the settling of Rwandan refugees in the Kivus (ibid). According to the International Crisis Group (2003), the Kivus never fell under the complete control by the Rwandan army who only controlled strategic positions such as the mines, airstrips, and towns (International Crisis Group 2003). Nevertheless, this strategic control came to be a major component in the civil war in Congo as the sales of natural resources, like coltan, became a means of revenue income for the involving partners.

6.3 Tantalum and Coltan

Tantalum is a mineral that is extracted from the tantalite ore, which also contains iron, manganese, and niobium. The mineral can resist corrosion and can be objected to extremely high temperatures, which makes tantalum a highly lucrative mineral. Tantalum is increasingly used in the telecommunications and the electronics industry, particularly in the production of cell phones, computers, DVD-players, but also surgical equipment (Emsley 2001: 418-421, Hayes & Burge 2003: 11+20+33, and Winer & Roule 2003: 200). The main tantalum producing country is Australia, accounting for about 41% of the world's production. Countries like Congo, Nigeria and Burundi that reportedly are producing lower amounts, may however possess large

deposits that have not completely been accounted for, or are experiencing internal conflict, suspending most of the commercial activities (Hayes & Burge 2003:16-17). It is also reasonable to assume that although commercial activities are suspended during time of war, illegal trade of the resource executed by the Congolese rebels have taken place, accounting for the low official figures.

Coltan is not a crude mineral, but a type of tantalum ore. More precisely, it is the result of a combination of tantalum and columbium, or niobium (Jackson 2003). Its name is derived from the abbreviation of the name these two resources put together (columbium + tantalum = coltan). In Congo, coltan appears in streambeds, alluvial deposits, and soft rock, and the mineral is easy to extract without the use of skilled workers (Bøås 2009:28). Tantalum, however, is not easily refined. Extracting tantalum from the ore is by Lide (2003) described as a complicated and difficult process, and are in the dataset coded as unlootable and moderately obstructable since this resource is according to the SITC grouped together with similar ores like niobium, titanium and molybdenum (see table 5). Coltan mining in the DRC can easily be done by hand and does not require knowledge and skilled men. Therefore, the mineral is classified as lootable and moderately obstructable in the discussion of this mineral in the DRC.

According to Jackson (2003), rebel groups have looted significant amount of tantalum ore. In 1998, the RCD seized control over the east of Congo and as a result gained control over large stockpiles of minerals that where already mined. 42.5 million USD are estimated losses of the Congolese state department, Société minieré et industrielle du Kivu, in South Kivu (Jackson 2003:27). Looting already mined tantalum ore is thus highly lucrative for rebels, and the mere threat of the use of violence from the RDC is sufficient enough to empty mining areas for looting (Jackson 2003:28). Additionally, the mineral is unobstructable since anyone can pocket the mineral and smuggle it across the national border without being noticed. For this reason, it is almost impossible for a central government to hinder illicit trade in countries such as Congo.

6.4 Coltan Mining and Exports in the DRC

In the east of Congo, especially around the Kivus, coltan is extensively distributed. Until the 1990s, tantalum had not been exploited in these provinces, but from 1996 exploitation was initiated and thereafter accelerated (Jackson 2003:25). As mentioned previously, coltan is mined by hand, and a team of a few men can produce about two kilos of ore a day. The mining process is described in Jackson (2003:26):

> "after digging a few metres, one person bails water from the hole, one person digs up from the hole onto a pile of the sluice, […] one person refills the sluice periodically with materials from the pile, and one sluices, continuously turning and scraping the materials with a spade. The dirt runs away in the water; turning it brings the bigger stones to the top to be skimmed."

The mines are mainly dug by labourers and controlled by the military, the RDC or Rwandan officials (Jackson 2003: 27) and have evolved during the time of production. What was previously artisanal exploitation where digging took place close to the surface has now become formal exploitations with mines that go as deep as ten metres (Winer & Roule 2003: 200). Additionally, the mines are in dire conditions, and several collapses have taken place, killing many of the miners (Bøås 2009: 27). According to the UN Panel of Experts, which was established as a result of the cease-fire in 1999, elite networks control the exploitation of the natural resources present in the DRC in areas controlled by the DRC, Rwanda, and Uganda (United Nations 2002). Common for these networks is that they consist of a small core of political and military elites, and of rebel

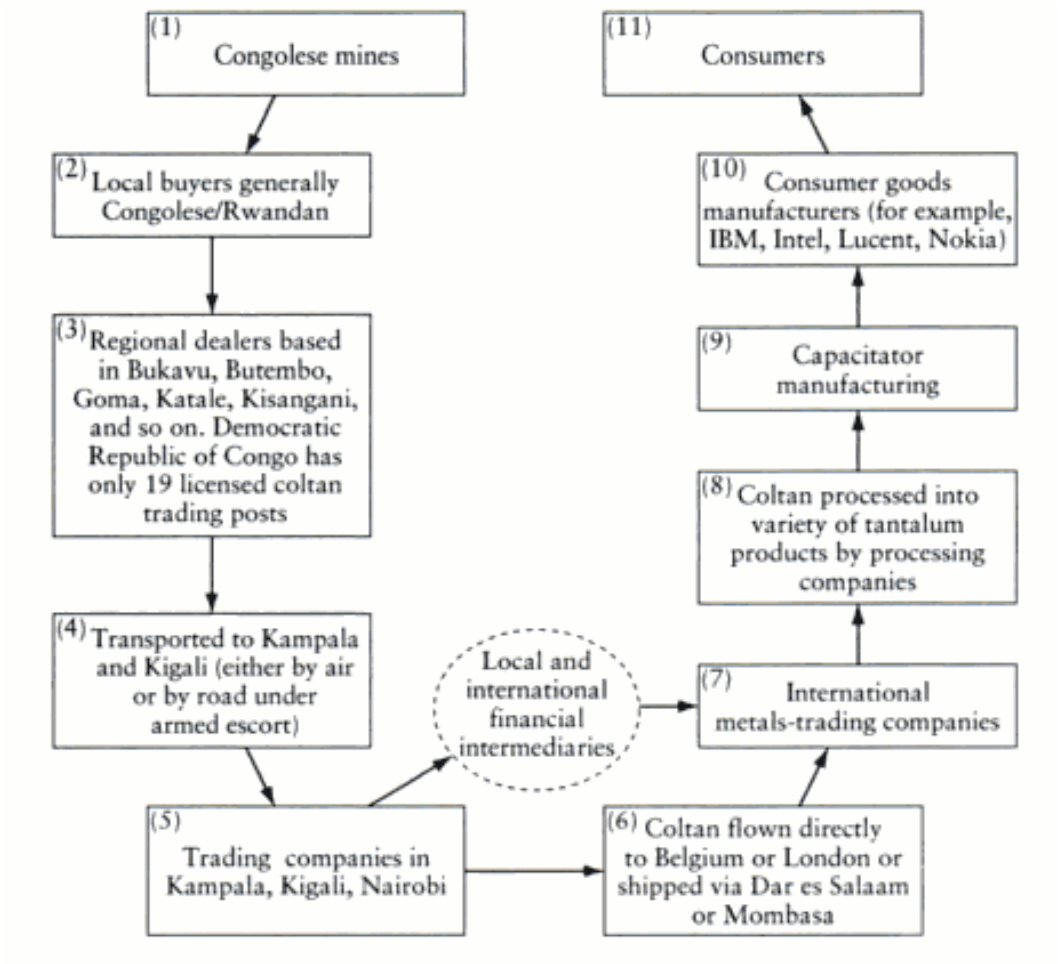
Boys mining coltan in the DRC[19].

[19] Source: http://kimpavitapress.org/2009/04/11/from-rebel-held-congo-to-beer-can/comment-page-1/

leaders in the occupied areas. These networks cooperate to ensure revenues by monopolizing production, commerce, and fiscal functions. Revenues also come from theft, smuggling, illicit trade, and taxes through the production and exploitation of natural resources. Using these strategies, rebels and the elite networks generate revenues (United Nations 2002). It also occurs that in return for a percentage of the ore, the military offers protection of the mines (Jackson 2003: 27).

Coltan has a long and complex extraction chain, shown in figure 4. This makes it hard to execute a chain of custody certification, and pressure from the consumers will according to Crosser, Hayman & Taylor (2003), most likely be an ineffective driving force of change (Crosser, Hayman & Taylor 2003: 134). The ones that profit from this extraction chain are especially the Rwandan army, known as the Rwandan Patriotic Army (RPA) (Winer & Roule 2003: 201- 202 and United Nations 2002). As much as 60-70% of the coltan exports have been mined under RPA control, which have used military aircraft to export much of the coltan from their controlled airstrips. Rwandans and the Congolese control the rest of the mining sites, and struggle to compete with the RPA on exporting coltan (Winer & Roule 2003 and United Nations 2002). International trading companies buy coltan from Congo, and despite their claims of only trading with small scale local suppliers and not with rebel leaders, the UN Panel states that: “no coltan exist from the eastern Democratic Republic of the Congo without benefiting either the rebel group or foreign armies” (United Nations 2002:16). Furthermore, the Panel have set out recommendations of placing financial restriction on several Congolese and foreign firms in addition to travel bans for named persons (United Nations 2002).

Figure 4. Coltan Extraction Chain from Eastern Democratic Republic of the Congo



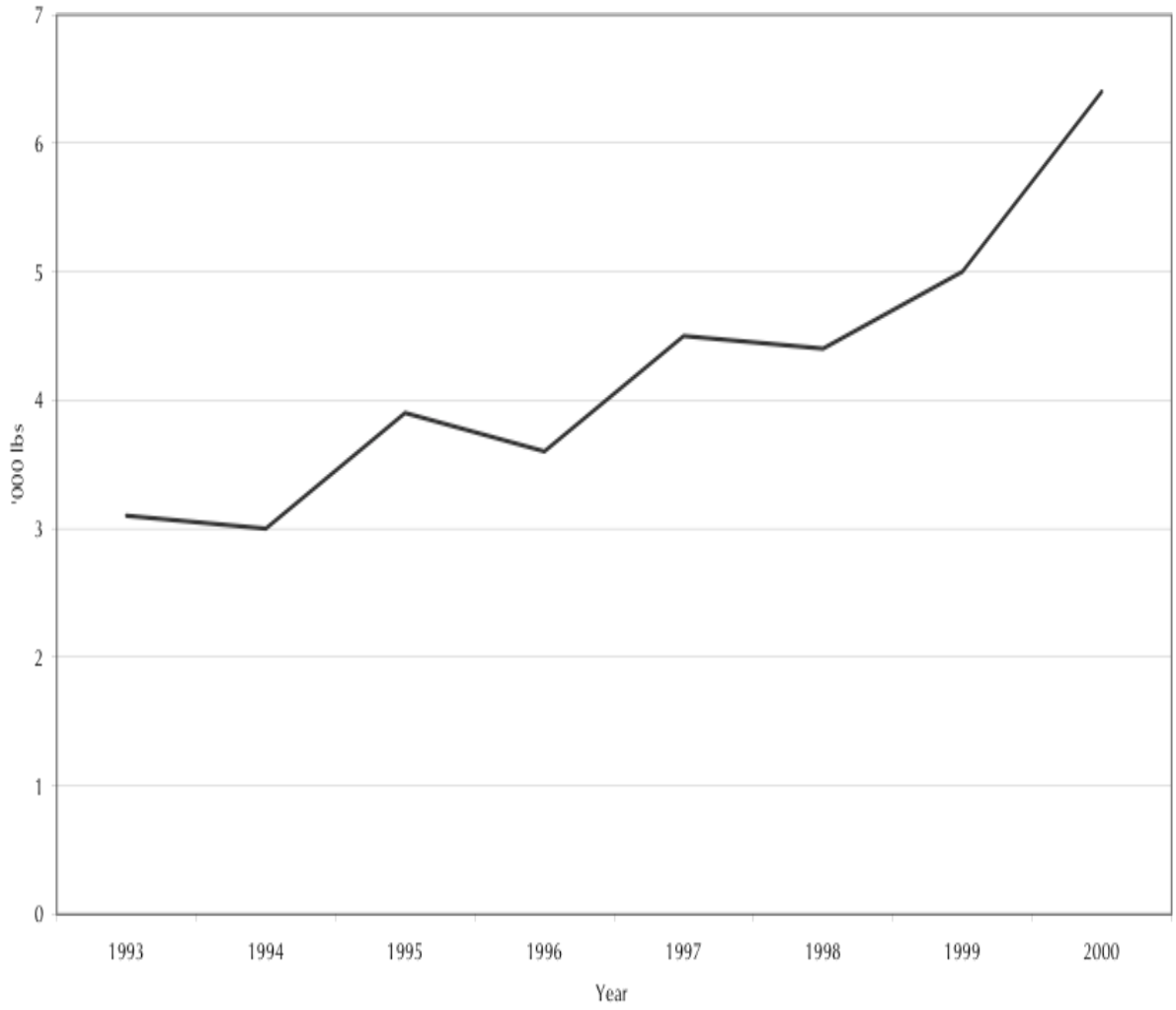
Source: Crossin, Hayman & Taylor 2003: 135 in Bannon & Collier (eds) 2003.

According to Congolese laws, extraction of coltan and other minerals requires licenses. However, these rules come to short as most government regulations do during time of war (Hayes & Burge 2003: 33). Since licenses for mineral extraction are both difficult to obtain and costly (sums as high as 40 000 USD per year are reported), coltan is regularly smuggled across the DRC borders into Rwanda by road or even air. Coltan vendors are also subjected to taxes, bribes, and the risk of getting caught in which their ores are consequently confiscated (Hayes & Burge 2003:33). The RDC rebels and the Rwandan army benefit from administrating these licensing fees. Jackson has estimated a surplus of 17 million USD in the late 2000. This is based on 100 metric tonnes of coltan that have been exported during a period of 18 months at a

world price of 200 USD per kilo, with an average of 300 USD per kilo being paid to intermediaries (Jackson 2003: 29).

In the end of the 1990s, the world demand for tantalum increased drastically as the technology sector tried to meet the consumer demands. This is illustrated in figure 5, which shows that the tantalum demand more than doubled in the period from 1993 to 2000.

Figure 5. Tantalum Concentrate Demand, 1993-2000

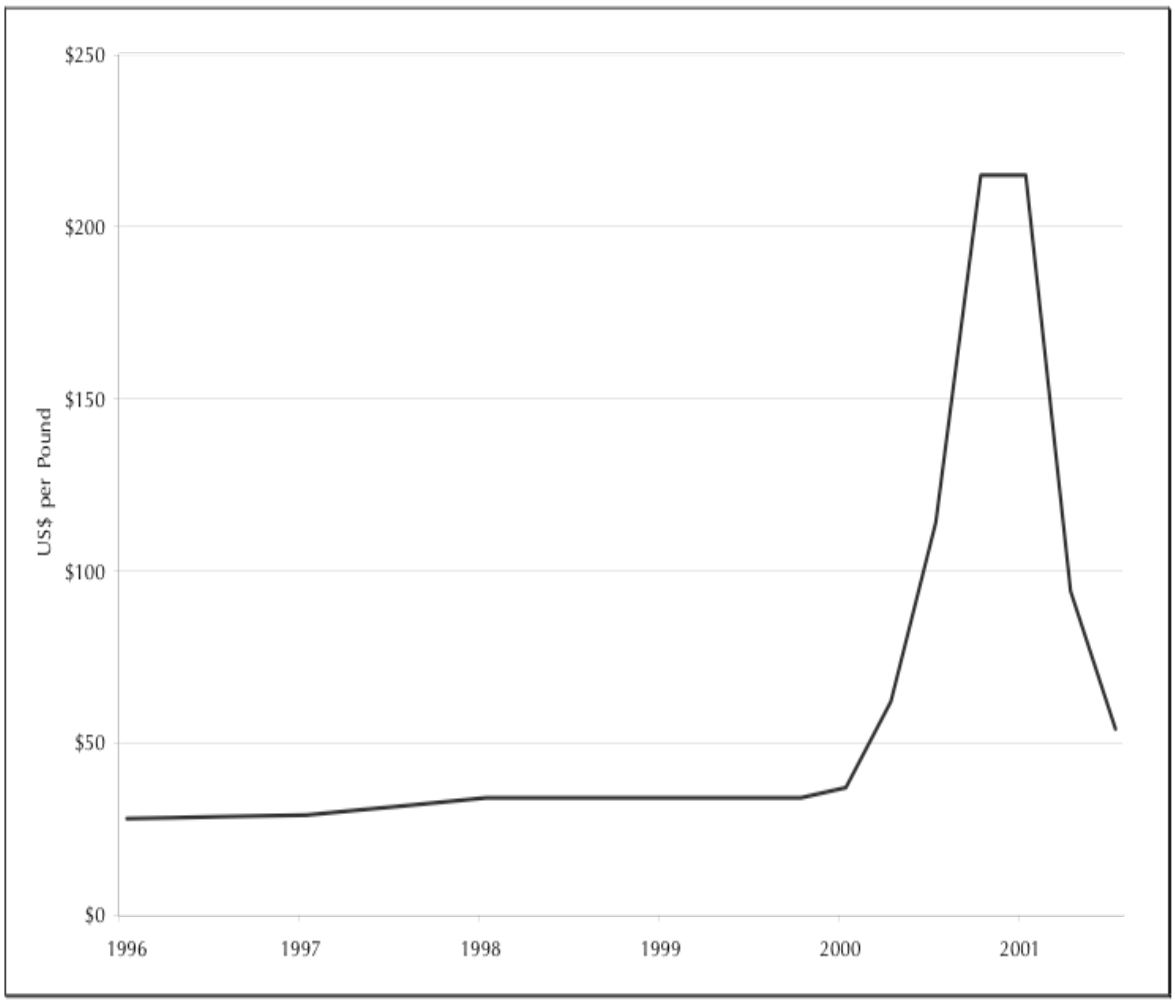


Source: Jackson 2003:25[20]

[20] In Jackson's article, this table is taken from the Australian mining company, "Sons of Gwalia." Their web site, which Jackson refers to, is at the time of writing no longer functioning. Instead, Jackson (2003) is listed as the source of reference. The web site he refers to is: http://www.sog.com.au/web/tantover.htm.

The world shortage of tantalum lead to a ten-fold increase in the spot price of the resource and this increase also coincided with the Great African War (from 1998) (Bøås 2009). In 2000, the price of tantalum experienced a boom, and the world market price went up from about 50 USD per pound to over 200 USD per pound (Bøås 2009:27), shown in figure 6. Although risky, coltan mining became highly profitable, particularly for the rebels controlling the mines. This boom, or "coltan fever" as the locals named it, did have implications for life in the Kivus (Jackson 2003).

Figure 6. Tantalum and World Price Movements, 1996-2001



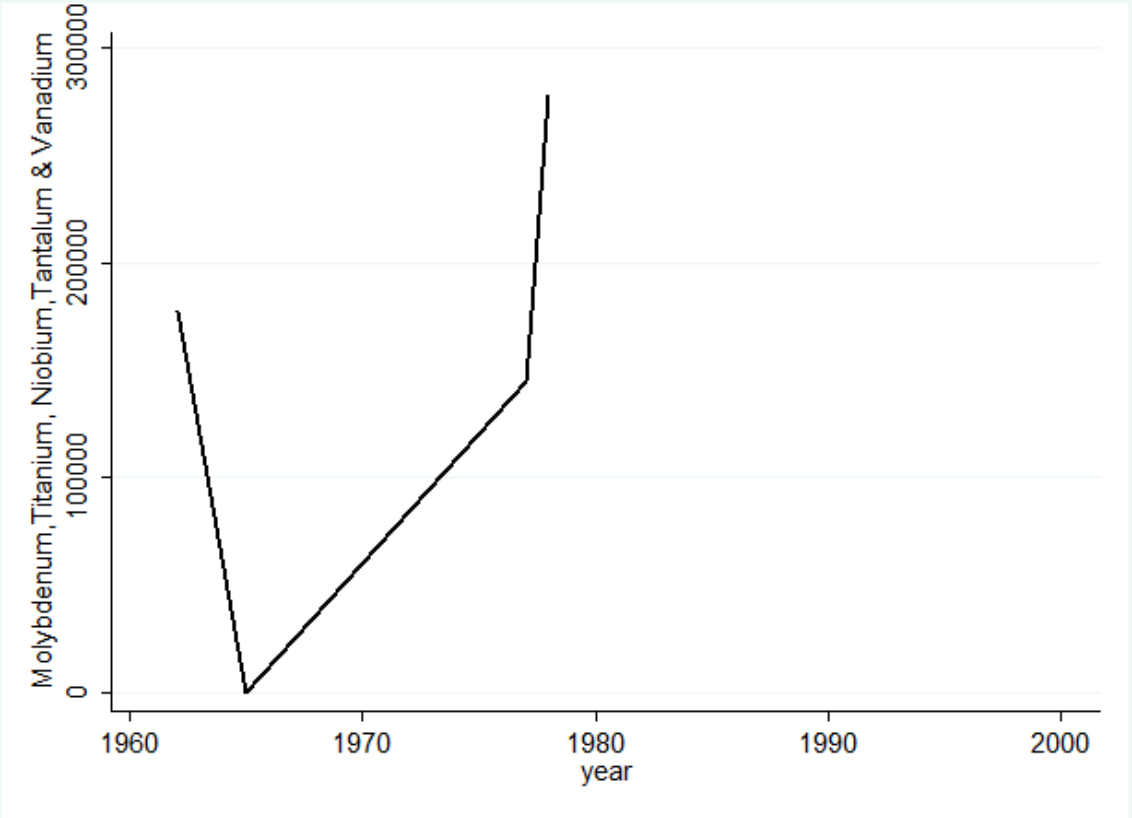
Source: Jackson 2003: 25

As a result of the war and the boom in coltan, many people ceased to farm and started mining coltan instead, causing food shortages to erupt (Bøås 2009:27). In the 1990s,

farming on cattle ranches dominated the landscape. At the time when coltan became profitable, that is between 1993 and the Great African War in 1998, these ranches were destroyed in order to open the land for exploitation of coltan. Coltan mining consequently became a more attractive pursuit of living (Jackson 2003:26). To illustrate, price on staple food increased by 9000 percent in the period of 1999-2001. (Bøås 2009: 27). A local NGO director which Jackson (2003) interviewed in 2001 stated that: "we have already seen the beginning of a bad impact of coltan on agricultural production […] almost all of the young, from the age of ten up, are involved in this, and they would normally be the labour force for agricultural production" (Jackson 2003: 33). Even though agricultural production has not completely ceased to exist, in combination with insecurity of war, young people leaving the farm life for coltan mining have caused a drop in the agricultural production (Jackson 2003: 33).

Coltan mining has thus become a means of obtaining food and other supplies from the occupying military forces (Winer & Roule 2003: 201). Tantalum exports from the DRC is shown in figure 7. Although this figure contains the export values for molybdenum, titanium, niobium, tantalum, and vanadium, and does not contain data after 1980, it still indicates the general trend of tantalum, or coltan, exports from Congo.

Figure 7. Exports of Tantalum, (including similar ores and concentrates) in the DRC, 1960-2001



Source: UNCOMTRADE 2009c, graph generated in Stata from the applied dataset in this thesis.

Winer & Roule (2003: 200) argue that there are no official figures of the revenues of illicit coltan trade during the periods of civil war. An estimate indicates nevertheless that the Rwandan army earned about 20 million USD in just one month during the boom in 2000 (Winer & Roule 2003:200). Illegal trade of coltan may account for the missing data in figure 7. Even though the UNCOMTRADE does not report of any export of this resource group from the DRC after 1978, reports from the UN Panel of Experts (United Nations 2002) still indicate that coltan was to a large extent exported out of the country, but illegally as described by figure 4. There is little doubt that this illegal trade have benefitted the rebels controlling the coltan mines.

In 2001, the UN condemned illicit trade in Congo, and the same year the monopoly of coltan mining was lifted (Hayes & Burge 2003). The reason for this was according to the former RCD leader, Dr Adolphe Onusumba, that smuggling was increasing, and

reduced revenues was making it hard to maintain modest health services they strived to provide (Hayes & Burge 2003). The price of tantalum also dropped in 2001 (see figure 6), and the quantities being exported out of the DRC dropped as a result of this (Hayes & Burge 2003). Rebels, occupying forces, and armed militias all experienced as sharp reduction of income, and consequently started to demand higher taxes and imposing higher customs tariffs from coltan vendors as a desperate way of gaining finances for future operations (Hayes & Burge 2003:34). Hayes & Burge (2003) claim that the reduction in illicit trade, rather than the UN condemnation was "[…] attributable to manufacturers working off their expensive inventories […]" (Hayes & Burge 200:3 34).

With the fall of tantalum (or coltan) prices, the capacitor manufacturers have progressively been using more contracts that are fixed with large suppliers (Crosser, Hayman & Taylor 2003: 134). This has had consequences for the young people that left farming in order to make easy dollars mining coltan. Some went back to their farms, others have tried to combine mining with farming and accepting the new coltan price (Jackson 2003: 34). Regardless, other minerals have ensured revenues for armed rebels. The price of tin, or cassiterite (the name of the tin ore), increased during the 2000s, and experienced in 2004 a boom like coltan (Bøås 2009). Tungsten has also experienced a similar boom, and became in 2006 the new growth sector of mining in North Kivu (Bøås 2009:27 and Tegera & Johnson 2007: 40-41). Even though the UN condemned illegal mining in 2001, the price of coltan has decreased, and the media continues to spread negative publicity, coltan is still mined for the world market. This is allegedly due to the availability of cheap labour force and low extraction costs (Hayes & Burge 2003:34).

6.5 Natural Resources and the Duration of Civil War in the DRC

In addition to coltan, other lootable resources like cobalt, tin, coffee, diamonds, gold and timber are illicitly traded in Congo. The sales of these resources have contributed to the Great African War (Winer & Roule 2003 and Bøås 2009). According to Winer

& Roule (2003), 4 million people died in three years during internal fighting (Winer & Roule 2003:201). The DRC's central government has managed to control the northern and central parts of the DRC, whereas eastern Congo, where the coltan mines are concentrated, is still under rebel control (Bøås 2009: 27).

Can the long-lasting civil war in Congo be explained by resource dependence? Results from the analysis in chapter 5, using both data from the UNCOMTRADE and the World Bank, implies that resource dependence have a positive effect on the duration of civil wars. This means that resource dependent countries do not experience longer civil wars; in fact being dependent on the revenues from primary commodity export shortens civil war duration. This does not support the findings from Collier & Hoeffler (1998, 2004) and the hypothesis described in chapter 2 and 3, and cannot account for the long time period of internal conflict in Congo. Moreover, this is more in line with previous findings from researchers like DeSouen & Soebek (2004) and Humphreys (2005). Both studies argue that resource dependence does not prolong civil war duration, rather. Instead, in countries dependent on natural resources (measured as primary commodity export ratio to GDP), there is increased likelihood that civil wars will be over shortly after breaking out, ending in a military victory for one of the conflicting parts. DeRouen & Soebek (2004) conclude that the government will most likely be the victor, whereas Humphreys (2005) does not conclude which part this may be. Both studies, however, come to the conclusion that military victory is most likely the outcome instead of a cease-fire agreement.

The empirical results from the DRC do not however support this. Although the statistical results indicate a short duration for civil wars when countries are dependent on natural resources, civil war in Congo has taken place in the last four decades. Cease-fires have been signed, but still, violence takes place. This implies that resource dependence cannot explain the long-lasting war in Congo. However, the effects from the statistical analysis are relatively weak, and it can be argued that resource dependence does not have an effect on increasing or decreasing resource dependence. If more precise data are collected and analysed, a statistical analysis may reveal more

robust coefficients, leading to different results, thus perhaps proving this conclusion to be wrong.

According to the collected data, the export value of primary commodities exceeds the GDP in Congo. This implies that the country is highly dependent on natural resources. However, since illicit trade of coltan and other minerals has taken place, these figures are questionable. When examining data more thoroughly, both data obtained from the World Bank and the UNCOMTRADE have problems of missing data. This indicates that either the DRC did not export the certain types of primary commodities for the specific years that are reported as missing, or that both institutions have not been able to gather data. Several implications follow from the lack of data. First of all, it may be that exports did not at all take place during the conflict years since trade was practically impossible.

Another possibility is that trade still took place in these conflict years, but illegally. As explained previously, during the war illegal trade became increasingly a source of revenue for belligerent groups, thus enabling them to execute violence. The sales of coltan and other resources have been the main source of revenue for rebel groups, enabling them to fund insurgencies through commercial operations of these minerals (Winer & Roule 2003:201). According to Dr Adolphe Onusumba, the previous RCD-Goma leader, in 2000 his rebel government raised 200 000 USD per month from the sales of diamonds compared to 1 million USD per month from the trades of coltan (Hayes & Burge 2003:34). When comparing the sums from the sales of natural resources, the profitability of natural resources becomes more apparent. High-value resources such as diamonds and coltan in the DRC are both lootable, enabling rebels to extract these resources easily themselves and trade them illegally, avoiding all government taxes, and pocketing the money directly. In spite of efforts from the Kabila government to seize control over Eastern Congo and the mines, armed groups are still in control. The mines where resources are exploited are thus a great source of income to maintain continuous warfare (Bøås 2009:27). Although resource dependence has a relatively weak and positive effect on civil war duration, illegal trade

of coltan may still indicate resource dependence. However, since coltan is a lootable resource, it might be that this quality of the resource accounts for the long-lasting war, not the dependence as measured as primary export ratio to GDP.

As the results from the statistical analysis estimates, lootable natural resources have a negative effect on civil war duration, and unlootable resources have a positive effect. This indicates that countries exporting unlootable resources will experience shorter duration than with lootable resources, which prolongs civil war duration. These findings are in line with the results from the scholarly research. According to Lujala's findings (forthcoming), lootable resources doubles the duration of civil wars, and civil wars are additionally more durable in conflicts with gemstone production (Buhaug, Gates & Lujala 2009). Moreover, unlootable resources is claimed by Ross (2002) to most likely benefit the government, implying that resources like onshore oil will be a source of income for the government to clamp down on rebel insurgencies. However, the statistical findings are mostly statistically insignificant except for unlootable resources that are moderately or highly obstructable. Nevertheless, natural resources that are both unlootable and moderately obstructable have strong, positive effect on civil war duration, indicating that these types of natural resources do not contribute to longer-lasting civil wars. Tantalum, the ore from which coltan is extracted is classified as unlootable and moderately obstructable, whereas coltan as it appears in the DRC is classified (but only in the DRC) as lootable and moderately obstructable. The coefficient for moderately obstructable and lootable resources is according to the results from the analysis negative, implying that with this type of natural resources, civil wars last longer. This implies that coltan nevertheless may fuel civil war duration since this resource, as it appears mostly in the DRC, is a lootable resource.

Lootable natural resources on the other hand have a negative effect on civil war duration. This implies that lootable resources prolong civil war duration. In this case, the results are not statistically significant and thus cannot be used to support the claim that lootable resources fuel the civil war in Congo. Even though coltan does not fit into this group, the DRC are abundant with unobstructable and lootable resources like

alluvial diamonds. In chapter 5, alluvial diamonds were also analysed. The results indicate that alluvial diamonds prolong the duration of civil wars, but the results are not statistically significance. However, since figures on tantalum exports are questionable because of documented illicit trade, lootable and moderately obstructable resources may still prolong civil wars, although this cannot be confirmed using statistical methods. Even if there is no statistical significance in support of lootable resources prolonging civil war, there is evidence that unlootable resources shorten civil wars duration. This implies that there is indirectly support for H2, thus supporting the notion that lootable resources like coltan indeed have fuelled the civil war in the DRC. Thus, it can be argued that lootable resources have fuelled the civil war in Congo. Despite the fact that there is missing data for Congo, this can be explained by illegal trade and smuggling of resources by rebels, who in this way have a means of finance further operations.

Collier & Hoeffler (2004) state that rebellions occur when it is profitable for rebels, meaning that the revenues from primary commodities are high and the costs are low. It is easy to see that rebels are motivated by the high price of coltan and other natural resources caused by world demands. These economic incentives do not only prolong internal conflict. Additionally, settling for peace will be hindered as rebels will fear the loss of control of resources and will thus try to spoil peacemaking efforts (United Nations Environment Programme 2009). This implies that the conflict is mainly over the control of resources, even resources that may not yet been extracted yet (Le Billon 2008). Controlling the coltan mines is very important for the rebels in order to secure incomes to finance not only armed violence, but also to benefit personally from the sales of the resources, selling the primary commodities illegally and pocketing most of the profit for own personal use. The price to weight ratio of natural resources can be used as a measure of profitability natural resources, which both rebel groups and government seek. The results from the analysis indicate indirectly that resources with a high price to weight ratio prolong civil war duration compared with resources with a low price to weight ratio. Coltan, and other lootable resources, for instance alluvial

diamonds, have a high price to weight ratio, and the occurrence of these resources can explain the duration of civil war in Congo.

Since duration of civil war cannot be explained by resource dependence, other elements may explain the long-lasting civil war. The conflict may be result of long international borders, as the DRC borders to nine countries (Hayes & Burge 2003:25), and the Kivu provinces borders to Burundi, Tanzania, Rwanda, and Uganda (see figure 3). Buhaug & Gates (2002) conclude that conflicts situated close to a border is correlated with the scope and duration of civil war and that long-lasting conflicts involves vast geographic areas, and the DRC falls into this conclusion. Moreover, Buhaug & Gates (2002) find that civil wars are affected by rebel motivations to succeed and if the rebel group has an ethnic or religious identity (ibid). Ethnicity is highly relevant when discussing factors that trigger civil war in the DRC. As described earlier, the Kivu provinces where the conflict have mainly taken place are populated with several ethnic groups, some of which have also formed rebel groups. In the DRC, the heterogenic Congolese population consist of 49 to 59 million people, divided into more than 100 ethnic groups (Hayes & Burge 2003: 25). Ethnicity and civil wars are correlated, especially when there is a dispute between an ethnic minority and majority as studies from Fearon (2004) have shown.

In the case of the DRC, there is no easy explanation. The DRC was a lucrative colony for Belgium as the country was abundant with cheap labour force and natural resources. After exploiting the country for several decades, Mobutu came into power, only to exploit the natural resources himself in the 1970s (Olsson & Fors 2004: 323). In spite of being rich with natural resources, the country experienced during this time low growth rates and the external debt increased. Even though a cease-fire was signed in 1999, the fighting stilled continued in the Kivu provinces, especially in the North in the end of the 1990's and the beginning of the 2000's. As mentioned earlier, the Kivus are where the coltan mines are located, and this is the area the central government no longer has control. The reason why this area has become the cradle of violence can be questioned. The location of minerals in North Kivu makes the province of strategic

importance, as rebels easily can use the mines as a means of finance. By possessing such a profitable source of revenue, continuing fighting will be of no particular difficulty for the rebels.

Overall, the Congolese civil war is complicated and cannot be explained by possession of natural resources alone. As Morten Bøås (2009:2) puts it: “there is no doubt that the conflict is fuelled and sustained by the extraction of minerals, but coltan […] did not start the war in the first place. The conflict is deeply entrenched in history and rooted in a combination of land rights issues combined with uncertainties about citizenship.” However, researchers should not overlook the effect natural resources have on the dynamics of war, even though the results from the statistical analysis indicate that conflicts in resource dependent countries do not last longer.

7 CONCLUSION

Why should scholars consider the resource dimensions of civil war? Environmental factors are seldom the only cause that prolongs civil war. Other factors such as the level of development and ethno-linguistic fractionalization are additionally drivers of civil war. Nevertheless, the existence of natural resources that are easily extracted and gained control over can contribute to undermining peace settlements, as rebels will benefit from fighting. This gives rebels an incentive to keep fighting since this is more profitable than signing a cease-fire, which involves giving up contested land and control over natural resources.

This thesis have provided a new empirical approach to studying the effect of natural resources on the duration of civil wars by combining previous approaches. Instead of only concentrating on resource dependency of the total primary export, this thesis has included a classification of natural resources into lootability and obstructability of each and one of 55 natural resources. In this way, the effect of not only primary commodities are measured, but the difference between lootability and obstructability natural resources are measured, not only as having a effect, but also as resource dependence.

Results from the analysis indicate several implications. First of all, the results go seemingly in the opposite direction of the hypothesized findings and theories. The coefficients indicate that resource dependence has a positive effect on civil war duration, the data coming from World Bank or UNCOMTRADE being of no difference. This is in line with the results from DeRouen and Sobek (2004). They find that natural resource availability for rebels, measured with the same proxy as I have, the primary commodity export ratio to GDP does little do benefit the rebels. Instead, exports will mostly benefit the government and end in a government truce, victory or treaty.

Furthermore, this thesis has also scrutinized a categorization of resources by lootability and obstructability. Results from the analysis indicate that there is indirect support for the hypothesis that lootable resources prolong civil war duration. This is because there is only statistically significant support for unlootable natural resources to shorten civil war duration. There may be several reasons for this. The most likely explanation is that the data on primary exports apply to the government revenues, not rebel revenues since rebel income are most likely a result of smuggling and illicit trade, which are consequently not reported to the central government. The obstructability approach on the other hand proved not to be statistically significant. Moreover, the results indicate that both obstructable and unobstructable natural resources both shorten civil war duration, and that there is little difference between the effects of the different levels of obstructability. Differentiating between obstructability of natural resources is in this way a less suitable approach in order to conclude more substantial how natural resources prolong civil war duration.

Additionally, low-price-to-weight resources shorten civil war duration, and there is thus indirect support that high-price-to-weight resources prolong civil war duration. This is most likely because high-price-to-weight resources, like diamonds and coltan, are considered to be highly profitable for rebels who will therefore strive to gain and remain in control of these types of resources. In turn, this will prolong civil war duration. To conclude, resource dependence does not lead to longer lasting civil wars and coding natural resources by lootability can be said to give a better empirical picture of civil war duration. However, classifying natural resources into different levels of obstructability is not found to give a better empirical picture of the effects of natural resources on civil war duration.

The Democratic Republic of the Congo is a country that has experienced several long-lasting civil wars. Natural resources have played an important role as demonstrated in chapter 6. This illustrated the methods of which rebels can gain revenues from the sales of lootable resources like coltan. Coltan and alluvial diamonds are lootable, and alluvial diamonds in particular are unobstructable. This implies that not only can

rebels extract the resource themselves easily, it is also possible to smuggle the resource without obstruction. This has enabled the rebels of the DRC to finance their insurgency and continuous warfare. Although there are many other factors that play an important role when it comes to the civil war in Congo, the role of natural resources should not be ignored as it clearly fuels the fighting.

According to the data, 207 of the 236 civil wars ended during the period of 1946-2004. This means that after the end of 2004, 29 conflicts had not ceased. Since 2004, several conflicts have awakened anew, and the DRC conflict intensified during 2008. This put the DRC and the role of natural resources on the global agenda, but the internal violence still continues. If civil wars are to end, and natural resources contribute to the onset and duration of civil wars, policy makers should focus more on the role of natural resources and implement this element in the peace- making process. Instead of natural resources being a curse for countries like the DRC, resources should be used as a way of increasing the GDP and end inequality. In this way, the state apparatus can function better and the country can more easily solve problems that may cause civil war outbreak. The results from this thesis are ambivalent. Resource dependence cannot explain long duration time of civil wars, and insignificant coefficients make it difficult to infer directly that lootability and obstructability of natural resource matter. However, the general trend indicates that if more precise data is obtained, this may be proven statistically. Finally, researchers and policymakers should be aware that natural resources, in addition to other underlying factors, makes it difficult to settle for peace permanently.

REFERENCES

Adcock, Robert & David Collier (2001). “Measurement Validity: A Shared Standard for Qualitative and Quantitative Research”, *American Political Science Review* 95 (3): 529-546.

Addison, Tony, Phillip Le Billon, & S. Mansoob Murshed (2003). “Conflict in Africa: The Cost of Peaceful Behaviour”, *Journal of African Economics* 11 (3): 365-386.

Auty, Richard M. (2004). “Natural resources and civil strife: a two-stage process”, *Geopolitics* 9 (1): 29 -49.

BBC News (2009) “Country profile: Democratic Republic of Congo ” [Online] Available at http://news.bbc.co.uk/2/hi/africa/country_profiles/1076399.stm#overview [Accessed September 23, 2009].

Box-Steffenmeier, Janet & Bradford S. Jones (2004). *Event History Modeling. A Guide for Social Sciences.* Cambridge: Cambridge University Press.

Brunnschweiler, Christa N. & Erwin H. Bulte (2009). “Natural resources and violent conflict: resource abundance, dependence and the onset of civil wars”, *Oxford Economic Papers* 2009 (61): 651-674.

Buhaug, Halvard & Scott Gates (2002). “The Geography of Civil War”, *Journal of Peace Research* 2002 (39): 417-433.

Buhaug, Halvard, Scott Gates, & Paivi Lujala (2005). “Geography, Strategic Ambition, and the Duration of Civil Conflict.” Paper prepared for presentation at the “Mapping the Complexity of Civil Wars” International Conference, September 15-17, 2005, Zurich, Switzerland.

Buhaug, Halvard, & Paivi Lujala (2005). “Accounting for scale: Measuring geography in quantitative studies of civil war”, *Political Geography* 2005 (24): 399-418.

Buhaug, Halvard & Jan Ketil Rød (2006). “Local determinants of African civil wars, 1970-2001”, *Political Geography* 2006 *(*25): 315-335.

Buhaug, Halvard, Scott Gates & Paivi Lujala (2009). “Geography, Rebel Capability and the Duration of Civil Conflict”, *Journal of Conflict Resolution* 2009 (53): 544-569.

Central Intelligence Agency (2009). *The World Factbook* [Online] Available at https://www.cia.gov/library/publications/the-world-factbook/fields/2111.html [Accessed June 25, 2009].

Cleves, Mario A., William W. Gould & Roberto G. Gutierrez (2004). *An introduction to survival analysis using Stata. Revised edition.* United States of America: Stata Press.

Collier, Paul (1999a). “On the economic consequences of civil war”, *Oxford Economic Papers* 1999 (51): 168-183.

Collier, Paul (1999b). “Doing Well out of War”, Paper prepared for Conference on Economic Agendas in Civil Wars, London April 26-27, 1999 [Online] Available at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.17.239&rep=rep1&type=pdf [Accessed September 10, 2009].

Collier, Paul & Anke Hoeffler (1998). “On economic causes of civil war”, *Oxford Economic Papers* 1998 (50): 563-573.

Collier, Paul & Anke Hoeffler (2004). “Greed and grievance in civil war”, *Oxford Economic Papers* 2004, 56 (4): 563-595.

Collier, Paul & Anke Hoeffler (2005). “Resource Rents, Governance, and Conflict”, *Journal of Conflict Resolution* 2005 (49) 625-633.

Collier, Paul, Anke Hoeffler & Måns Söderbom (2004). “On the Duration of Civil War”, *Journal of Peace Research* 2004 (41): 253-273.

Crossin, Corene, Gavin Hayman & Simon Taylor (2003). “Where Did It Come From? Commodity Tracking Systems” in Bannon, Ian & Paul Collier (2003) (eds), *Natural Resources and Violent Conflict. Options and Actions*, Washington: The International Bank for Reconstruction and Development, The World Bank.

DeRouen, Karl R., JR & David Sobek (2004). “The Dynamics of Civil War Duration and Outcome”. *Journal of Peace Research.* 2004 (41): 303-320.

De Soysa (2002). “Paradise is bazaar? Greed, creed and governance in civil war 1989-1999”, *Journal of Peace Research* 2002 (39) 395-416.

De Soysa, Indra & Eric Neumayer (2003). “Natural Resources and Civil War: Another Look With New Data”. [Online] Available at http://www.lse.ac.uk/collections/geographyAndEnvironment/whosWho/profiles/neumayer/pdf/Civilwarandresources.pdf [Accessed January 12, 2009].

Dunning, Thad & Leslie Wirpsa (2002). “Oil and the Political Economy of Conflict in Colombia and Beyond: A Linkages Approach” [Online] Available at http://www.santafe.edu/files/gems/obstaclestopeace/wirpsadunning.pdf [Accessed October 21, 2009].

Fearon, James D. & David Laitin (2003). “Ethnicity, Insurgency and Civil War”, *American Political Science Review* 2003 (97) 1.

Fearon, James D. (2005). “Primary Commodity Exports and Civil War”, *Journal of Conflict Resolution* 2005 (49) 483-507.

Fearon, James D. (2004). “Why Do Some Civil Wars Last So Much Longer than Others?”, *Journal of Peace Research* 2004 (41) 275-301.

Gilmore, Elisabeth & Päivi Lujala (2003). “The Location of Natural Resources Database”. Paper prepared for presentation at the Joint Sessions of Workshops European Consortium for Political Research, Edinburgh, UK
March 28th – April 2nd 2003.

Gilmore, Elisabeth, Nils Petter Gleditsch, Päivi Lujala & Jan Ketil Rød (2005a). “Conflict Diamonds: A New Dataset”. *Conflict Management and Peace Science* 22 (3): 257-272.

Gilmore, Elisabeth, Nils Petter Gleditsch, Päivi Lujala & Jan Ketil Rød (2005b). “The Diamond Dataset Codebook” [Online] Available at http://www.prio.no/sptrans/1122200499/DIADATA%20Codebook.pdf [Accessed October 24, 2009].

Gleditsch, Nils Petter, Petter Wallensteen, Mikael Eriksson, Margareta Sollenberg & Håvard Strand (2002a). “UCDP/PRIO Armed Conflict Dataset Codebook1 Version 4-2008”. [Online] Available at http://www.prio.no/CSCW/Datasets/Armed-Conflict/UCDP-PRIO/Armed-Conflicts-Version-4-2008/ [Accessed January 30, 2009].

Gleditsch, Nils Petter, Petter Wallensteen, Mikael Eriksson, Margareta Sollenberg & Håvard Strand (2002b). “Armed Conflict 1946-2001: A New Dataset”, *Journal of Peace Research* 2002 (39) 615-637.

Gleditsch, Nils Petter, Håvard Hegre & Håvard Strand (2009). “Democracy and Civil War” in Manus Midlarsky (eds), *Handbook of War Studies III.* Ann Arbor, MI: University of Michigan Press.

Gurr, Ted Robert, Keith Jaggers & Monty G. Marshall (2009). “Polity IV Project: Political Regime Characteristics and Transitions, 1800-2007”. [Online] Available at http://www.systemicpeace.org/polity/polity4.htm [Accessed September 19, 2009].

Hayes, Karen & Richard Burge (2003). “Coltan Mining in the Democratic Republic of Congo: How tantalum-using industries can commit to the reconstruction of the DRC”. Cambridge: Fauna & Flora International, Cambridge, UK.

Hegre, Håvard & Nicholas Sambanis (2006). “ Sensitivity Analysis of Emperical Results on Civil War Onset”, *Journal of Conflict Resolution* (50) 40, 508-535.

Hellevik, Ottar (1998). *Introduction to Causal Analysis. Exploring Survey Data by Crosstabulation*. Norway: Scandiavian University Press.

Hellevik, Ottar (2003). *Forskningsmetode i sosiologi og statsvitenskap*. Oslo: Universitetsforlaget.

Heston ,Alan, Robert Summers & Bettina Aten (2009a). “Penn World Table Version 6.3, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, About PWT” [Online] Available at http://pwt.econ.upenn.edu/php_site/pwt_index.php [Accessed October 12 2009].

Heston ,Alan, Robert Summers & Bettina Aten (2009b). “Penn World Table Version 6.3, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania” [Online] Available at http://pwt.econ.upenn.edu/php_site/pwt63/pwt63_form.php [Accessed October 12 2009].

Heston ,Alan, Robert Summers & Bettina Aten (2009c). “Penn World Table Version 6.3, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, Appendix” [Online] Available at http://pwt.econ.upenn.edu/Documentation/append61.pdf [Accessed October 12, 2009].

Humphreys, Macartan (2005). “Natural Resources, Conflict and Conflict Resolution: Uncovering the Mechanisms”. *Journal of Conflict Resolution* 2005 (49): 508-537.

International Crisis Group (2003). *The Kivus: the Forgotten Crucible of the Congo Conflicts*, Brussels: International Crisis Group.

Jackson, Stephen (2003). “Power, livelihoods, and conflict. Chapter 2. Fortunes of war: the coltan trade in the Kivus” [Online] Available at http://se1.isn.ch/serviceengine/Files/ISN/37941/ichapterchapter_singledocument/E4B488F5-5DD5-4E10-9E9B-A7382067E262/en/Chap2.pdf [Accessed September 12, 2009].

King, Gary, Robert Keohane & Sidney Verba (1994). *Designing Social Inquiery. Scientific Inference in Qualitativ Research.* USA: Princeton University Press.

Karl, Terry (1997). *The Paradox Of Plenty: Oil Booms and Petro-States.* Berkely: University of California Press.

Le Billon, Philippe (2001a). “The political ecology of war:
Natural resources and armed conflicts”. *Political Geography* 2001 (20): 561–584.

Le Billon, Phillippe (2001b). “Angola’s political economy of war: the role of oil and diamonds 1975-2000. *African Affairs* 2001 (100): 55-80.

Le Billon, Phillippe (2003). “Getting It Done: Instruments of Enforcement” in

in Coller, Paul & Ian Bannon (eds) (2003) *Natural Resources and Violent Conflict. Options and Actions.* Washington: The World Bank, The International Bank for Reconstruction and Development.

Le Billon, Phillippe (2005). *Fuelling War: Natural resources and armed conflict.* New York: Routledge for The Internationals Institute for Strategic Studies.

Le Billon, Philippe (2008). "Diamond Wars? Conflict Diamonds and Geographies of Resource Wars". *Annals of the Association of American Geographers* 98 (2): 345-372.

Lide, David (2003). *CRC Handbook of Chemistry and Physics: A Ready-Reference Book of Chemical and Physical data* (ed), Boca Raton, Fla. : CRC Press.

Lujala, Päivi (2003). "Classification of Natural Resources". Paper prepared for presentation at the 2003 ECPR Joint Session of Workshops, Edinburgh, UK 28.3-2.4.

Lujala, Päivi (2009). "Deadly Combat over Natural Resources: Gems, Petroleum, Drugs, and the Severity of Armed Civil Conflict [Online] Available at http://www.svt.ntnu.no/iso/Paivi.Lujala/home/Papers.htm [Accessed March 04, 2009].

Lujala, Päivi (Forthcoming). "The Spoils of Nature: Armed Civil Conflict and Rebel Access to Natural Resources" [Online] Available at http://www.svt.ntnu.no/iso/Paivi.Lujala/home/Papers.htm [Accessed March 04, 2009].

Lujala, Päivi, Nils Petter Gleditsch & Elisabeth Gilmore (2005). "A Diamond Curse? Civil War and a Lootable Resource". *Journal of Conflict Resolution* 2005 (49): 538-562.

Lujala, Päivi, Jan Ketil Rød & Nadia Thieme, (2007a). "Fighting over Oil: Introducing A New Dataset" *Conflict Management and Peace Science* 24(3), 239-256.

Lujala, Päivi, Jan Ketil Rød & Nadia Thieme, (2007b). "The Petroleum Dataset. Country Profiles" *[Online] Available at* http://www.prio.no/sptrans/-2009228485/Country%20Profiles%202007.pdf *[Accessed October 24, 2009]*.

Lujala, Päivi, Jan Ketil Rød & Nadia Thieme, (2007c). "The Petroleum Dataset Codebook" *[Online] Available at* http://www.prio.no/sptrans/-889127724/codebook.pdf *[Accessed October 24, 2009]*.

Olsson, Ola & Heather Congdon Fors (2004). "Congo: The Prize of Predation". *Journal of Peace Research.* 2004 (41): 321-336.

Oxford Advanced Learner's Dictionary (2000). Oxford: Oxford University Press.

Radetzki, Marian (2008). *A Handbook of Primary Commodities in the Global Economy*. Cambridge: Cambridge University Press.

Ross, Michael (2001). "Does Oil Hinder Democracy?", *World Politics* 53 (3): 325-361.

Ross, Michael, (2002). "Oil, drugs, and Diamonds. How do Natural Resources Vary in their Impact on Civil War" in Ballentine, Karen & Jake Sherman (eds) (2003). *The Political Economy of Armed Conflict. Beyond Greed and Grievance*. London: Lynne Rienner Publisher.

Ross, Michael (2003a). "Natural Resources and Civil War: An Overview". Paper submitted to the World Bank Research Observer, 2003.

Ross, Michael (2003b). “The Natural Resource Curse: How Wealth Can Make You Poor” in Coller, Paul & Ian Bannon (eds) (2003) *Natural Resources and Violent Conflict. Options and Actions.* Washington: The World Bank, The International Bank for Reconstruction and Development.

Ross, Michael (2004a). “What Do We Know about Natural Resources and Civil War?” *Journal of Peace Research* 2004 (41): 337-356.

Ross, Michael (2004b). “How Do Natural Resources Influence Civil War? Evidence from Thirteen Cases”. *International Organization* (58): 35-67.

Sandbakken, Camilla (2006): “The limits to democracy posed by oil rentier states: The cases of Algeria, Nigeria and Libya”, *Democratization* (13, 1): 135-152.

Skog, Ole-Jørgen (2004). *Å forklare sosiale fenomener. En regresjonsbasert tilnærming*, Oslo: Gyldendal Norsk Forlag AS.

Tegera, Aloys & Dominic Johnson (2007). “*Rules for Sale: Formal and Informal Cross-Border Trade in Eastern DRC”*, Goma: Pole Institute (Revue Trimestrielle no. 19 bis).

The World Bank (2009). Data on primary export and total export for all countries. Received by email from the Development Data Group April 29, 2009.

Tsui, Kevin K (2005). “More Oil, Less Democracy?: Theory and Evidence from Crude Oil Discoveries” [Online] Available at http://economics.uchicago.edu/download/tsui_applwksp_120505.pdf [Accessed October 17, 2008].

UCLA: Academic Technology Services, Statistical Consulting Group (2009). “Statistical Computing Seminars. Survival Analysis with Stata”. [Online] Available at

http://www.ats.ucla.edu/stat/stata/seminars/stata_survival/default.htm [Accessed October 28, 2009].

United Nations Commodity Trade Statistics Database (2009a). [Online] Available at http://comtrade.un.org/db/mr/rfCommoditiesList.aspx?px=S1&cc=TOTAL [Accessed August 10, 2009].

United Nations Commodity Trade Statistics Database (2009b) [Online] Available at http://comtrade.un.org/kb/article.aspx?id=10062 [Accessed August 10, 2009].

United Nations Commodity Trade Statistics Database (2009c) [Online] Available at http://comtrade.un.org/db/dqQuickQuery.aspx [Accessed August 10, 2009].

United Nations Environment Programme (2009). "From Conflict to Peacebuilding. The Role of Natural Resources and the Environment", [Online] Available at http://www.iisd.org/publications/pub.aspx?pno=1062 [Accessed September 10, 2009].

United Nations (2002): *Final report of the Panel of Experts on the Illegal Exploitation of Natural Resources and Other Forms of Wealth of the Democratic Republic of the Congo* (S2002/1146), New York: The United Nations Security Council.

Wantchekon, Leonard (2002). "Why Do Resource Abundant Countries Have Authoritarian Regimes?" [Online] Available at http://www.afea-jad.com/2002/Wantchekon3.pdf [Accessed October 15, 2008].

Winer, Jonathan M. & Trifin J. Roule (2003). "Follow the Money: The Finance of Illicit Resource Extraction" in Bannon, Ian & Paul Collier (2003): *Natural Resources and Violent Conflict* (eds). Washington: The International Bank for Reconstruction and Development, The World Bank.

REFERENCES FOR APPENDIX I

Answers.com (2009). [Online] Available at http://www.answers.com [Accessed September 28, 2009].

Davis, Joseph R. (2000). *ASM specialty handbook: nickel, cobalt, and their alloys.* United States of America: AMS International.

Department of Geology, University of Michigan (2009). [Online] Available at http://www.geo.msu.edu [Accessed September 28, 2009].

Emsley, John (2001). *Nature's Building Blocks: An A to Z guide to the Elements.* Oxford: Oxford University Press.

Encyclopædia Britannica Online (2009). [Online] Available at http://www.britannica.com [Accessed September 28, 2009].

Food and Agricultural Organization of the United Nations (FAO) (2009). [Online] Available at http://www.fao.org/ [Accessed September 28, 2009].

Gilmore, Elisabeth, Nils Petter Gleditsch, Päivi Lujala & Jan Ketil Rød (2005a). "Conflict Diamonds: A New Dataset". *Conflict Management and Peace Science* 22 (3): 257-272.

Industrial Minerals Association of North America (IMA-NA) (2009) [Online] Available at http://www.ima-na.org [Accessed September 28, 2009].

Lide, David (2003). *CRC Handbook of Chemistry and Physics: A Ready-Reference Book of Chemical and Physical data* (ed), Boca Raton, Fla. : CRC Press.

Lujala, Päivi, Jan Ketil Rød & Nadia Thieme, (2007a). "Fighting over Oil: Introducing A New Dataset" *Conflict Management and Peace Science* 24(3), 239-256.

Mindat.org (2009). [Online] Available at http://www.mindat.org [Accessed September 28, 2009].

Mineral Information Institute (MII) (2009). [Online] Available at http://www.mii.org/index.html [Accessed September 28, 2009].

Minerals Zone (2009). [Online] Available at http://www.mineralszone.com [Accessed October 30, 2009].

Mining Technology (2009) [Online] Available at http://www.mining-technology.com [Accessed October 28, 2009].

Oil Sands Discovery Centre (2009). [Online] Available at http://www.oilsandsdiscovery.com [Accessed September 28, 2009].

Palm Oil World (2009). [Online] Available at http://www.palmoilworld.org [Accessed October 29, 2009].

The International Rubber Research and Development Board (IRRDB) (2009) [Online] Available at http://www.irrdb.com [Accessed September 28, 2009].

United States Geological Survey (2009) [Online] Available at http://minerals.usgs.gov/minerals [Accessed September 28, 2009].

Webmineral (2009). [Online] http://www.webmineral.com [Accessed October 25, 2009].

Wikipedia (2009). [Online] Available at http://www.wikipedia.org/ [Accessed January 20, 2009].

World Coal Institute (2009). [Online] Available at http://www.worldcoal.org/home [Accessed October 20, 2009].

APPENDICES

Appendix I Classification and Coding of Natural Resources

Natural Resource	SITC Code Rev. 1	Lootable	Obstructable	Sources	Excluded Resources	Why
Aluminium ores and concentrates	283.3	No	Moderately	Wikipedia 2009, Answers.com 2009	Antimony	Not found in SITC Rev 1
Arsenic	512.82	No	Moderately	Wikipedia 2009, Emsley 2001	Arable land	Not exportable
Asbestos	276.4	No	Moderately	Wikipedia 2009, Answers.com 2009	Asphalt	By-product
Calcium	514.94	Yes	Moderately	Wikipedia 2009, Emsley 2001	Chicle	Coincide with rubber
Chalk	276.91	Yes	Moderately	Wikipedia 2009, Answers.com 2009	Coastal Climate	Not exportable
Chromium ores and concentrates	283.91	No	Moderately	Wikipedia 2009, Emsley 2001	Diatomite	Not found in SITC
Clay	276.21	Yes	Moderately	Wikipedia 2009, US Geology Survey 2009	Emeralds	Coincides with Preacious Stones
Coal, wether or not pulverized, but not agglomerated	321.	Yes	Moderately	Wikipedia 2009, World Coal Institute 2009	Forest	Not exportable
Cobalt	513.54	No	Moderately	Wikipedia 2009, Davis 2000	Gemstones	Coincides with Preacious Stones
Cocoa	072.1	Yes	Moderately	Wikipedia 2009, FAO 2009	Hydropower	Not exportable
Coffee, wether or not roasted	071.	Yes	Moderately	Wikipedia 2009, FAO 2009	Kaolin	Coincide with clay
Copper ores and concentrates	283.11	No	Moderately	Wikipedia 2009, Answers.com 2009	Lignite	No data availble in UNCOMTRADE
Crude rubber	231.1	Yes	Moderately	Wikipedia 2009, IRRDB 2009	Methane	Could not find a match in UNCOMTRADE
Diamonds, industrial	275.1	No	Moderately	Wikipedia 2009, Britannica 2009	Natron	Could not find a match in UNCOMTRADE
Diamonds, other than industrial (deep shaft)	667.22	No	Unobstructable	Wikipedia 2009, Gilmore, Gleditsch, Lujala & Rød 2005	Nitrates	Could not find a match in UNCOMTRADE
Diamonds, other than industrials (alluvial)	667.21	Yes	Unobstructable	Wikipedia 2009, Gilmore, Gleditsch, Lujala & Rød 2005	Pyrites	Could not find a match in UNCOMTRADE
Feldspar	276.54	Yes	Moderately	Wikipedia 2009, Answers.com 2009, IMA-NA 2009	Scenic beauty	Not exportable
Fish	031.	Yes	Moderately	Wikipedia 2009, FAO 2009	Shrimp	Not found in SITC Rev 1
Flourspar	276.54	Yes	Moderately	Wikipedia 2009, MII 2009	Silica Sand	Coincides with Sand, Stone and Gravel
Granite	273.13	Yes	Moderately	Wikipedia 2009, Answers 2009	Soda Ash	Could not find a match in UNCOMTRADE
Graphite	276.22	Yes	Moderately	Wikipedia 2009, Minerals Zone 2009	Timber	Could not find a match in UNCOMTRADE
Gypsum	273.21	Yes	Moderately	Wikipedia 2009, Mindat.org 2009	Wildlife	Could not find a match in UNCOMTRADE
Iron ore and concentrates, not agglomerated	281.3	No	Moderately	Wikipedia 2009, MII 2009	Zircon	Could not find a match in UNCOMTRADE
Lead ores and concentrates	283.4	No	Moderately	Wikipedia 2009 US Geology Survey 2009		
Limestone flux	273.22	Yes	Moderately	Wikipedia 2009, US Geology Survey 2009		
Magnesite	276.24	No	Moderately	Wikipedia 2009, Webmineral 2009		
Manganese ores and concentrates	283.7	No	Moderately	Wikipedia 2009, Emsley 2001		
Marble	273.12	Yes	Moderately	Wikipedia 2009, US Geology Survey 2009		
Mercury	512.83	Yes	Moderately	Wikipedia 2009, Emsley 2001		
Mica	276.52	Yes	Moderately	Wikipedia 2009, Answers.com 2009		
Molybdenum ores and concentrates	283.93	No	Moderately	Wikipedia 2009, Lide 2003		
Natural barium sulphates (barytes)	276.93	No	Moderately	Wikipedia 2009, Britannica 2009		
Natural gas in the gaseous state, offshore	341.12	No	Unobstructable	Wikipedia 2009, Lujala, Rød & Thieme 2007		
Natural gas in the gaseous state, onshore	341.11	No	Highly	Wikipedia 2009, Lujala, Rød & Thieme 2007		
Nickel ores and concentrates	283.21	No	Moderately	Wikipedia 2009, Answers,com 2009		
Niobium, tantalum and vanadium ores and concentrates	283.93	No	Moderately	Wikipedia 2009, Lide 2009		
Palm Oil	422.2	Yes	Moderately	Wikipedia 2009, Palm Oil World 2009		
Peat	321.7	Yes	Moderately	Wikipedia 2009, US Geology Survey 2009		
Petroleum oils, offshore	331.2	No	Unobstructable	Wikipedia 2009, Lujala, Rød & Thieme 2007		
Petroleum oils, onshore	331.1	No	Highly	Wikipedia 2009, Lujala, Rød & Thieme 2007		
Phosphates, phosphinates	514.26	No	Moderately	Wikipedia 2009, Mining Technology 2009		
Platinum	681.21	No	Moderately	Wikipedia 2009, Emsley 2001		
Potassium hydroxide (potash)	513.63	Yes	Moderately	Wikipedia 2009, US Geology Survey 2009		
Precious and semiprecious stones, alluvial	667.31	Yes	Unobstructable	Wikipedia 2009, Gilmore, Gleditsch, Lujala & Rød 2005		
Precious and semiprecious stones, deep shaft	667.32	No	Unobstructable	Wikipedia 2009, Gilmore, Gleditsch, Lujala & Rød 2005		
Pumice	275.23	Yes	Moderately	Wikipedia 2009, Britannica 2009		
Quartz	276.51	Yes	Moderately	Wikipedia 2009, Answers.com 2009		
Rice	042.	Yes	Moderately	Wikipedia 2009, FAO 2009		
Salt (Sodium chloride)	276.3	Yes	Moderately	Wikipedia 2009, Britannica 2009		
Silver ores and concentrates	285.	No	Moderately	Wikipedia 2009, Emsley 2001		
Slate	273.11	Yes	Moderately	Wikipedia 2009, Minerals Zone 2009		
Stone,Sand & Gravel	273.	Yes	Moderately	Wikipedia 2009, Department of Geology 2009		
Sulphur	512.81	Yes	Moderately	Wikipedia 2009, US Geology Survey 2009		
Talc	276.95	Yes	Moderately	Wikipedia 2009, Britannica 2009		
Tin ores and concentrates	283.6	No	Moderately	Wikipedia 2009, MII 2009		
Titanium ores and concentrates	283.93	No	Moderately	Wikipedia 2009, Lide 2003		
Tungsten (or wolfram) ores and concentrates	283.92	No	Moderately	Wikipedia 2009, Lide 2003		
Uranium ores and concentrates	286.	No	Moderately	Wikipedia 2009, Emsley 2001		
Zinc ores and concentrates	283.5	No	Moderately	Wikipedia 2009, Emsley 2001		

Appendix II Classification and Coding of Oil, Precious Stones, and Diamonds

Country	Type	Source	Country	Type of resource	Sources
Afghanistan	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Afghanistan	Precious stones	UNCOMTRADE 2009c
Algeria	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Algeria	Alluvial diamonds and Precious stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Angola	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Angola	Alluvial diamonds and Precious stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Argentina	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Argentina	Diamonds and Precious stones	UNCOMTRADE 2009c
Azerbaijan	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Bangladesh	Diamonds and Precious stones	UNCOMTRADE 2009c
Bangladesh	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Bolivia	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Bolivia	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Burundi	Precious stones	UNCOMTRADE 2009c
Bosnina-Herzegovina	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Cameroon	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Burkina Faso	Gas	UNCOMTRADE 2009c	Central African Republic	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Burma	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Chad	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Burundi	Petroleum	UNCOMTRADE 2009c	Chile	Diamonds and Precious stones	UNCOMTRADE 2009c
Cambodia	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	China	Deep shaft diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Cameroon	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Colombia	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Central African Republic	Gas	UNCOMTRADE 2009c	Congo	Alluvial diamonds	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Chad	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Costa Rica	Diamonds and Precious stones	UNCOMTRADE 2009c
Chile	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Croatia	Diamonds and Precious stones	UNCOMTRADE 2009c
China	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Democratic Republic of the Congo	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Colombia	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Djibouti	Precious stones	UNCOMTRADE 2009c
Congo	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Dominican Republic	Diamonds and Precious stones	UNCOMTRADE 2009c
Costa Rica	Gas and Petroleum	UNCOMTRADE 2009c	Egypt	Diamonds and Precious stones	UNCOMTRADE 2009c
Croatia	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	El Salvador	Precious stones	UNCOMTRADE 2009c
Cuba	Onshore oil	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Ethiopia	Precious stones	UNCOMTRADE 2009c
Djibouti	Gas and Petroleum	UNCOMTRADE 2009c	France	Diamonds and Precious stones	UNCOMTRADE 2009c
Dominican Republic	Gas	UNCOMTRADE 2009c	Gabon	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
DRC	Onshore oil	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Gambia	Diamonds and Precious stones	UNCOMTRADE 2009c
Egypt	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Georgia	Precious stones (exports from 2008, year not included in dataset)	UNCOMTRADE 2009c
El Salvador	Gas and Petroleum	UNCOMTRADE 2009c	Ghana	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Eritrea	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Greece	Diamonds and Precious stones	UNCOMTRADE 2009c
Ethiopia	Onshore gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Guatemala	Diamonds and Precious stones	UNCOMTRADE 2009c
France	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Guinea	Alluvial diamonds	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Gabon	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Haiti	Diamonds	UNCOMTRADE 2009c
Gambia	Gas	UNCOMTRADE 2009c	India	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Georgia	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Indonesia	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Ghana	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Iran	Diamonds and Precious stones	UNCOMTRADE 2009c
Greece	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Israel	Diamonds and Precious stones	UNCOMTRADE 2009c
Guatemala	Onshore oil	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Ivory Coast	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
India	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Kenya	Diamonds and Precious stones	UNCOMTRADE 2009c
Indonesia	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Korea	Diamonds and Precious stones	UNCOMTRADE 2009c
Iran	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Laos	Precious stones	UNCOMTRADE 2009c
Iraq	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Lebanon	Diamonds and Precious stones	UNCOMTRADE 2009c
Israel	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Lesotho	Deep shaft diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Ivory Coast	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Liberia	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Kenya	Petroleum	UNCOMTRADE 2009c	Macedonia	Precious stones	UNCOMTRADE 2009c
Korea	Offshore gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Madagascar	Diamonds and Precious stones	UNCOMTRADE 2009c
Lebanon	Gas and Petroleum	UNCOMTRADE 2009c	Malaysia	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Macedonia	Onshore oil	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Mali	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Madagascar	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Mexico	Diamonds and Precious stones	UNCOMTRADE 2009c
Malaysia	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Moldova	Precious stones	UNCOMTRADE 2009c
Mali	Gas and Petroleum	UNCOMTRADE 2009c	Morocco	Diamonds and Precious stones	UNCOMTRADE 2009c
Mexico	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Mozambique	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Moldova	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Myanmar (Burma)	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Morocco	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Nepal	Precious stones	UNCOMTRADE 2009c
Mozambique	Onshore gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Nicaragua	Precious stones	UNCOMTRADE 2009c
Nepal	Gas	UNCOMTRADE 2009c	Niger	Precious stones	UNCOMTRADE 2009c
Nicaragua	Gas and Petroleum	UNCOMTRADE 2009c	Nigeria	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Niger	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Oman	Diamonds and Precious stones	UNCOMTRADE 2009c
Nigeria	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Pakistan	Diamonds and Precious stones	UNCOMTRADE 2009c
Oman	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Panama	Precious stones	UNCOMTRADE 2009c
Pakistan	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Papua New Guinea	Diamonds and Precious stones	UNCOMTRADE 2009c
Panama	Gas	UNCOMTRADE 2009c	Paraguay	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Papua New Guinea	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Peru	Diamonds and Precious stones	UNCOMTRADE 2009c
Paraguay	Petroleum	UNCOMTRADE 2009c	Phillippines	Diamonds and Precious stones	UNCOMTRADE 2009c
Peru	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Romania	Diamonds and Precious stones	UNCOMTRADE 2009c
Philippines	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Russia	Deep shaft diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Philippines	Onshore gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Rwanda	Precious stones	UNCOMTRADE 2009c
Romania	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Saudi Arabia	Diamonds and Precious stones	UNCOMTRADE 2009c
Russia	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Senegal	Precious stones	UNCOMTRADE 2009c
Rwanda	Gas and Petroleum	UNCOMTRADE 2009c	Serbia&Montenegro	Diamonds and Precious stones	UNCOMTRADE 2009c
Saudi Arabia	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Sierra Leone	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Senegal	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	South Africa	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Serbia	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Spain	Diamonds and Precious stones	UNCOMTRADE 2009c
Sierra Leone	Gas and Petroleum	UNCOMTRADE 2009c	Sri Lanka	Diamonds and Precious stones	UNCOMTRADE 2009c
Somalia	Onshore gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Suriname	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
South Africa	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Syria	Diamond exports from 2006, year not included in thesis	UNCOMTRADE 2009c
Spain	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Thailand	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Sri Lanka	Gas and Petroleum	UNCOMTRADE 2009c	Togo	Diamonds and Precious stones	UNCOMTRADE 2009c
Sudan	Onshore oil	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Trinidad&Tobago	Diamonds and Precious stones	UNCOMTRADE 2009c
Sudan	Offshore gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Tunisia	Diamonds and Precious stones	UNCOMTRADE 2009c
Suriname	Onshore oil	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Turkey	Diamonds and Precious stones	UNCOMTRADE 2009c
Syria	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Uganda	Diamonds and Precious stones	UNCOMTRADE 2009c
Tajikistan	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	United Kingdom	Diamonds and Precious stones	UNCOMTRADE 2009c
Thailand	Offshore oil	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Uruguay	Deep shaft diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Thailand	Onshore gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Venezuela	Alluvial diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Togo	Gas and Petroleum	UNCOMTRADE 2009c	Vietnam	Diamonds and Precious stones	UNCOMTRADE 2009c
Trinidad & Tobago	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Yemen	Precious stones	UNCOMTRADE 2009c
Tunisia	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Yugoslavia	Precious stones	UNCOMTRADE 2009c
Turkey	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c	Zimbabwe	Deep shaft diamonds and stones	Gilmore, Buhaug, Lujala & Rød 2005a and 2005b & UNCOMTRADE 2009c
Turkmenistan	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c			
Uganda	Gas and Petroleum	UNCOMTRADE 2009c			
United Kingdom	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c			
Uzbekistan	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c			
Venezuela	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c			
Vietnam	Offshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c			
Yemen	Onshore oil and gas	Lujala, Rød &Tieme 2007 & UNCOMTRADE 2009c			
Zimbabwe	Gas and Petroleum	UNCOMTRADE 2009c			

Appendix III Classification of Natural Resources by Price to Weight Ratio

Variable	Obs	Mean	Std. Dev.	Min	Max	Low	Medium	High
W1_2311	898	0	0	0	0	W1_3311	W1_51426	W1_286
W1_285	898	0	0	0	0	W1_66732	W1_27693	W1_285
W1_286	898	0	0	0	0	W1_27654	W1_3312	W1_4222
W1_3311	898	958610	5447657	.0143923	3.19e+07	W1_27322	W1_27624	W1_071
W1_66732	898	.0885445	.3340231	0	1.811719	W1_273	W1_28311	W1_27652
W1_27654	898	.1884059	.2207933	.0298816	1.294211	W1_34112	W1_2833	W1_28321
W1_27322	898	.204928	.3281566	.0090386	1.961757	W1_2813	W1_2764	W1_66721
W1_273	898	.2757744	.2875685	.0440855	1.591315	W1_2835	W1_2836	W1_321
W1_34112	898	.324899	.308098	.0486849	2.23578	W1_27695	W1_68121	W1_27311
W1_2813	898	.4462204	.5244558	.0134311	2.497098	W1_2834	W1_66731	W1_27651
W1_2835	898	.4575613	.784999	.0416192	5.487584	W1_27313	W1_51283	W1_51281
W1_27695	898	.552849	.3788235	.0488963	1.432106	W1_2763	W1_51354	W1_51282
W1_2834	898	.6156113	.5837801	.0784	3.354275	W1_27621	W1_031	W1_27523
W1_27313	898	.6253688	1.652892	.0328843	9.861315	W1_27691	W1_27622	W1_28392
W1_2763	898	.6280065	1.758898	.0327338	10.06707	W1_28391	W1_27321	W1_2751
W1_27621	898	.6550337	1.256099	.0359167	5.971055	W1_042	W1_51363	W1_66722
W1_27691	898	.6988628	1.072726	.0283873	4.962213	W1_27312	W1_0721	W1_28393
W1_28391	898	.8344471	2.042903	.0280954	12.07557	W1_51494		W1_2837
W1_042	898	.8387045	1.703997	.1648412	9.740527	W1_34111		W1_3217
W1_27312	898	.8641599	2.620276	.0841902	17.9807			
W1_51494	898	.9054474	.9095871	.1329449	4.816054	**Low Price / Weigth**	**Medium Price / Weigth**	**High Price / Weight**
W1_34111	898	.9792529	1.198682	.0627674	6.266187	S1_3311	S1_51426	S1_286
W1_51426	898	1.001081	.8783807	.1762285	4.754539	S1_66732	S1_27693	S1_285
W1_27693	898	1.050805	4.831946	.019527	27.95331	S1_27654	S1_3312	S1_4222
W1_3312	898	1.326928	4.981555	.0095085	33.88661	S1_27322	S1_27624	S1_071
W1_27624	898	1.382019	3.766505	.0484799	24.58873	S1_273	S1_28311	S1_27652
W1_28311	898	1.509193	2.577964	.1313597	15.99549	S1_34112	S1_2833	S1_28321
W1_2833	898	1.706672	3.469515	.0081619	14.7764	S1_2813	S1_2764	S1_66721
W1_2764	898	1.932223	3.035052	.1347557	15.30307	S1_2835	S1_2836	S1_321
W1_2836	898	11.55384	36.39384	1.202907	224.1918	S1_27695	S1_68121	S1_27311
W1_68121	898	1416.204	3099.008	0	9623.225	S1_2834	S1_66731	S1_27651
W1_66731	898	1533.608	7146.516	0	38628	S1_27313	S1_51283	S1_51281
W1_51283	898	16.69048	49.29608	0	285	S1_2763	S1_51354	S1_51282
W1_51354	898	16.71592	11.88792	1.828479	54.99558	S1_27621	S1_031	S1_27523
W1_031	898	2.672273	1.184086	.5237395	4.925326	S1_27691	S1_27622	S1_28392
W1_27622	898	2.787779	6.762831	.1590941	42.37261	S1_28391	S1_27321	S1_2751
W1_27321	898	2.803313	14.23875	.0230033	90.44267	S1_042	S1_51363	S1_66722
W1_51363	898	2.847028	3.046783	.1646867	12.63104	S1_27312	S1_0721	S1_28393
W1_0721	898	2.880102	4.698754	.4079826	24.51923	S1_51494		S1_2837
W1_4222	898	3.474041	16.09393	.2152182	98.50298	S1_34111		S1_3217
W1_071	898	3.517284	2.188205	.8042197	12.33104			
W1_27652	898	3.86564	9.31024	.200785	51.16068			
W1_28321	884	4.145785	7.159494	.0097608	38.23929			
W1_66721	898	4762.528	21447.8	0	117475.1			
W1_321	898	5.517647	26.71227	.0307589	149.0289			
W1_27311	898	5.899316	15.60741	.0183248	74.02996			
W1_27651	898	6.663785	14.86354	.0605637	96.38502			
W1_51281	898	7.274209	7.455299	.8316101	46.89822			
W1_51282	898	7.454422	36.76334	0	269.9048			
W1_27523	898	7.992772	32.39989	.1337034	198.5919			
W1_28392	898	8.952617	15.67017	.5732083	91.30536			
W1_2751	898	8180.624	23412.12	0	117433.6			
W1_66722	898	83407.56	253400.6	0	1276091			
W1_28393	898	9.187751	30.68529	.5600133	184.5887			
W1_2837	898	9.205423	46.05375	.0453147	256.7452			
W1_3217	898	9.961729	51.22235	.0103962	285.2943			

Appendix IV Do-files

```
set mem 1000m
insheet using "M:\MA thesis\Data\CSVfiles\allcommmodities1962-2008 (sorted by reporter).csv", delimiter(";")
names
rename period year
keep year reporter commoditycode tradevalue netweightkg
destring tradevalue, force replace
destring netweightkg, force replace

sort reporter year commoditycode
capture drop first
gen first = 0
replace first = 1 in 1
replace first = 1 if year != year[_n-1] | reporter != reporter[_n-1]
sort reporter year

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-031"
by reporter year: egen S1_031 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-042"
by reporter year: egen S1_042 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-071"
by reporter year: egen S1_071 = max(temp)
capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-0721"
by reporter year: egen S1_0721 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-2311"
by reporter year: egen S1_2311 = max(temp)
```

```
capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-273"
by reporter year: egen S1_273 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27312"
by reporter year: egen S1_27312 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27313"
by reporter year: egen S1_27313 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27321"
by reporter year: egen S1_27321 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27322"
by reporter year: egen S1_27322 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-2751"
by reporter year: egen S1_2751 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27523"
by reporter year: egen S1_27523 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27621"
by reporter year: egen S1_27621 = max(temp)
```

```
capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27622"
by reporter year: egen S1_27622 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27624"
by reporter year: egen S1_27624 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-2763"
by reporter year: egen S1_2763 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-2764"
by reporter year: egen S1_2764 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27651"
by reporter year: egen S1_27651 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27652"
by reporter year: egen S1_27652 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27654"
by reporter year: egen S1_27654 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27691"
by reporter year: egen S1_27691 = max(temp)
```

```
capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27693"
by reporter year: egen S1_27693 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27695"
by reporter year: egen S1_27695 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-2813"
by reporter year: egen S1_2813 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-28311"
by reporter year: egen S1_28311 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-28321"
by reporter year: egen S1_28321 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-2833"
by reporter year: egen S1_2833 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-2834"
by reporter year: egen S1_2834 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-2835"
by reporter year: egen S1_2835 = max(temp)
capture drop temp
```

```
gen temp = .
replace temp = tradevalue if commoditycode== "S1-2836"
by reporter year: egen S1_2836 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-2837"
by reporter year: egen S1_2837 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-28391"
by reporter year: egen S1_28391 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-28392"
by reporter year: egen S1_28392 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-28393"
by reporter year: egen S1_28393 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-285"
by reporter year: egen S1_285 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-286"
by reporter year: egen S1_286 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-321"
by reporter year: egen S1_321 = max(temp)
capture drop temp
gen temp = .
```

```
replace temp = tradevalue if commoditycode== "S1-3217"
by reporter year: egen S1_3217 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-3311"
by reporter year: egen S1_3311 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-3312"
by reporter year: egen S1_3312 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-34111"
by reporter year: egen S1_34111 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-34112"
by reporter year: egen S1_34112 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-4222"
by reporter year: egen S1_4222 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-51281"
by reporter year: egen S1_51281 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-51282"
by reporter year: egen S1_51282 = max(temp)

capture drop temp
gen temp = .
```

```
replace temp = tradevalue if commoditycode== "S1-51283"
by reporter year: egen S1_51283 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-51354"
by reporter year: egen S1_51354 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-51363"
by reporter year: egen S1_51363 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-51426"
by reporter year: egen S1_51426 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-66721"
by reporter year: egen S1_66721 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-66722"
by reporter year: egen S1_66722 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-66731"
by reporter year: egen S1_66731 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-66732"
by reporter year: egen S1_66732 = max(temp)

capture drop temp
gen temp = .
```

```
replace temp = tradevalue if commoditycode== "S1-68121"
by reporter year: egen S1_68121 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-27311"
by reporter year: egen S1_27311 = max(temp)

capture drop temp
gen temp = .
replace temp = tradevalue if commoditycode== "S1-51494"
by reporter year: egen S1_51494 = max(temp)

sort year

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-031" & netweightkg >0
by year: egen W1_031 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-042" & netweightkg >0
by year: egen W1_042 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-071" & netweightkg >0
by year: egen W1_071 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-0721" & netweightkg >0
by year: egen W1_0721 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-2311" & netweightkg >0
by year: egen W1_2311 = mean(temp2)
```

```
capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-273" & netweightkg >0
by year: egen W1_273 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27311" & netweightkg >0
by year: egen W1_27311 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27312" & netweightkg >0
by year: egen W1_27312 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27313" & netweightkg >0
by year: egen W1_27313 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27321" & netweightkg >0
by year: egen W1_27321 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27322" & netweightkg >0
by year: egen W1_27322 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-2751" & netweightkg >0
by year: egen W1_2751 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27523" & netweightkg >0
by year: egen W1_27523 = mean(temp2)
```

```
capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27621" & netweightkg >0
by year: egen W1_27621 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27622" & netweightkg >0
by year: egen W1_27622 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27624" & netweightkg >0
by year: egen W1_27624 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-2763" & netweightkg >0
by year: egen W1_2763 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-2764" & netweightkg >0
by year: egen W1_2764 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27651" & netweightkg >0
by year: egen W1_27651 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27652" & netweightkg >0
by year: egen W1_27652 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27654" & netweightkg >0
by year: egen W1_27654 = mean(temp2)
```

```
capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27691" & netweightkg >0
by year: egen W1_27691 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27693" & netweightkg >0
by year: egen W1_27693 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-27695" & netweightkg >0
by year: egen W1_27695 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-2813" & netweightkg >0
by year: egen W1_2813 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-28311" & netweightkg >0
by year: egen W1_28311 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-28321" & netweightkg >0
by year: egen W1_28321 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-2833" & netweightkg >0
by year: egen W1_2833 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-2834" & netweightkg >0
by year: egen W1_2834 = mean(temp2)
```

```
capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-2835" & netweightkg >0
by year: egen W1_2835 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-2836" & netweightkg >0
by year: egen W1_2836 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-2837" & netweightkg >0
by year: egen W1_2837 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-28391" & netweightkg >0
by year: egen W1_28391 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-28392" & netweightkg >0
by year: egen W1_28392 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-28393" & netweightkg >0
by year: egen W1_28393 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-285" & netweightkg >0
by year: egen W1_285 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-286" & netweightkg >0
by year: egen W1_286 = mean(temp2)
```

```
capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-321" & netweightkg >0
by year: egen W1_321 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-3217" & netweightkg >0
by year: egen W1_3217 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-3311" & netweightkg >0
by year: egen W1_3311 = mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-3312" & netweightkg >0
by year: egen W1_3312= mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-34111" & netweightkg >0
by year: egen W1_34111= mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-34112" & netweightkg >0
by year: egen W1_34112= mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-4222" & netweightkg >0
by year: egen W1_4222= mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-51281" & netweightkg >0
by year: egen W1_51281= mean(temp2)
```

```
capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-51282" & netweightkg >0
by year: egen W1_51282= mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-51283" & netweightkg >0
by year: egen W1_51283= mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-51354" & netweightkg >0
by year: egen W1_51354= mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-51363" & netweightkg >0
by year: egen W1_51363= mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-51426" & netweightkg >0
by year: egen W1_51426= mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-51494" & netweightkg >0
by year: egen W1_51494= mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-66722" & netweightkg >0
by year: egen W1_66722= mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-66721" & netweightkg >0
by year: egen W1_66721= mean(temp2)
```

```
capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-66732" & netweightkg >0
by year: egen W1_66732= mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-66731" & netweightkg >0
by year: egen W1_66731= mean(temp2)

capture drop temp2
gen temp2 = .
replace temp2 = tradevalue/netweightkg  if commoditycode== "S1-68121" & netweightkg >0
by year: egen W1_68121= mean(temp2)

drop if first == 0
drop temp
drop temp2
drop commoditycode
drop tradevalue
drop netweightkg

label variable  S1_031 "Fish"
label variable  S1_042 "Rice"
label variable  S1_071 "Coffee"
label variable  S1_0721 "Cocoa"
label variable  S1_2311 "Crude Rubber"
label variable  S1_273 "Stone,Sand & Gravel"
label variable  S1_27311 "Slate"
label variable  S1_27312 "Marble"
label variable  S1_27313 "Granite"
label variable  S1_27321 "Gypsum"
label variable  S1_27322 "Limestone flux'
label variable  S1_2751 "Diamonds, industrial"
label variable  S1_27523 "Pumice"
label variable  S1_27621 "Clay"
label variable  S1_27622 "Graphite"
label variable  S1_27624 "Magnesite"
label variable  S1_2763 "Salt (Sodium chloride)"
label variable  S1_2764 "Asbestos"
```

label variable S1_27651 "Quartz"

label variable S1_27652 "Mica"

label variable S1_27654 "Feldspar and Flourspar"

label variable S1_27691 "Chalk"

label variable S1_27693 "Natural barium sulphates (barytes)"

label variable S1_27695 "Talc"

label variable S1_2813 "Iron ore and concentrates, not agglomerated"

label variable S1_28311 "Copper ores and concentrates"

label variable S1_28321 "Nickel ores and concentrates"

label variable S1_2833 "Aluminium ores and concentrates"

label variable S1_2834 "Lead ores and concentrates"

label variable S1_2835 "Zinc ores and concentrates"

label variable S1_2836 "Tin ores and concentrates"

label variable S1_2837 "Manganese ores and concentrates"

label variable S1_28391 "Chromium ores and concentrates"

label variable S1_28392 "Tungsten (or wolfram) ores and concentrates"

label variable S1_28393 "Molybdenum,Titanium Niobium,Tantalum and Vanadium ores and concentrates"

label variable S1_285 "Silver ores and concentrates"

label variable S1_286 "Uranium ores and concentrates"

label variable S1_321 "Coal, wether or not pulverized, but not agglomerated"

label variable S1_3217 "Peat"

label variable S1_3311 "Petroleum oils, onshore"

label variable S1_3312 "Petroleum oils, offshore"

label variable S1_34111 "Natural gas, onshore"

label variable S1_34112 "Natural gas, offshore"

label variable S1_4222 "Palm Oil"

label variable S1_51281 "Sulphur"

label variable S1_51282 "Arsenic"

label variable S1_51283 "Mercury"

label variable S1_51354 "Cobalt"

label variable S1_51363 "Potassium hydroxide (potash)"

label variable S1_51426 "Phosphates, phosphinates"

label variable S1_51494 "Calcium"

label variable S1_66721 "Diamonds,alluvial

label variable S1_66722 "Diamonds,deepshaft

label variable S1_66731 "Precious and semiprecious stones, alluvial

label variable S1_66732 "Precious and semiprecious stones, deepshaft"

label variable S1_68121 "Platinum"

label variable W1_031 "Fish"

label variable W1_042 "Rice"

label variable W1_071 "Coffee"
label variable W1_0721 "Cocoa"
label variable W1_2311 "Crude Rubber"
label variable W1_273 "Stone,Sand & Gravel"
label variable W1_27311 "Slate"
label variable W1_27312 "Marble"
label variable W1_27313 "Granite"
label variable W1_27321 "Gypsum"
label variable W1_27322 "Limestone flux'
label variable W1_2751 "Diamonds, industrial"
label variable W1_27523 "Pumice"
label variable W1_27621 "Clay"
label variable W1_27622 "Graphite"
label variable W1_27624 "Magnesite"
label variable W1_2763 "Salt (Sodium chloride)"
label variable W1_2764 "Asbestos"
label variable W1_27651 "Quartz"
label variable W1_27652 "Mica"
label variable W1_27654 "Feldspar and Flourspar"
label variable W1_27691 "Chalk"
label variable W1_27693 "Natural barium sulphates (barytes)"
label variable W1_27695 "Talc"
label variable W1_2813 "Iron ore and concentrates, not agglomerated"
label variable W1_28311 "Copper ores and concentrates"
label variable W1_28321 "Nickel ores and concentrates"
label variable W1_2833 "Aluminium ores and concentrates"
label variable W1_2834 "Lead ores and concentrates"
label variable W1_2835 "Zinc ores and concentrates"
label variable W1_2836 "Tin ores and concentrates"
label variable W1_2837 "Manganese ores and concentrates"
label variable W1_28391 "Chromium ores and concentrates"
label variable W1_28392 "Tungsten (or wolfram) ores and concentrates"
label variable W1_28393 "Molybdenum,Titanium Niobium,Tantalum and Vanadium ores and concentrates"
label variable W1_285 "Silver ores and concentrates"
label variable W1_286 "Uranium ores and concentrates"
label variable W1_321 "Coal, wether or not pulverized, but not agglomerated"
label variable W1_3217 "Peat"
label variable W1_3311 "Petroleum oils, onshore"
label variable W1_3312 "Petroleum oils, offshore"
label variable W1_34111 "Natural gas, onshore"

```
label variable W1_34112 "Natural gas, offshore"
label variable W1_4222 "Palm Oil"
label variable W1_51281 "Sulphur"
label variable W1_51282 "Arsenic"
label variable W1_51283 "Mercury"
label variable W1_51354 "Cobalt"
label variable W1_51363 "Potassium hydroxide (potash)"
label variable W1_51426 "Phosphates, phosphinates"
label variable W1_51494 "Calcium"
label variable W1_66721 "Diamonds,alluvial
label variable W1_66722 "Diamonds,deepshaft
label variable W1_66731 "Precious and semiprecious stones, alluvial
label variable W1_66732 "Precious and semiprecious stones, deepshaft"
label variable W1_68121 "Platinum"

gen gwno = .
replace gwno = 700 if reporter == "Afghanistan"
replace gwno = 615 if reporter == "Algeria"
replace gwno = 540 if reporter == "Angola"
replace gwno = 160 if reporter == "Argentina"
replace gwno = 373 if reporter == "Azerbaijan"
replace gwno = 771 if reporter == "Bangladesh"
replace gwno = 145 if reporter == "Bolivia (Plurinational State of)"
replace gwno = 346 if reporter == "Bosnia Herzegovina"
replace gwno = 439 if reporter == "Burkina Faso"
replace gwno = 516 if reporter == "Burundi"
replace gwno = 811 if reporter == "Cambodia"
replace gwno = 471 if reporter == "Cameroon"
replace gwno = 482 if reporter == "Central African Rep."
replace gwno = 483 if reporter == "Chad"
replace gwno = 155 if reporter == "Chile"
replace gwno = 710 if reporter == "China"
replace gwno = 100 if reporter == "Colombia"
replace gwno = 581 if reporter == "Comoros"
replace gwno = 484 if reporter == "Congo"
replace gwno = 490 if reporter == "Dem. Rep. of the Congo"
replace gwno = 94 if reporter == "Costa Rica"
replace gwno = 344 if reporter == "Croatia"
replace gwno = 40 if reporter == "Cuba"
replace gwno = 522 if reporter == "Djibouti"
```

```
replace gwno = 42 if reporter == "Dominican Rep."
replace gwno = 651 if reporter == "Egypt"
replace gwno = 92 if reporter == "El Salvador"
replace gwno = 411 if reporter == "Equatorial Guinea"
replace gwno = 531 if reporter == "Eritrea"
replace gwno = 530 if reporter == "Ethiopia"
replace gwno = 530 if reporter == "Fmr Ethiopia"
replace gwno = 220 if reporter == "France"
replace gwno = 481 if reporter == "Gabon"
replace gwno = 420 if reporter == "Gambia"
replace gwno = 372 if reporter == "Georgia"
replace gwno = 452 if reporter == "Ghana"
replace gwno = 350 if reporter == "Greece"
replace gwno = 90 if reporter == "Guatemala"
replace gwno = 438 if reporter == "Guinea"
replace gwno = 404 if reporter == "Guinea-Bissau"
replace gwno = 41 if reporter == "Haiti"
replace gwno = 750 if reporter == "India"
replace gwno = 750 if reporter == "India, excl. Sikkim"
replace gwno = 850 if reporter == "Indonesia"
replace gwno = 630 if reporter == "Iran"
replace gwno = 645 if reporter == "Iraq"
replace gwno = 666 if reporter == "Israel"
replace gwno = 437 if reporter == "Côte d'Ivoire"
replace gwno = 501 if reporter == "Kenya"
replace gwno = 732 if reporter == "Rep. of Korea"
replace gwno = 812 if reporter == "Lao People's Dem. Rep."
replace gwno = 660 if reporter == "Lebanon"
replace gwno = 570 if reporter == "Lesotho"
replace gwno = 450 if reporter == "Liberia"
replace gwno = 343 if reporter == "TFYR of Macedonia"
replace gwno = 580 if reporter == "Madagascar"
replace gwno = 820 if reporter == "Malaysia"
replace gwno = 820 if reporter == "Peninsula Malaysia"
replace gwno = 432 if reporter == "Mali"
replace gwno = 70 if reporter == "Mexico"
replace gwno = 359 if reporter == "Rep. of Moldova"
replace gwno = 600 if reporter == "Morocco"
replace gwno = 541 if reporter == "Mozambique"
replace gwno = 698 if reporter == "Muscat and Oman, United Kingdom"
```

```
replace gwno = 775 if reporter == "Myanmar"
replace gwno = 790 if reporter == "Nepal"
replace gwno = 93 if reporter == "Nicaragua"
replace gwno = 436 if reporter == "Niger"
replace gwno = 475 if reporter == "Nigeria"
replace gwno = 698 if reporter == "Oman"
replace gwno = 770 if reporter == "Pakistan"
replace gwno = 770 if reporter == "East and West Pakistan"
replace gwno = 95 if reporter == "Panama"
replace gwno = 95 if reporter == "Fmr Panama, excl.Canal Zone"
replace gwno = 910 if reporter == "Papua New Guinea"
replace gwno = 150 if reporter == "Paraguay"
replace gwno = 135 if reporter == "Peru"
replace gwno = 840 if reporter == "Philippines"
replace gwno = 360 if reporter == "Romania"
replace gwno = 365 if reporter == "Russian Federation"
replace gwno = 517 if reporter == "Rwanda"
replace gwno = 670 if reporter == "Saudi Arabia"
replace gwno = 433 if reporter == "Senegal"
replace gwno = 451 if reporter == "Sierra Leone"
replace gwno = 520 if reporter == "Somalia"
replace gwno = 560 if reporter == "South Africa"
replace gwno = 365 if reporter == "Soviet Union"
replace gwno = 230 if reporter == "Spain"
replace gwno = 780 if reporter == "Sri Lanka"
replace gwno = 625 if reporter == "Sudan"
replace gwno = 115 if reporter == "Suriname"
replace gwno = 652 if reporter == "Syria"
replace gwno = 702 if reporter == "Tajikistan"
replace gwno = 800 if reporter == "Thailand"
replace gwno = 461 if reporter == "Togo"
replace gwno = 52 if reporter == "Trinidad and Tobago"
replace gwno = 616 if reporter == "Tunisia"
replace gwno = 640 if reporter == "Turkey"
replace gwno = 500 if reporter == "Uganda"
replace gwno = 200 if reporter == "United Kingdom"
replace gwno = 165 if reporter == "Uruguay"
replace gwno = 704 if reporter == "Uzbekistan"
replace gwno = 101 if reporter == "Venezuela"
replace gwno = 817 if reporter == "Fmr Rep. of Vietnam"
```

```
replace gwno = 678 if reporter == "Fmr Arab Rep. of Yemen"
replace gwno = 680 if reporter == "Fmr Dem. Yemen"
replace gwno = 345 if reporter == "Serbia and Montenegro"
replace gwno = 552 if reporter == "Zimbabwe"

replace S1_031 = 0 if S1_031 == .
replace S1_042 = 0 if S1_042 == .
replace S1_071 = 0 if S1_071 == .
replace S1_0721 = 0 if S1_0721 == .
replace S1_2311 = 0 if S1_2311 == .
replace S1_273 = 0 if S1_273 == .
replace S1_27311 = 0 if S1_27311 == .
replace S1_27312 = 0 if S1_27312 == .
replace S1_27313 = 0 if S1_27313 == .
replace S1_27321 = 0 if S1_27321 == .
replace S1_27322 = 0 if S1_27322 == .
replace S1_2751 = 0 if S1_2751 == .
replace S1_27523 = 0 if S1_27523 == .
replace S1_27621 = 0 if S1_27621 == .
replace S1_27622 = 0 if S1_27622 == .
replace S1_27624 = 0 if S1_27624 == .
replace S1_2763 = 0 if S1_2763 == .
replace S1_2764 = 0 if S1_2764 == .
replace S1_27651 = 0 if S1_27651 == .
replace S1_27652 = 0 if S1_27652 == .
replace S1_27654 = 0 if S1_27654 == .
replace S1_27691 = 0 if S1_27691 == .
replace S1_27693 = 0 if S1_27693 == .
replace S1_27695 = 0 if S1_27695 == .
replace S1_2813 = 0 if S1_2813 == .
replace S1_28311 = 0 if S1_28311 == .
replace S1_28321 = 0 if S1_28321 == .
replace S1_2833 = 0 if S1_2833 == .
replace S1_2834 = 0 if S1_2834 == .
replace S1_2835 = 0 if S1_2835 == .
replace S1_2836 = 0 if S1_2836 == .
replace S1_2837 = 0 if S1_2837 == .
replace S1_28391 = 0 if S1_28391 == .
replace S1_28392 = 0 if S1_28392 == .
replace S1_28393 = 0 if S1_28393 == .
```

```
replace S1_2835 = 0 if S1_2835 == .
replace S1_2836 = 0 if S1_2836 == .
replace S1_285 = 0 if S1_285 == .
replace S1_286 = 0 if  S1_286 == .
replace S1_321 = 0 if S1_321 == .
replace S1_3217 = 0 if S1_3217 == .
replace S1_3311 = 0 if S1_3311 == .
replace S1_3312 = 0 if S1_3312 == .
replace S1_34111 = 0 if S1_34111 == .
replace S1_34112 = 0 if S1_34112 == .
replace S1_4222 = 0 if S1_4222 == .
replace S1_51281 = 0 if S1_51281 == .
replace S1_51282 = 0 if S1_51282 == .
replace S1_51283 = 0 if S1_51283 == .
replace S1_51354 = 0 if S1_51354 == .
replace S1_51363 = 0 if S1_51363 == .
replace S1_51426 = 0 if S1_51426 == .
replace S1_51494 = 0 if S1_51494 == .
replace S1_66721 = 0 if S1_66721 == .
replace S1_66722 = 0 if S1_66722 == .
replace S1_66731 = 0 if S1_66731 == .
replace S1_66732 = 0 if S1_66732 == .
replace S1_68121 = 0 if S1_68121 == .

drop if gwno == .
gen primkey = (gwno * 10000 )+ year
gen hiobs_unloot = S1_3311 + S1_34111
gen modobs_loot = S1_27622 +  S1_031 + S1_042 + S1_071 +  S1_0721 + S1_2311 + S1_273 + S1_27311 +
S1_27312 + S1_27313 + S1_27321 + S1_27322 + S1_27523 + S1_27621  +  S1_2763 + S1_27651 + S1_27652
+ S1_27654 + S1_27654  +  S1_27691 + S1_27695 + S1_2813 + S1_28311 + S1_2834  + S1_2835 + S1_28391
+ S1_321 + S1_3217 + S1_4222  +  S1_51281 + S1_51283 + S1_51363 + S1_51494
gen modobs_unloot = S1_2751 + S1_27624 + S1_2764 + S1_27693 + S1_28321 + S1_2833 + S1_2836 +
S1_2837 + S1_28392 + S1_28393 + S1_285 + S1_286 + S1_51282 + S1_51354 + S1_51426 + S1_68121
gen unobs_loot =  S1_66721 + S1_66731
gen unobs_unloot = S1_3312 + S1_34112 + S1_66722 + S1_66732

label variable hiobs_unloot "highly obstructable and unlootable"
label variable modobs_loot "moderately obstructable and lootable"
label variable modobs_unloot "moderately obstructable and unlootable"
label variable unobs_loot "unobstructable and lootable"
```

```
label variable unobs_unloot "unobstructable and unlootable"
sort primkey

edit  reporter gwno primkey if gwno == 530
replace reporter = "Ethiopia" in 1678
replace reporter = "Ethiopia" in 1679
replace reporter = "Ethiopia" in 1680
replace reporter = "Ethiopia" in 1681
replace reporter = "Ethiopia" in 1682
replace reporter = "Ethiopia" in 1683
replace reporter = "Ethiopia" in 1684
replace reporter = "Ethiopia" in 1685
replace reporter = "Ethiopia" in 1686
replace reporter = "Ethiopia" in 1687
replace reporter = "Ethiopia" in 1688
replace reporter = "Ethiopia" in 1689
replace reporter = "Ethiopia" in 1690
replace reporter = "Ethiopia" in 1691
replace reporter = "Ethiopia" in 1692
replace reporter = "Ethiopia" in 1693
replace reporter = "Ethiopia" in 1694
replace reporter = "Ethiopia" in 1695
replace reporter = "Ethiopia" in 1696
edit  reporter gwno primkey if gwno == 820
replace reporter = "Malaysia" in 2656
replace reporter = "Malaysia" in 2657
edit  reporter gwno primkey if gwno == 770
replace reporter = "Pakistan" in 2415
replace reporter = "Pakistan" in 2416
replace reporter = "Pakistan" in 2417
replace reporter = "Pakistan" in 2418
replace reporter = "Pakistan" in 2419
replace reporter = "Pakistan" in 2420
replace reporter = "Pakistan" in 2421
replace reporter = "Pakistan" in 2422
replace reporter = "Pakistan" in 2423
replace reporter = "Pakistan" in 2424
edit  reporter gwno primkey if gwno == 750
replace reporter = "India" in 2368
replace reporter = "India" in 2369
```

```
replace reporter = "India" in 2370
replace reporter = "India" in 2371
replace reporter = "India" in 2372
replace reporter = "India" in 2373
replace reporter = "India" in 2374
replace reporter = "India" in 2375
replace reporter = "India" in 2376
replace reporter = "India" in 2377
replace reporter = "India" in 2378
replace reporter = "India" in 2379
replace reporter = "India" in 2380
edit  reporter gwno primkey if gwno ==95
replace reporter = "Panama" in 324
replace reporter = "Panama" in 325
replace reporter = "Panama" in 326
replace reporter = "Panama" in 327
replace reporter = "Panama" in 328
replace reporter = "Panama" in 329
replace reporter = "Panama" in 330
replace reporter = "Panama" in 331
replace reporter = "Panama" in 332
replace reporter = "Panama" in 333
replace reporter = "Panama" in 334
replace reporter = "Panama" in 335
replace reporter = "Panama" in 336
replace reporter = "Panama" in 337
replace reporter = "Panama" in 338
replace reporter = "Panama" in 339
save comexp.dta
clear

insheet using "M:\MA thesis\Data\Text files\Penn.txt"
gen gwno = .
replace gwno = 700 if country== "Afghanistan"
replace gwno = 615 if country== "Algeria"
replace gwno = 540 if country== "Angola"
replace gwno = 160 if country== "Argenti"
replace gwno = 373 if country== "Azerbaijan"
replace gwno = 771 if country== "Bangladesh"
replace gwno = 145 if country== "Bolivia"
```

```
replace gwno = 346 if country== "Bosnia and Herzegovi"
replace gwno = 439 if country== "Burki  Faso"
replace gwno = 516 if country== "Burundi"
replace gwno = 811 if country== "Cambodia"
replace gwno = 471 if country== "Cameroon"
replace gwno = 482 if country== "Central African Republic"
replace gwno = 483 if country== "Chad"
replace gwno = 155 if country== "Chile"
replace gwno = 710 if country== "Chi  Version 2"
replace gwno = 100 if country== "Colombia"
replace gwno = 581 if country== "Comoros"
replace gwno = 484 if country== "Congo. Republic of"
replace gwno = 490 if country== "Congo. Dem. Rep."
replace gwno = 94 if country== "Costa Rica"
replace gwno = 344 if country== "Croatia"
replace gwno = 40 if country== "Cuba"
replace gwno = 522 if country== "Djibouti"
replace gwno = 42 if country== "Dominican Republic"
replace gwno = 651 if country== "Egypt"
replace gwno = 92 if country== "El Salvador"
replace gwno = 411 if country== "Equatorial Guinea"
replace gwno = 531 if country== "Eritrea"
replace gwno = 530 if country== "Ethiopia"
replace gwno = 220 if country== "France"
replace gwno = 481 if country== "Gabon"
replace gwno = 420 if country== "Gambia. The"
replace gwno = 372 if country== "Georgia"
replace gwno = 452 if country== "Gha"
replace gwno = 350 if country== "Greece"
replace gwno = 90 if country== "Guatemala"
replace gwno = 438 if country== "Guinea"
replace gwno = 404 if country== "Guinea-Bissau"
replace gwno = 41 if country== "Haiti"
replace gwno = 750 if country== "India"
replace gwno = 850 if country== "Indonesia"
replace gwno = 630 if country== "Iran"
replace gwno = 645 if country== "Iraq"
replace gwno = 666 if country== "Israel"
replace gwno = 437 if country== "Cote d`Ivoire"
replace gwno = 501 if country== "Kenya"
```

```
replace gwno = 732 if country== "Korea. Republic of"
replace gwno = 812 if country== "Laos"
replace gwno = 660 if country== "Lebanon"
replace gwno = 570 if country== "Lesotho"
replace gwno = 450 if country== "Liberia"
replace gwno = 343 if country== "Macedonia"
replace gwno = 580 if country== "Madagascar"
replace gwno = 820 if country== "Malaysia"
replace gwno = 432 if country== "Mali"
replace gwno = 70 if country== "Mexico"
replace gwno = 359 if country== "Moldova"
replace gwno = 600 if country== "Morocco"
replace gwno = 541 if country== "Mozambique"
replace gwno = 698 if country== "Muscat and Oman United Kingdom"
replace gwno = 775 if country== "Myanmar"
replace gwno = 790 if country== "Nepal"
replace gwno = 93 if country== "Nicaragua"
replace gwno = 436 if country== "Niger"
replace gwno = 475 if country== "Nigeria"
replace gwno = 698 if country== "Oman"
replace gwno = 770 if country== "Pakistan"
replace gwno = 95 if country== "Pama"
replace gwno = 910 if country== "Papua New Guinea"
replace gwno = 150 if country== "Paraguay"
replace gwno = 135 if country== "Peru"
replace gwno = 840 if country== "Philippines"
replace gwno = 360 if country== "Romania"
replace gwno = 365 if country== "Russia"
replace gwno = 517 if country== "Rwanda"
replace gwno = 670 if country== "Saudi Arabia"
replace gwno = 433 if country== "Senegal"
replace gwno = 451 if country== "Sierra Leone"
replace gwno = 520 if country== "Somalia"
replace gwno = 560 if country== "South Africa"
replace gwno = 365 if country== "Soviet Union"
replace gwno = 230 if country == "Spain"
replace gwno = 780 if country== "Sri Lanka"
replace gwno = 625 if country== "Sudan"
replace gwno = 115 if country== "Surime"
replace gwno = 652 if country== "Syria"
```

```
replace gwno = 702 if country== "Tajikistan"
replace gwno = 800 if country== "Thailand"
replace gwno = 461 if country== "Togo"
replace gwno = 52 if country== "Trinidad &Tobago"
replace gwno = 616 if country== "Tunisia"
replace gwno = 640 if country== "Turkey"
replace gwno = 500 if country== "Uganda"
replace gwno = 200 if country== "United Kingdom"
replace gwno = 165 if country== "Uruguay"
replace gwno = 704 if country== "Uzbekistan"
replace gwno = 101 if country== "Venezuela"
replace gwno = 817 if country== "Vietm"
replace gwno = 678 if country== "Yemen"
replace gwno = 680 if country== "Yemen. Peoples Republic of"
replace gwno = 345 if country== "Serbia"
replace gwno = 552 if country== "Zimbabwe"
drop if gwno == .

label variable pop "Population in Thousands"
label variable cgdp "Real Gross Domestic Product Per Capita Current Price"
label variable rgdpch "Real GDP Per Capita (Chain) Constant Price"

gen primkey = (gwno * 10000)+ year
drop if year < 1962
drop if year > 2004
drop if primkey == 5311962
drop if primkey == 5311963
drop if primkey == 5311964
drop if primkey == 5311965
drop if primkey == 5311966
drop if primkey == 5311967
drop if primkey == 5311968
drop if primkey == 5311969
drop if primkey == 5311970
drop if primkey == 5311971
drop if primkey == 5311972
drop if primkey == 5311973
drop if primkey == 5311974
drop if primkey == 5311975
drop if primkey == 5311976
```

```
drop if primkey == 5311977
drop if primkey == 5311978
drop if primkey == 5311979
drop if primkey == 5311980
drop if primkey == 5311981
drop if primkey == 5311982
drop if primkey == 5311983
drop if primkey == 5311984
drop if primkey == 5311985
drop if primkey == 5311986
drop if primkey == 5311987
drop if primkey == 5311988
drop if primkey == 5311989
drop if primkey == 5311990
drop if primkey == 5311991
drop if primkey == 5311992
sort primkey
save PWT
clear

insheet using "M:\MA thesis\Data\Text files\primaryexports.txt", names
drop partner partnername flowname
gen gwno = .
replace gwno = 700 if  reportername == "Afghanistan"
replace gwno = 615 if  reportername== "Algeria"
replace gwno = 540 if  reportername== "Angola"
replace gwno = 160 if  reportername== "Argentina"
replace gwno = 373 if  reportername== "Azerbaijan"
replace gwno = 771 if  reportername== "Bangladesh"
replace gwno = 145 if  reportername== "Bolivia"
replace gwno = 346 if  reportername== "Bosnia and Herzegovina"
replace gwno = 439 if  reportername== "Burkina Faso"
replace gwno = 516 if  reportername== "Burundi"
replace gwno = 811 if  reportername== "Cambodia"
replace gwno = 471 if  reportername== "Cameroon"
replace gwno = 482 if  reportername== "Central African Republic"
replace gwno = 483 if  reportername== "Chad"
replace gwno = 155 if  reportername== "Chile"
replace gwno = 710 if  reportername== "China"
replace gwno = 100 if  reportername== "Colombia"
```

```
replace gwno = 581 if  reportername== "Comoros"
replace gwno = 484 if  reportername== "Congo. Rep."
replace gwno = 490 if  reportername== "Congo. Dem. Rep."
replace gwno = 94 if  reportername== "Costa Rica"
replace gwno = 344 if  reportername== "Croatia"
replace gwno = 40 if  reportername== "Cuba"
replace gwno = 522 if  reportername== "Djibouti"
replace gwno = 42 if  reportername== "Dominican Republic"
replace gwno = 651 if  reportername== "Egypt. Arab Rep."
replace gwno = 92 if  reportername== "El Salvador"
replace gwno = 411 if  reportername== "Equatorial Guinea"
replace gwno= 530 if  reportername== "Ethiopia(excludes Eritrea)"
replace gwno = 531 if reportername == "Eritrea"
replace gwno = 220 if  reportername== "France"
replace gwno = 481 if  reportername== "Gabon"
replace gwno = 420 if  reportername== "Gambia. The"
replace gwno = 372 if  reportername== "Georgia"
replace gwno = 452 if  reportername== "Ghana"
replace gwno = 350 if  reportername== "Greece"
replace gwno = 90 if  reportername== "Guatemala"
replace gwno = 438 if  reportername== "Guinea"
replace gwno = 404 if  reportername== "Guinea-Bissau"
replace gwno = 41 if  reportername== "Haiti"
replace gwno = 750 if  reportername== "India"
replace gwno = 850 if  reportername== "Indonesia"
replace gwno = 630 if  reportername== "Iran. Islamic Rep."
replace gwno = 645 if  reportername== "Iraq"
replace gwno = 666 if  reportername== "Israel"
replace gwno = 437 if  reportername== "Cote d'Ivoire"
replace gwno = 501 if  reportername== "Kenya"
replace gwno = 732 if  reportername== "Korea. Rep."
replace gwno = 812 if  reportername== "Lao PDR"
replace gwno = 660 if  reportername== "Lebanon"
replace gwno = 570 if  reportername== "Lesotho"
replace gwno = 450 if  reportername== "Liberia"
replace gwno = 343 if  reportername== "Macedonia. FYR"
replace gwno = 580 if  reportername== "Madagascar"
replace gwno = 820 if  reportername== "Malaysia"
replace gwno = 432 if  reportername== "Mali"
replace gwno = 70 if  reportername== "Mexico"
```

```
replace gwno = 359 if  reportername== "Moldova"
replace gwno = 600 if  reportername== "Morocco"
replace gwno = 541 if  reportername== "Mozambique"
replace gwno = 698 if  reportername== "Muscat and Oman, United Kingdom"
replace gwno = 775 if  reportername== "Myanmar"
replace gwno = 790 if  reportername== "Nepal"
replace gwno = 93 if  reportername== "Nicaragua"
replace gwno = 436 if  reportername== "Niger"
replace gwno = 475 if  reportername== "Nigeria"
replace gwno = 698 if  reportername== "Oman"
replace gwno = 770 if  reportername== "Pakistan"
replace gwno = 95 if  reportername== "Panama"
replace gwno = 910 if  reportername== "Papua New Guinea"
replace gwno = 150 if  reportername== "Paraguay"
replace gwno = 135 if  reportername== "Peru"
replace gwno = 840 if  reportername== "Philippines"
replace gwno = 360 if  reportername== "Romania"
replace gwno = 365 if  reportername== "Russian Federation"
replace gwno = 517 if  reportername== "Rwanda"
replace gwno = 670 if  reportername== "Saudi Arabia"
replace gwno = 433 if  reportername== "Senegal"
replace gwno = 451 if  reportername== "Sierra Leone"
replace gwno = 520 if  reportername== "Somalia"
replace gwno = 560 if  reportername== "South Africa"
replace gwno = 365 if  reportername== "Soviet Union"
replace gwno = 230 if  reportername == "Spain"
replace gwno = 780 if  reportername== "Sri Lanka"
replace gwno = 625 if  reportername== "Sudan"
replace gwno = 115 if  reportername== "Suriname"
replace gwno = 652 if  reportername== "Syrian Arab Republic"
replace gwno = 702 if  reportername== "Tajikistan"
replace gwno = 800 if  reportername== "Thailand"
replace gwno = 461 if  reportername== "Togo"
replace gwno = 52 if  reportername== "Trinidad and Tobago"
replace gwno = 616 if  reportername== "Tunisia"
replace gwno = 640 if  reportername== "Turkey"
replace gwno = 500 if  reportername== "Uganda"
replace gwno = 200 if  reportername== "United Kingdom"
replace gwno = 165 if  reportername== "Uruguay"
replace gwno = 704 if  reportername== "Uzbekistan"
```

```
replace gwno = 101 if  reportername== "Venezuela"
replace gwno = 817 if  reportername== "Fm Vietnam Rp"
replace gwno = 678 if  reportername== "Yemen"
replace gwno = 680 if  reportername== "Yemen Democratic"
replace gwno = 345 if  reportername== "Yugoslavia. FR (Serbia/Montene"
replace gwno = 552 if  reportername== "Zimbabwe"

reshape long v, i(reportername product)
gen year = _j+1955
drop in 1/54
drop if gwno == .
drop if year >2004
drop if year <1962
sort reportername year

capture drop temp
gen temp = .
replace temp = v if product == "primary"
by reportername year: egen primexp_WB = max(temp)
label variable primexp_WB "primary export of SITC codes 0,1,2,3,4 and 68 from the World Bank"
replace primexp_WB = 0 if  primexp_WB == .

drop temp
drop  product productname
drop  _j v
duplicates drop

gen primkey = (gwno * 10000) + year
sort primkey
drop if primkey == 5311962
drop if primkey == 5311963
drop if primkey == 5311964
drop if primkey == 5311965
drop if primkey == 5311966
drop if primkey == 5311967
drop if primkey == 5311968
drop if primkey == 5311969
drop if primkey == 5311970
drop if primkey == 5311971
drop if primkey == 5311972
```

```
drop if primkey == 5311973
drop if primkey == 5311974
drop if primkey == 5311975
drop if primkey == 5311976
drop if primkey == 5311977
drop if primkey == 5311978
drop if primkey == 5311979
drop if primkey == 5311980
drop if primkey == 5311981
drop if primkey == 5311982
drop if primkey == 5311983
drop if primkey == 5311984
drop if primkey == 5311985
drop if primkey == 5311986
drop if primkey == 5311987
drop if primkey == 5311988
drop if primkey == 5311989
drop if primkey == 5311990
drop if primkey == 5311991
drop if primkey == 5311992
sort primkey
save primaryexportsWB2
clear

use "M:\MA thesis\Data\Dataset\dur1.dta", clear
sort primkey
save, replace

merge primkey using "M:\MA thesis\Data\Dataset\PWT.dta", keep (pop cgdp rgdpch) _merge (merge_PWT)
tab merge_PWT
drop if merge_PWT == 2
sort primkey
drop if year <1962
drop if year >2004

merge primkey using "M:\MA thesis\Data\Dataset\comexp.dta",  _merge (commexp)
tab commexp
drop if commexp == 2
sort primkey
```

```
merge primkey using "M:\MA thesis\Data\Dataset\primaryexportsWB2.dta", _merge (primexpWB)
tab primexpWB
drop if primexpWB == 2
sort primkey
drop commexp reportername primexpWB merge_PWT
save Duration_mergecomexp

replace hiobs_unloot = 0 if hiobs_unloot ==.
replace modobs_loot = 0 if modobs_loot ==.
replace modobs_unloot = 0 if modobs_unloot == .
replace unobs_loot =0 if unobs_loot ==.
replace unobs_unloot = 0 if unobs_unloot ==.

gen hiobs_unlootscaled = (hiobs_unloot/1000000)
gen modobs_lootscaled =  (modobs_loot/1000000)
gen modobs_unlootscaled =  (modobs_unloot/1000000)
gen unobs_lootscaled = ( unobs_loot/1000000)
gen unobs_unlootscaled =  (unobs_unloot/1000000)

label variable hiobs_unlootscaled "highly obstructable unlootable scaled"
label variable modobs_lootscaled  "moderately obstructable lootable scaled"
label variable modobs_unlootscaled "moderately obstructable unlootable scaled"
label variable unobs_lootscaled "unobstructable lootable scaled "
label variable unobs_unlootscaled "unobstructable unlootable scaled"

gen totalprimexport =  hiobs_unlootscaled + modobs_lootscaled + modobs_unlootscaled + unobs_lootscaled+
unobs_unlootscaled
label variable totalprimexport "total primary commodities export"

gen totalgdp= (pop/1000)*cgdp
label variable totalgdp "total GDP"

gen HULratioGDP = (hiobs_unlootscaled/totalgdp)*100
label variable HULratioGDP "highly obstructable and lootable export ratio to GDP"

gen MLratioGDP = (modobs_lootscaled/totalgdp) * 100
label variable MLratioGDP "moderately obstructable and lootable export ratio to GDP"

gen MULratioGDP = (modobs_unlootscaled/ totalgdp) * 100
label variable MULratioGDP " moderately obstructable and unlootable export ratio to GDP
```

```
gen ULratioGDP = (unobs_lootscaled/ totalgdp) * 100
label variable ULratioGDP  "unobstructable and lootable export ratio to GDP"

gen UULratioGDP = (unobs_unlootscaled/totalgdp) * 100
label variable UULratioGDP "unobstructable and unlootable export ratio to GDP"

gen primexp_WBratioscaled = (primexp_WB/1000)
label variable primexp_WBratioscaled "primary export WB scaled"

gen primexp_WBratioGDP= (primexp_WBratioscaled/totalgdp) * 100
label variable primexp_WBratioGDP "primary export WB ratio to GDP"

gen totalprimexportratioGDP = (totalprimexport/totalgdp) * 100
label variable totalprimexportratioGDP "total commodity export ratio to gdp"

drop lnpop (variable name from original dataset)
gen lnrgdpch = ln(rgdpch)
gen lncgdp = ln(cgdp)
gen lnpop= ln(pop)
gen lnpop_t = lnpop*_t
gen  polityiv_t =  polityiv* _t
summ W*
gen high_PW =  S1_286 + S1_285 + S1_4222 + S1_071 + S1_27652 + S1_28321 + S1_66721 + S1_321 +
S1_27311 + S1_27651 + S1_51281 + S1_51282 + S1_27523 + S1_28392 + S1_2751 + S1_66722 + S1_28393 +
S1_2837 + S1_3217

gen medium_PW = S1_51426 + S1_27693 + S1_3312 + S1_27624 + S1_28311 + S1_2833 + S1_2764 +
S1_2836 + S1_68121 + S1_66731 + S1_51283 + S1_51354 + S1_031 + S1_27622 + S1_27321 + S1_51363 +
S1_0721

gen low_PW = S1_3311 + S1_66732 + S1_27654 + S1_27322 + S1_273 + S1_34112 + S1_2813 + S1_2835 +
S1_27695 + S1_2834 + S1_27313 + S1_2763 + S1_27621 + S1_27691 + S1_28391 + S1_042 + S1_27312 +
S1_51494 + S1_34111

label variable high_PW "high price to weight ratio"
label variable medium_PW "medium price to weight ratio"
label variable low_PW "low price to weight ratio"
replace high_PW = 0 if high_PW == .
replace medium_PW = 0 if medium_PW == .
replace low_PW = 0 if low_PW == .
```

```
gen high_PWscaled = (high_PW/1000000)
gen medium_PWscaled = (medium_PW/1000000)
gen low_PWscaled = (low_PW/1000000)

label variable high_PWscaled "high price to weight ratio scaled"
label variable medium_PWscaled "medium price to weight ratio scaled"
label variable low_PWscaled "low price to weight ratio scaled"

gen high_PWratioGDP = (high_PWscaled/totalgdp) * 100
gen medium_PWratioGDP = (medium_PWscaled/totalgdp) * 100
gen low_PWratioGDP = (low_PWscaled/totalgdp) * 100

label variable high_PWratioGDP "high price to weigth ratio to GDP"
label variable medium_PWratio "medium price to weigth ratio to GDP"
label variable low_PWratio "low price to weigth ratio to GDP"

save Duration_NaturalResourcescomepx

summ  totalprimexportratioGDP primexp_WBratioGDP HULratioGDP MLratioGDP MULratioGDP
ULratioGDP UULratioGDP  high_PWratioGDP medium_PWratioGDP low_PWratioGDP  lnpop_t lnpop
lnrgdpch cenelf cenelfsq polityiv polity_sq

stcox  totalprimexportGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv polity_sq, schoenfeld(sch*)
scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*

stcox  primexp_WBratioGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv polity_sq  , schoenfeld(sch*)
scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*

stcox HULratioGDP MLratioGDP MULratioGDP ULratioGDP UULratioGDP lnpop_t lnrgdpch cenelf cenelfsq
polityiv_t polity_sq, schoenfeld(sch*) scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*
```

```
stcox HULratioGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq  , schoenfeld(sch*)
scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*

stcox MLratioGDP lnrgdpch lnpop_t cenelfsq cenelf polityiv_t polity_sq , schoenfeld(sch*) scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*

stcox MULratioGDP lnrgdpch lnpop_t cenelfsq cenelf polityiv_t polity_sq  , schoenfeld(sch*)
scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*

stcox ULratioGDP lnrgdpch lnpop_t cenelfsq cenelf polityiv_t polity_sq  , schoenfeld(sch*) scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*

stcox UULratioGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq  , schoenfeld(sch*)
scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*

stcox  high_PWratioGDP medium_PWratioGDP low_PWratioGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv
polity_sq  , schoenfeld(sch*) scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*

stcox MLratioGDP ULratioGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq, schoenfeld(sch*)
scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*
```

```
stcox HULratioGDP MULratioGDP UULratioGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq ,
schoenfeld(sch*) scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*

stcox HULratioGDP MULratioGDP MLratioGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq ,
schoenfeld(sch*) scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*

stcox UULratioGDP ULratioGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq, schoenfeld(sch*)
scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*

stcox totalprimexportGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv polity_sq
stcox primexp_WBratioGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv polity_sq
stcox HULratioGDP  MLratioGDP  MULratioGDP  ULratioGDP  UULratioGDP lnpop_t lnrgdpch cenelf
cenelfsq polityiv_t polity_sq
stcox HULratioGDP  lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq
stcox MLratioGDP  lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq
stcox MULratioGDP  lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq
stcox ULratioGDP  lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq
stcox UULratioGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq
stcox high_PWratioGDP medium_PWratioGDP low_PWratioGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv
polity_sq
stcox MLratioGDP ULratioGDP  lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq
stcox HULratioGDP MULratioGDP UULratioGDP  lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq
stcox HULratioGDP MULratioGDP MLratioGDP  lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq
stcox ULratioGDP UULratioGDP lnpop_t lnrgdpch cenelf cenelfsq polityiv_t polity_sq

gen DiaAll = (S1_66721/1000000)
gen DiaAll_GDP = (DiaAll/totalgdp )*100
label variable DiaAll_GDP "Diamonds, alluvial ratio to GDP

gen OilOnshore = (S1_3311/1000000)
gen OilOnshore_GDP = (OilOnshore/totalgdp) * 100
```

```
label variable OilOnshore_GDP "Oil, onshore ratio to GDP"
gen OilOffshore = (S1_3312/1000000)
gen OilOffshore_GDP = (OilOffshore/totalgdp) * 100
label variable OilOffshore_GDP "Oil, offshore ratio to GDP"

stcox DiaAll_GDP  lnpop_t lnrgdpch cenelf cenelfsq polityiv polity_sq, schoenfeld(sch*) scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*

stcox OilOnshore_GDP OilOffshore_GDP  lnpop_t lnrgdpch cenelf cenelfsq polityiv polity_sq,
schoenfeld(sch*) scaledsch(sca*)nohr
stphtest, detail
capture drop sch*
capture drop sca*

stcox DiaAll_GDP  lnpop_t lnrgdpch cenelf cenelfsq polityiv polity_sq, nohr
stcox DiaAll_GDP  lnpop_t lnrgdpch cenelf cenelfsq polityiv polity_sq
stcox OilOnshore_GDP OilOffshore_GDP lnpop_t lnrgdpch cenelf cenelfsq polityiv polity_sq, nohr
stcox OilOnshore_GDP OilOffshore_GDP lnpop_t lnrgdpch cenelf cenelfsq polityiv polity_sq
```

Appendix V. Results from the Analysis of Obstructability and Lootability of Natural Resources in Separate Models

	Model 1		Model 2		Model 3		Model 4		Model 5	
	b (SE)	exp (*b*)	*b* (SE)	exp (*b*)	*b* (SE)	exp (*b*)	*b* (SE)	exp (*b*)	*b* (SE)	exp (*b*)
Highly Obstructable & Unlootable Exports/GDP	.0288948* (.0172765)	1.029316								
Moderately Obstructable & Lootable Exports/GDP			-.0084587 (.0507215)	.991577						
Unobstructable & Unlootable Exports/GDP					.0152678 (.047537)	1.015385				
Moderately Obstructable & Unlootable Exports/GDP							.3874784*** (.1434902)	1.473261		
Unobstructable & Lootable Exports/GDP									-.0648828 (.6306769)	.9371773
Population Interaction (lnpop * _t)	-.0001733 (.0000336)	.9998267	.1494934 (.1109452)	1.161246	-.000173 (.0000336)	.9998271	.135055 (.1117369)	1.1446	.1489872 (.1110051)	1.160658
GDP Per Capita, Constant USD (ln)	.1196077 (.1126004)	1.127055	-.0001736 (.0000337)	.9998264	.1471869 (.1113903)	1.15857	-.0001694 (.0000335)	.9998307	-.000173 (.0000336)	.9998271
Ethnic-lingustic Fractionalization (cen)	-.138 (.407588)	.8710987	-.2893403 (1.571441)	.7487574	-.1677939 (.4096764)	.8455281	-.4048897 (1.564835)	.6670504	-.3100836 (1.562366)	.7333856
Ethnic-linguistic Fractionalization (cen) (sq)	-.5846032 (1.57615)	.557327	-.1402455 (.4154029)	.8691448	-.3131976 (1.559839)	.7311055	-.2426353 (.4110731)	.7845576	-.147144 (.4124721)	.8631697
Regime Type										
Regime Type Interaction (polityiv * _t)	-8.43e-06* (5.01e-06)	.9999916	-9.12e-06* (4.97e-06)	.9999909	-9.07e-06* (4.98e-06)	.9999909	-9.13e-06* (4.96e-06)	.9999909	-9.14e-06* (4.98e-06)	.9999909
Regime Type (sq)	-.0003801 (.0029154)	.99962	-.0002423 (.0029115)	.9997577	-.0002798 (.0029132)	.9997203	-.0002214 (.002921)	.9997786	-.0002432 (.0029112)	.9997568
df	7		7		7		7		7	
LR	-635.1415		-636.18176		-636.14703		-634.03251		-636.19065	
N	1024		1024		1024		1024		1024	
* = p<0.10, ** = p <0.05, *** = p <0.01										