STOCKHOLM SCHOOL OF ECONOMICS
Department of Economics
659 Degree project in economics
Spring 2014

Does Natural Resource Abundance Cause Capital Flight?

David Ljungberg (22463) and Christoffer Friedl (22158)

Abstract. This paper finds a link between resource curse and capital flight research by finding support for an empirically unexplored but implied relationship between natural resources and capital flight. In empirically testing this relationship it concludes that natural resource endowments tend to presage capital flight. The paper uses previously defined models of rent-seeking behavior in resource abundant economies to explain the observed effects. The relationship is economically and statistically significant, and persists even when control variables for rule of law, democracy, and economic development are added.

Keywords: Resource curse, Capital flight, Rent-seeking

JEL: O13, O17, O43

Supervisor:	Örjan Sjöberg
Date submitted:	May-14-2014
Date examined:	June-02-2014
Discussant:	Hannes Tordengren and Madeleine Brandt
Examiner:	Chloé Le Coq

Acknowledgements: We would like to thank our supervisor Örjan Sjöberg for his valuable input. We would also like to thank our fellow students Oscar Anderson and Ingvar Ziemann for their insightful critique. A big thank you also to Hartwig Friedl, Elisabeth Bylund, Karin Rudling and Will Teich who assisted in layout and proofreading.

Contents

0. Introduction

An abundance of commercially integrated natural resources is a fundament of the modern economy, with the discovery and exploitation of commodities serving as one of the primary forces of market integration. However, the wealth extracted does not always come to benefit the country of origin, capital may instead flee to off-shore havens where it is not subject to government purview. Casual empiricism would suggest that in some cases the two occur in tandem, for instance, kleptocratic regimes in Africa and unstable economies in Latin America both exhibit high degrees of capital flight and natural resource abundance. Is this a causal relationship that holds in a general setting?

A cursory glance would suggest that a country abundant in easily extracted wealth in the form of natural resources would surely benefit from it, providing an incentive for market integration, as well as providing the resources required to develop public goods to spur further growth. Yet, the literature on the effect of abundant natural resources remains fraught with contention, as can be seen in the differing nomenclature used to describe it, ranging from describing both resource blessings (Brunnschweiler, 2008; Haber and Menaldo, 2011; Arezki and van der Ploeg, 2007) and curses (Auty, 1993; Sachs and Warner, 1997b, 1997b, 2001) to the less fatalistic endowments and impacts (Stevens 2003). Should the true relationship between natural resources and development be clarified beyond doubt it would be an important tool with which to inform policy in developing nations.

The evidence is by no means conclusive, and there are examples of both countries coming up far short of their potential, as well as becoming regional success stories, by relying on natural resources. Natural resources may be a necessity for wealth on a global scale, but domestically there seems to be no need for a strong resource base in order to develop, as seen by the relatively recent successes of the Republic of China (Taiwan) and South Korea, and earlier Japan. If resources are not necessary for development it may be that they are actually harmful to development. The proponents of the resource curse suggest that the ease with which rents can be extracted perverts incentives, shifts entrepreneurial talent into non-productive sectors, makes fiscal stability an impossibility by the volatility and heavy reliance on commodity markets, and retards growth in a manufacturing sector rich in positive externalities for societal development.

The presence of actual negative effects stemming from natural resources would then manifest themselves in certain measurable values. Capital flight, the illicit transfer of funds outside the national accounts, is such a value; it implies an outflow of capital necessary for development. There are several reasons to transfer capital abroad, but in order to compel an agent to move the funds illicitly there has to either exist a risk of appropriation of assets or the presence of capital controls. The resource curse hypothesis contains many different mechanisms by which an economy flounders. Many of the outcomes from these mechanisms are the purported drivers of capital flight, as suggested by the capital flight literature. As such capital flight captures many of the disparate explanations offered for the resource curse. Currently in the resource curse literature, when capital flight is mentioned as part of the poor growth of resource countries, it is assumed to exist without further exploration. Other authors have examined the resource curse in connection with a number of dependent variables in addition to growth, for instance conflict (Fearon, 2005; Brunnschweiler and Bulte 2009), democracy (Haber and Menaldo, 2011; Damania and Bulte, 2008; Andersen and Aslaksen, 2008), savings (Atkinson and Hamilton, 2003), and corruption (Busse and Gröning, 2013). The capital flight literature has explored a number of causes for capital flight, including GDP growth (Mikkelsen, 1991) and corruption (Le and Rishi 2006). Previous research on the connection between natural resource rents and capital flight is limited to a study by Demachi (2013), wherein 21 countries are selected on the basis of experiencing both capital flight and high natural resource rents. There is never an explicit connection to the resource curse and the study lies within the capital flight literature. In addition to the study by Demachi, a paper by Andersen et. al (2012) found that at least 8 percent of petroleum rents went directly to politically connected people in countries with bad political institutions. This implies that a significant amount of rent-seeking takes place in resource economies, possibly fueling capital flight. Thus the goal of this thesis is to explore the relationship between natural resources and capital flight, and the focus lies on examining a sub-mechanism by which the resource curse may operate. Several of the proposed effects of natural resources and explanatory variables for capital flight coincide. The implication is that there should exist an observable correlation between natural resources and capital flight where the coinciding effects and explanations of natural resources and capital flight respectively, form the channels by which this correlation occurs. The purpose is not to investigate these channels but their anticipated existence is the basis for our hypothesis. Our hypothesis is that countries more abundant in natural resources will exhibit higher levels of illicit capital flight.

This thesis is divided into four sections. Section one (1) contains the theoretical framework that we build our case upon. There are brief explanations of the concepts used, a discussion of the causal links and what previous research has shown. Section two (2) builds upon the theoretical framework established in section one to deduce a method with which to measure and explore the validity of the hypothesis. There is also a discussion on the measures chosen in areas of contention and a discussion of the data sets used, their timespan and particulars. Section three (3) is a discussion of the results of the regressions run, what other factors may be influencing the results and what evidence for the hypothesis is found. The robustness of the results is also evaluated in this section. Section four (4) contains a conclusion drawn from the results in section three and also discusses questions that remain open for further study.

1. Theoretical framework

The Resource curse

The resource curse hypothesis paints a bleak picture of the opportunities for resource rich countries. Such countries forgo the chance for long-lasting durable growth, stemming from manufacturing, for volatile resource revenue. The quick growth in government revenue that comes from tapping resource wealth perverts incentives and hinders institutional reforms. Money that could have been spent productively, improving institutions and building future foundations of growth is instead ill-spent, diverted into patronage networks or smuggled abroad. The volatility of the rents received meanwhile presage chronic economic and political instability from rapid expansion and contraction of the economy. Proposed solutions range from leaving the resources in the ground to doing the very utmost to neutralize the volatility. In the discussion on the matter, there is a sense of despondency. True development, it is felt, comes from husbanding scarce resources so as to employ them most efficiently, rather than profligately spending the sudden influx a commodity boom entails. This can be seen in some of the famous quotes on the matter, some commentators going as far as to be thankful for their country's dearth of resources or even wishing away the ones they have.

> "Ten years from now, twenty years from now, you will see: oil will bring us ruin... Oil is the Devil's excrement." – Juan Pablo Pérez Alfonso, Minister of Mines and Hydrocarbons, Venezuela

> "Mozambique is different [from Angola]. We are fortunate not to have oil and not to have diamonds." – Leonardo Simão, Minister of foreign affairs, Mozambique[1]

And yet, there is nothing inherent in the purely natural properties of oil or other natural resources that presage poor economic development; they are not a natural calamity such as floods or disease, though they have been decried as being as destructive. Rather it is the nature of the economic properties they hold in the human economy that supposedly ruins the latter. The proposed causal explanations for the purported low growth of resource dependent economies fall into two major camps: economic and political. These schools are by no means exclusionary, however many authors tend to be predisposed.

[1] Boschini et al. (2007), p. 613

Economical

Both explanations have deep historical roots, but the modern discussion begins with the so called Dutch disease, whereby a reorientation of the domestic economy, due to a resource stream coming online, has long-term negative effects on economic development. The other aspect is the volatility with which commodity prices, and so rents, move. As such, when relying primarily on commodities to finance government expenditure fiscal stability becomes a mirage.

Dutch disease

In its original sense Dutch disease referred to the effect the discovery and exploitation of the Groningen gas field had upon the economy of the Netherlands. The expansion of natural resource exports caused an appreciation of the real exchange rate, and inflation domestically from increased consumption. Where a non-traded sector's prices are set only by domestic supply and demand, the traded sector that is subject to world market prices would then find it hard to compete under the new exchange rate. The traded natural resource sector thus grew at the expense of traded manufactures. This was seen as detrimental as manufacturing is perceived as having positive learn-by-doing effects (Stijns, 2001; Sachs and Warner 1997a; Gylfason, 2001; Wood 1997; Torvik, 2001), wherein improvements accrue gradually to human capital from repeated processes, increasing output by higher productivity. A response many resource dependent economies adopted was to protect the traded manufacturing sector with tariffs and capital controls. The dramatic phrasing and established use of the term Dutch disease has since attracted other similar meanings, ranging from the macroeconomic difficulties of running a resource dependent economy to a failure to promote manufacturing within the same. In its expanded implications in the literature over time Dutch disease will slow down economic growth in an economy.

Volatility

In addition to the long-term effects of Dutch disease, there are also the short term fluctuations of commodity prices to consider. Should these fluctuations be large and endemic to natural resources they do become a long term problem. While the production quantities of most natural resources are by and large determined by long term capital investment projects (mines, oil wells, infrastructure etc.) and barring political effects rather stable, the prices are subject to larger fluctuations over time. As very basal inputs in most economic activity, they are subject to the bull-whip effect of demand,

whereby any increase or decrease in demand from an end consumer for a product is propagated through a system of intermediaries into much larger swings for a manufacturer or producer. The revenue of a government in a resource abundant economy will be intimately tied to the rents extracted, either through actual ownership of state-owned enterprises or because of the knock-on effect the resources have on the rest of the economy. The result for the receiving government is that revenues also fluctuate wildly, making stable fiscal policies difficult. Usually this is interpreted as an uptick in investment during good times and a sharp decline during bad times, thus exacerbating the business cycle further.

Political

Though the economic explanations held some explanatory power, the fact that countries of very similar resource endowments experienced very different outcomes could not be ignored; this led the search for a more nuanced explanation of the resource curse. Why did Norway and Botswana, for instance, not succumb to slow growth and decline whereas Sierra Leone and Venezuela did? A nascent explanation can be seen in Auty (2001), who postulates that states abundant in resources generally, but not exclusively, take on a predatory character towards its citizens. The explanation builds upon earlier work (Auty 1997) wherein he seeks links between the natural resource endowment and the political structure prevalent in the country, postulating that the ruling elite in resource-rich states can rely upon the distribution of rents to stay in power, whereas states without easily accessible wealth have to rule by majority assent. Through a mix of Dutch disease explanations, institutional factors and poor policy goals the resource abundant state experiences a staple trap situation wherein reliance upon primary goods continues indefinitely. In contrast the resource poor states of South Korea and Singapore are held up as examples where the lack of resources force the state to find its mainstay through broad economic development, initially by becoming a developmental rather than predatory state.

In some ways the model bridges the divide between economic and political explanations as it points towards state intent as bearing the onus for subsequent economic effects. It is this intent that presents a problem: what causes a government to become predatory rather than developmental? Rather than taking the causal connection between resources and government character for granted, there have been a multitude of attempts to model and empirically measure the political forces at work in the resource curse. Some models

suggest the net benefit loss stems from increased competition over resources, or by moving entrepreneurial talent into unproductive sectors. Other models try to explain the interaction between institutions and appropriable resources, in some cases endogenizing institutional development as the scramble for resources takes place.

Resources and Institutions

The definition of what constitutes a natural resource and what does not can be problematic. While the all-encompassing definition of - wealth stemming from land - could be used, the resource curse literature tends to focus on the resources that harbor the most rent, resource rents being the revenue from sales less the cost of extraction, the makeup of which usually has more to do with geological features than entrepreneurial or managerial prowess. A defining feature of high rent resources tends to be a high degree of geographic concentration of extraction, a gold seam or oil field will cover a smaller geographic area than a fertile plain or expansive forest. The geographic concentration also coincides with a smaller workforce required for extraction. As such, the exertion of control is less laborious than if the source covered a larger area. In the literature the dual attributes of geographic concentration and rent carrying capacity is combined into a measure called "point-resource," also "pointiness" by Boschini et al. (2005) and Wick and Bulte (2006). It is with this measure that the interaction between institutions and resource extraction can be seen. The pointier the resource the more harmful it will be to a country with poor institutions, whereas the opposite effect can be seen when a country has resilient institutions, when rents accrue to a competent government it boosts growth (Isham 2003, Boschini et al. 2005). Boschini et al. (2013) later develop this approach and unbundle the different resources and institutional properties in an empirical study, they find that property rights are an important interaction with certain resources, whereas strong contracting institutions are less so. The mechanisms by which the influx of wealth actually could hamper growth in a poor institutional setting are twofold.

There is the pure waste aspect whereby the newfound wealth is squandered. With a sudden influx of wealth, there is usually an impetus to quickly spend the same and rapidly improve living standards. Speedy decision making can lead to malinvestment, as there is less time to consider the pros and cons of a policy. Likewise, introducing a huge inflow of revenue into a previously poor country is likely to remove the necessity of making every investment count. The danger of making a poor investment is not perceived as being as high anymore, prudence suffers as a result. The centralization of revenues will also

concentrate decision power in fewer individuals than when wealth is held more widely. But, it's not the influx of wealth per se that constitutes a problem for the receiving country, many countries have grown rich without destroying the incentives for growth. Rather it is the speed with which conditions have changed. As the institutional framework races to keep up with the changed conditions, the routines of how decisions are taken, previously stressing the importance of prudence and caution, are thrown by the wayside as no longer relevant in the new environment.

However, in order for the empirical results of the resource curse to hold, resources must hobble growth permanently and put the country on a slower growth path. The influx of wealth must change the incentives in such a way as to not only squander the increase in wealth but also hinder future growth. In other words, the dissipation of rents must exceed 100%.

Rent-seeking

Rent-seeking is a separate concept from rents, rents are profits in excess of normal returns and rent-seeking is the acquisition of wealth, any wealth, from political action. The political activity can take many forms, for instance by lobbying for monopoly privilege, transfers of wealth, or tariffs and subsidies. Net welfare losses stemming from anti-market policies only tell part of the story; the actual lobbying or conflict involved in acquiring the right to the rents also expend resources. There are three prominent models exploring this subject (Deacon and Rode 2012).

Some of the earliest application of rent-seeking to natural resources was performed by Tornell and Velasco (1992), Lane and Tornell (1996) and Tornell and Lane (1999) wherein they lay out their "voracity model." In the simple model a single economic sector, based on a neoclassical growth model, is subject to redistribution by a number of powerful groups seeking to extract wealth from it. It is shown that under these circumstances an increase in the rate of return, in the presence of poor controls on redistribution, leads to more than a proportional increase in redistribution. This is the so called voracity effect, whereby dissipation exceeds 100%. In the expanded model a two-sector economy is present. One sector, the formal, uses efficient production technology but is subject to government taxation. In contrast there exists a second sector called informal that is immune to appropriation. Conceptually speaking the informal economy could be any sector which is not subject to the same government demands, either the

purely informal "black market," sectors sheltered from international competition or foreign assets due to capital flight. The informal economy will always exhibit a lower growth rate. As such any shift of capital from the formal to the informal will lower the growth rate of the economy as a whole. Tornell and Lane go on to show that again, increased returns to the formal economy, from for instance a resource find, will result in an appropriation of wealth that exceeds the gains. Both models depend on the number of groups capable of appropriation, the more groups that are capable the more maleficent the effect. However, in the presence of strong institutional barriers to transfers the voracity effect will be diminished, to the degree that growth may instead increase after a resource windfall. These models were developed to show why an economy could paradoxically slow down due to an increase in wealth, for the purposes of this paper however they illustrate how capital flight could increase due to natural resources.

Torvik (2002), Baland and Francois (2000), and Mehlum et al. (2006) focus instead on where entrepreneurial talent applies itself in the presence of a growing pool of resource wealth. A country is seen as having a limited endowment of entrepreneurial ability, which can choose to apply itself either towards capturing rents from a resource endowment or working in a modern sector with increasing returns to scale. In Torvik entrepreneurial talent applied in productive ways carries with it positive externalities, which when shifted into non-productive rent-seeking brings with it a dissipation exceeding 100%. In the context of previous research these externalities could be seen as representing the learn-by-doing effects of the Dutch disease explanations. Given the possibility to earn income from rent-seeking rather than productive economic activity, some individuals will shift their activities from one sector to the other as incentives change, until the rate of return for both activities is the same. Institutional quality again acts as a mitigator in Mehlum et al. (2006), as the incentive for the individual entrepreneur depends on the size of rents to be appropriated as well as the capacity of the institutional setting to prevent rent seeking. Given a sufficiently strong institutional environment rent-seeking will never occur as the entrepreneurial units will always find a higher rate of return in the modern sector. This model shows how the competition for rents can diminish growth, thus providing an incentive to offshore capital.

A later model by Hodler (2006) explores the implication that competition for rents can erode institutions. The model exhibits similarities to the two previous models on rent-seeking, however in Hodler's model the units are not bound to a specific sector but can

allocate their labor as a mix between either producing for themselves or competing for a common pool of rents. The competition for the rents carries with it a negative externality, a decline in property rights, whereby a portion of the previously proprietary production becomes part of the same pool of resources as the rents. Thus an increase in rents to be captured leads to an increase in rent-seeking, in turn harming the incentives to production. Again dissipation from an increase in resources exceeds 100%. As in the Torvik and Mehlum models an increase in the number of groups leads to an increase in rent-seeking. Hodler later tests the model by using the level of ethnic fractionalization in a country as an indicator of the number of conflicting groups, and finds a correlation between resource endowment and lower income when the country exhibits high ethnic fractionalization. This is in line with Collier and Hoeffler (2005) who finds that countries abundant in resources are more likely to experience violent conflict.

Capital flight

The family of models stemming from Tornell and Lane predicts a flow of capital from the formal economy to a safe haven as a consequence of rent-seeking due to common-pool resources. Should such flows actually leave the country they are usually referred to as capital flight. In its widest measure capital flight is synonymous with the outflow of capital from a country, both legal and illegal. This involves both legitimate capital outflows, carried in the national accounts as well as illegitimate clandestine transfers of capital. For the purposes of this paper we will be defining capital flight as only the illegitimate outflows of capital from a country. As opposed to normal capital outflows the illicit transfer of funds can be seen as exceptionally harmful as the wealth itself and any future dividends will rarely return to the country of origin. Thus, by demarcating capital flight clearly, the term turns into a useful analytical measure rather than an alarmist catch-all synonym of negative current accounts.

Schneider (2003) sees capital flight as a response to domestic economic and political instability, developing this we have identified two main causes of capital flight: proactive protection from appropriation, and seeking less adverse economic conditions. They are inter-related and to some extent endogenous. Where does, for instance, appropriation end and strict capital controls begin? As such, while it is difficult to isolate and explore these causes as individual mechanisms, attempts have been made by Mikkelsen (1991) and Harrigan et al. (2002) among others, we believe that protection from appropriation and the search for less adverse economic conditions in aggregate form a collectively

exhaustive set of reasons to illicitly move capital out of a country. Another equally thorny question regards who is primarily responsible for the outflow of capital. We will be looking at capital flight in aggregate and so not explore further whether the ruling elites who stand to benefit the most from the rent-seeking are the ones who move capital or if it is primarily agents who stand to lose the most that do.

Fear of appropriation

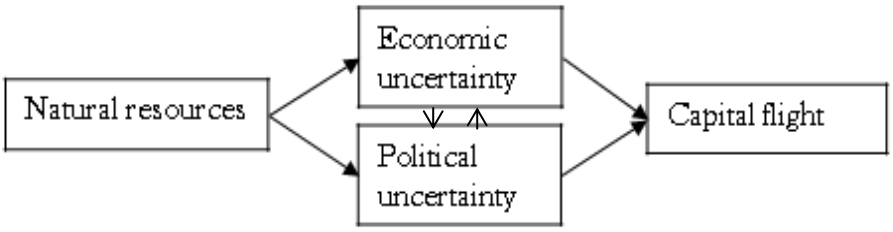
Capital flight can be a response to political uncertainty, where capital is hidden to avoid expropriation. By putting capital out of reach of the domestic authorities, the agent safeguards a continued ownership of the assets. A distinction lies in the origin of the problem, while fear of appropriation and the wish for less adverse economic conditions both aim to maintain and grow the agent's wealth, the former is a response to conditions in which property rights are negligible. Not only does the agent risk losing part of the dividends but the actual principal itself. In terms of rent-seeking this is a more direct and less sophisticated way to redistribute resources from unfavored to favored parties than by, for instance: capital controls, tariffs, taxes, or legislation. It is a hallmark of kleptocratic states to engage in the looting of national wealth in order to enrich a political elite. Being subject to the whims of a capricious government is a strong incentive to protect your wealth, but examples also abound of the ruling elites themselves engaging in capital flight in order to hide their wealth. In a society in which poor property rights are endemic, the wealth of everyone is at risk of expropriation. The government might be replaced, whether by the ballot-box or by armed conflict, and the former rulers would find themselves as sufferers under a rent-seeking government.

Adverse economic conditions

Some countries may avoid actual political upheaval of the forms previously discussed but still be the subject of perennial economic malaise. While this may well be contingent on policy or political mismanagement, the form of resource redistribution is a more indirect route of favoring certain groups than wholesale appropriation or theft. They could be dispensed in the form of privileged access to foreign exchange, tariffs and subsidies. Likewise the conditions could derive from the aforementioned volatility of resource rents, thus the domestic economy contracts and expands rapidly under the influence of commodity prices. The rationale may not be sinister or self-serving, the distortions of the economy may well stem from a misconstrued attempt to offset Dutch disease. Under conditions of slow growth or high inflation, it would be natural for capital to flow from a

weak economy to a safer haven. However in the presence of capital controls the only option available would be to move capital illicitly.

Figure 1: The proposed channels



Capital flight, then, ought to be a strong measure with which to explore the effects that the natural resource curse is purported to cause. Should political and economic instability follow in the tracks of natural resources, capital flight will reflect these conditions and exhibit an increase (Fig.1). The relationship will not be perfect, there are effects associated with the natural resource curse that do not cause capital flight, just as there is capital flight caused by factors other than resource abundance.

2. Method

In order to investigate whether natural resources have an effect on capital flight we must find a method that accurately depicts the relationship. The method usually applied in the resource curse literature is a simple OLS regression contrasting the GDP growth over a period (or another dependent variable) to the natural resource exports or rents during a similar period, neglecting all variation over time for a specific country. Applying this method to capital flight and natural resources does not generate results that are sufficiently satisfying. The lack of data for capital flight results in a final regression of only about 30 observations. Even though the results point to a significant relationship in line with our hypothesis this sample is too small to be able to draw any conclusions regarding its validity for the general relationship.

To solve this problem we want to investigate both the relationship in the same country over time as the natural resource rents vary and over different countries. We allow for both variation over time in one country and variation between countries in our hypothesis why random effects is the main regression method we will use. We will also run fixed effects regressions that require weaker assumptions but ignore cross-sectional variation. Fixed effects will automatically control for variables that are time invariant, such as topography, land area, climate etc. These are all variables that could impact both capital flight (sometimes indirectly) and natural resource rents and controlling for them via fixed effects renders a less biased regression. Although fixed effects are usually argued to be the regression type that best controls for omitted variable bias, random effects will be our main econometric method. This is due to the empirical observation that natural resource rents do not vary substantially over time since resource rich countries will have consistently high resource rents and vice versa. The fixed effects regression that we will also run will act as robustness test that tells us whether our results might hold up to stronger assumptions. To quantitatively measure natural resource abundance we use natural resource rents as a percentage of GDP. Thus, the underlying relationship we want to examine is the following:

$$Capital\ Flight\ as\ \%\ GDP_{it} = \beta_0 + \beta_1 * Natural\ Resource\ Rents\ as\ \%\ GDP_{it} + \varepsilon_{it}$$

An observed positive relationship, after controlling for the variables mentioned below, between natural resource rents and capital flight significant at any conventional level is

interpreted as support for our hypothesis while the absence of a relationship or a negative relationship is seen as disproving our hypothesis.

We can assume with some confidence that natural resources are randomly distributed across countries. Natural resources may not be randomly distributed across earth but if countries are not formed with natural resource endowments in mind this is not significant, natural resources will still be exogenous of the variables we are interested in. Natural resource rents, however, is not an entirely exogenous variable even if we assume that natural resource endowments are. Natural resource rents depend on three different factors: price, cost (including the cost of capital which is risk dependent), and quantity. Price is an exogenous variable for a single country since natural resources are by and large undifferentiated commodities traded in an international market for a price set by the same international market. The quantity that a single country can add or remove from the market is in most cases too small to be able to profit from influencing the world price. Some exceptions to this exist, for example, the OPEC cartel is able to wield some degree of monopoly power in oil prices by curtailing or expanding their supply of oil. Assuming prices are unaffected by a state's supply, rents for a given extracted quantity of natural resources can only be affected by the cost of extraction. Thus, a country with more efficient extraction techniques or resources that are more easily extracted will produce higher rents. The cost of extracting natural resources cannot be assumed to be exogenous. It depends on several factors that may also be correlated with capital flight. Quality of institutions and the cost of labor and capital are likely to be correlated both with natural resource rents and capital flight and should thus be controlled for in some way.

In addition to different costs of extracting natural resources, there is the issue of what quantity of resources is extracted, which depends on when resources are extracted and discovered. It is not unreasonable to assume that natural resources are more likely to be discovered earlier in a country that is more accepting of prospecting and exploration activities of their land. The characteristics of a country that decide exploration proneness will thus most likely be correlated with natural resource rents and could possibly be correlated with capital flight. When the resources are found a decision has to be made whether to extract them or not, and when extraction should take effect. The time of extraction cannot be assumed to be exogenous either. It is likely to be decided by when the decision makers believe they can create most utility from extracting the resource, the time of extraction is correlated with current and expected future events. The time of

extraction is also endogenous of the current and expected future price of natural resources. This raises the difficult question of whether prices for natural resources should be controlled for or not. Controlling for natural resource prices erases a large portion of the variation in natural resource rents why it is difficult to argue that controlling for it does not imply over-controlling. We will instead use GDP growth as a substitute variable for quantity extracted.

Since we are assuming that capital flight is a consequence of political and economic factors we must be careful not to overcontrol. We want to control for the effect that institutions have on natural resource rents but we do not want to control for the effect that natural resource rents have on institutions as this is one of the channels through which we believe that natural resource rents influence capital flight. Following this logic, we should not control for factors that are potentially affected by natural resource endowments but should not affect natural resource rents directly. Institutional quality could, as mentioned previously, also affect the natural resource rents in a state, but controlling for general, often weak, measures of institutional quality will remove the effect natural resources rents have on capital flight through these institutions and defeat one of the main purposes of this study. In our regressions, we will add control variables for institutional quality to try to identify if natural resources have a direct effect on capital flight not transmitted through institutional effects. Isolating these different effects will give us a clue to the specifics of the relationship.

Some variables are highly correlated within a specific cluster of countries. This is a problem because it leads to both heteroskedasticity and omitted variable bias. Previous studies, including Brunnschweiler (2008), have remedied this problem by adding dummy variables for continent or other clusters. By adding dummy variables they control for the heteroskedasticity that arises from cluster correlation in rule of law and systems of governance as well as other cluster correlated omitted variables, improving the accuracy of the regression. However, adding cluster dummies can also have the effect of controlling away relevant correlations already represented in the chosen variables. For example, adding a dummy variable for Africa will control for unobserved variables that could bias the result but could also diminish the relationship between for example capital flight and natural resource rents, assuming that the dummy variable is correlated with those variables. In addition, there is the question of how to define clusters. Choosing which countries that should belong to a certain cluster is not elementary since there are no clear

definitions. For the purpose of this paper we believe that cluster dummies should not be added as they risk removing significant correlations and cannot be sufficiently supported by theory. We have made one exception to this in including a dummy variable for former Soviet Union countries. Since our dataset spans both the Soviet and post-Soviet era we need to take into account that former Soviet countries are influenced by their history and the fact that their domestic situations changed drastically with the dissolution of the Soviet Union.

Capital flight measure

In order to find the relationship between natural resource abundance and capital flight we must find an effective estimate for capital flight. We use the definition suggested by Schneider (2003) that capital flight is outflows of resident capital as a consequence of economic and political uncertainty. This definition fits our assumption that natural resources lead both to political and economic instability, by way of Dutch disease variants as well as by affecting behavior of agents.

There are several methods for estimating capital flight used in the academic literature. The most commonly used are the "Broad or Residual measure" defined by the World Bank (Claessens and Naudé, 1993) and the "Hot-money measure" defined by Cuddington (1987). The broad measure calculates the residual between sources of funds and uses of funds in a certain country. A discrepancy between them suggests that there is capital flight present. It can be easily measured with data accessible through the World Bank (World Bank, 2014) and the IMF Balance of Payments Yearbook (IMF, 2014). The Hot-money approach uses data on private short-term capital outflows and the errors and omission in the balance of payments statistics. This estimate is, as the name indicates, more short term focused.

In addition to these methods there are several other methods building on different data. One aspect that is not taken into account in the above methods is the prevalence of trade misinvoicing (Claessens and Naudé, 1993). When looking at trade flows between two countries, should there exist a difference between the invoices and the actual payments deliberate trade misinvoicing is assumed to occur. In using this measure a strong assumption has to be made, namely that in the presence of discrepancies in trade between two countries one party is always misinvoicing and another party is constantly telling the

truth. The line drawn, while not necessarily completely arbitrary, reflects a bias in opinion.

Thus in estimating capital flight we use the World Bank method using residuals, or the broad measure, suggested in "Recent estimates of capital flight" (Claessens and Naudé, 1993). This is the most widely used, requires no assumptions regarding trade misinvoicing and has a long term perspective. The residual measure derives from the national accounts and relies on data of current account balance, net foreign direct investment, change in reserves and change in external debt. The estimate for capital flight is found by summing up the previous factors.

Table 1: Method for measuring capital flight (Claessens and Naudé, 1993)

Current Account	A
Net Foreign Direct Investment	B
Other short-term capital outflows	C
Portfolio Investment	D
Change in banks foreign assets	E
Change in Reserves	F
Errors and Omissions	G
Change in External Debt	H

Broad measure

Capital Flight=A+B+F+H

We use the BPM5 statistics from IMF for the current account statistics (IMF, 2014). This is not the most recent measure but we use it nevertheless since it covers a longer time period than BPM6. BPM5 covers all years between 1960 and 2008 while BPM6 covers years after 2005. Through these inputs we calculate an estimate of the gap in source of funds and use of funds for each country and each year. Any gap between source and use would then suggest movements outside of the national accounts, indicating illicit capital flows. In the final regressions we will only take illicit capital outflows, or capital flight, into account since a negative value in the residual method cannot always be interpreted in the same way as positive values. Finally, we relate the calculated capital flight to the size of the economy by dividing it with GDP. We do this to better be able to relate the measure with

the natural resource rents as a percentage of GDP measure as well as to improve economic readability of the results. This change is mainly cosmetic and does not distort the final results.

Natural resource measure

The data used for measuring natural resource abundance is the World Bank data of natural resource rents as a percentage of GDP (World Bank, 2011). This measure includes rents for oil, natural gas, coal, minerals and forests. We do not discriminate in our inclusion of natural resources depending on their pointiness and thus their relative effect on institutions. Instead, by using rents, resources are implicitly weighed after their pointiness since rents include some measures of pointiness, including cost of extraction. Rents is a purely quantitative measure which is an advantage because it is easy to comprehend and estimate. However, such a diverse measure, including everything from forest rents to oil rents, fails to account for different qualitative characteristics of the resources. We use total natural resource rents instead of natural resource exports, a variable previously use for example by Sachs and Warner (1997b), because we want to estimate how much of the economy, both domestically consumed and traded, that is centered on natural resources. Instead of using exports, a measure based on rents is less endogenous. Poor countries with small manufacturing sectors will consume less resources domestically and export more as a percentage of GDP, this bias will appear to strengthen the resource curse relationship. A country might also want to export more or less depending on prices, current political and economic events and expectations of future events, for example, the expected onset of a civil war (Rigterink, 2010). A larger percentage of GDP deriving from natural resources means an increased vulnerability to changes in commodity prices and thus larger economic uncertainty. Using rents as opposed to exports also focuses on the right aspects, in order for wealth to be appropriable and spent by the producing country, there needs to be a surplus after costs. Exports are simply tallied by revenue and thus only capture acquisition of foreign exchange.

Another method suggested for calculating natural resource wealth is to calculate natural capital (World Bank, 2006). This method sums up (with discounting) all future natural resource rents to find the total natural capital. This method is less endogenous than previously suggested methods but the result is very uncertain due to probable changes in prices and future discoveries. Foremost, we want to examine the relationship between a

country's actual rents from natural resources and actual capital flight, over time. Accounting for future rents is thus incorrect for our purpose. The wealth has to be produced before it can leave the country.

Missing data

To examine the relationship between natural resources and capital flight we will use panel data of 178 countries over the years 1972-2008. Most of the data originates from the World Bank and the IMF Balance of Payments Yearbook statistics. There is a lack of data for some countries, indicators and years. The lack of data reduces our sample size and is often correlated with the size of the country and whether data is easily gathered. This is especially problematic in the case of external debt data that is one of the measures used to calculate capital flight. Due to not being required to report external debt statistics, most high income countries lack external debt data and subsequently capital flight data. This means that high income countries are generally missing from our dataset which could potentially lead to a biased result due to the non-random removal of countries. However our data set is adequate when compared to previous studies.

Descriptive statistics

Table 2 provides a brief description of the data for the most important variables used in our regressions. The variable that has the least number of observations and most missing data is capital flight, or more specifically the natural logarithm of capital flight. This is partly due to the effect of removing negative values (capital inflows) from taking the logarithm of capital flight but also due to a the difficulty in obtaining data for calculating capital flight. Our dataset is significantly reduced by the lack of data for capital flight and therefore we must utilize both cross sectional and time series data in our regressions. Rule of law also has fewer observations than the other variables but this is less problematic since it is due to the fact that there only exists data from 1996 and possible deviations from including rule of law in the regression can be easily investigated by limiting other data sets to years after 1995.

The maximum value for the natural logarithm of capital flight as a percentage of GDP is seemingly incredibly large. As a consequence of this we will remove data of capital flight that exceeds 1000% of GDP, as this is highly improbable. We do this to remove the effect large outliers would have on the regressions. We will also remove all data for natural resource rents that exceed 100% of GDP as this is impossible and any such values must depend on misreporting or miscalculations.

The democracy variable is an index variable spanning from -10 to 10 where ten represents the highest level of democracy. It is better to use an index as a measure than using a dummy variable for democratic and non-democratic countries since democracy is not a binary variable. The data for democracy is taken from the Polity IV data series (2012) and the score is based on an evaluation of a country's election process. A score of -10 to -6 indicates autocracy, -5 to 5 indicates anocracy and 6 to 10 indicates that the state is a democracy. Rule of law is an index variable that is based on the perceptions of agents' confidence in societal rules (World Bank, 2012). The index weighs several different variables and creates a final score that is higher for better rule of law. Both these variables are quantified qualitative measures and are not perfect representations of the actual governance system or rule of law in a state.

The high standard deviations for both rule of law and democracy compared to the means, minimums and maximums implies a large variation in both rule of law and systems of governance. This is indeed expected as we observe clusters of correlated states with high values in the rule of law and democracy indices (Europe, North America) and clusters with low values (Africa).

It is notable that the minimum and maximum values for GDP growth are very large. This is most likely explained by extraordinary events and would not seem very remarkable if put into context.

Table 2: Descriptive statistics of variables

	Observations	Mean	Std. deviation	Mini	Max
lncfp	1671	-2.505965	1.635823	-9.465617	4.934284
nrp	5757	.0824798	.1468311	0	2.188864
lngdp	5772	22.89591	2.432708	16.54197	30.32025
gdpg	5670	.0378119	.063829	-.5103086	1.062798
lngdpc	5769	7.4287	1.521841	4.054136	11.62651
cccp	6764	.0730337	.2602111	0	1
democracy	5629	.5666193	7.36347	-10	10
RoL*	1760	-.088364	.9839819	-2.229847	1.99964

* Rule of Law data only available from 1996

Definition of variables: LNCFP = the natural logarithm of capital flight as a percentage of GDP, nrp = Natural resource rents as a percentage of GDP, lngdp = the natural logarithm of GDP, lngdpc = the natural logarithm of GDP per capita, gdpg = GDP growth, cccp = a dummy variable for former soviet countries, democracy = democracy index, RoL = Rule of law index

3. Results

Random effects

The random effects regression will estimate this relationship:

$$\ln(Capital\ Flight\ \%\ of\ GDP)_{it} - \theta\,\overline{\ln(Capital\ Flight\ \%\ of GDP)}_i = \beta_0 * (1-\theta) + \beta_1 * (Natural\ Resource\ Rents\ \%\ of\ GDP_{it} - \theta\overline{Natural\ Resource\ Rents\ \%of\ GDP}_i) + \varepsilon_{it} - \theta\bar{\varepsilon}_i$$

In all our random effects regressions, theta has a value of about 0.75.

In the random effects regressions we need to control for time invariant but cross-sectional variant variables. The most significant variable that is time invariant is land area that directly affects a country's natural resource endowments. However, there is no theoretical background or logic that claims that land area should be correlated with capital flight. Including it would thus reduce the significance of natural resource rents because of high multicollinearity but not necessarily improve the accuracy of the regression. In column (1) in table 3 the logarithm of capital flight as a percentage of GDP depends on natural resource rents as a percentage of GDP expressed as one percentage being equal to 1. We use natural resource rents as a percentage of GDP in order to relate this variable to the country's dependence of natural resource rents. Having absolute measure for natural resource rents and capital flight is a less intuitive way of presenting the regression why we believe using the relative form has higher economic significance. This first regression shows a significant positive relationship between natural resource rents as a percentage of GDP and capital flight as a percentage of GDP. Economically, the coefficient implies that an increase in natural resource rents as a percentage of GDP with one percentage point increases capital flight as a percentage of GDP by approximately 2.8 percent.

In column (2) we add the logarithm of GDP as a control variable. This is necessary since, given that natural resources are randomly distributed across countries any systematic difference in natural resource rents as a percentage of GDP depends on other sectors of the economy being larger or smaller. More specifically, a lower value of natural resource rents as a percentage of GDP could be caused by randomness or a large non-resource sector in the economy meaning that GDP should have a negative correlation with natural resource rents as a percentage of GDP. Running random effect regressions with the logarithm of natural resource percentage as the dependent variable and the logarithm of

GDP as the independent variable gives insignificant negative coefficients for the logarithm of GDP. In addition, these other sectors could also serve as a basis for capital flight. In column (2) GDP has a negative coefficient that is insignificant at all common significance levels and straddles zero. Natural resources as a percentage of GDP is only slightly affected by the addition of GDP as a control variable.

In column (3) we add the logarithm of GDP per capita as an additional control variable. A higher GDP per capita could indicate that the country has attributes that enable economic success and subsequently their skill in extracting resources. Following the same logic, a higher GDP per capita indicates that a country is successful in other sectors making it negatively correlated with natural resource rents as a percentage of GDP. More significantly, GDP per capita captures citizen's wealth and thus their capacity to move capital out of the country. A higher GDP per capita, regardless of whether it is concentrated in a majority or evenly spread, increases the propensity to move capital abroad. A country where GDP per capita is at minimum living standards will have close to zero possibility to move capital abroad, ceteris paribus, increasing GDP per capita will increase capital flight. Testing for variance inflation factors in a pooled OLS regression confirms that the correlation between GDP per capita and GDP is below our threshold value of 4. Adding GDP per capita as a control variable increases the significance of all variables and does not affect the coefficient for natural resource rents as a percentage of GDP in a major way. Adding it also generates a highly significant negative coefficient for GDP and a highly significant positive coefficient for GDP per capita. The positive GDP per capita coefficient confirms that a higher GDP per capita increases the propensity to move capital abroad illicitly. To control for the current progress and economic situation in the country we add a control variable for GDP growth in column (4). We also assume that the current GDP growth will be a good, albeit rough, estimation for expectations of future growth. Adding GDP growth as a control renders an insignificant coefficient and has only a marginal effect on the other variables.

We use the logarithm for GDP, GDP per capita, and capital flight as a percentage of GDP as most values are concentrated around the mean with a few outliers. Using the logarithmic scale yields a distribution that gives a more linear relationship without adding bias to the data. For the capital flight variable, using the logarithmic scale also has the benefit of removing all negative data or capital inflow. Investigating illicit capital inflows is outside of the scope of this paper.

To control for the current progress and economic situation in the country we add a control variable for GDP growth in column (4). GDP growth has been shown be an important determinant for capital flight (Mikkelsen, 1991). We also assume that the current GDP growth will be a good, albeit rough, estimation for expectations of future growth and thus addresses the choice of extraction time for natural resources. Adding GDP growth as a control renders an insignificant coefficient and has only a marginal effect on the other variables.

Finally, we control for institutional variables and their interaction with natural resource rents in column (5) and (6) in order to verify that there is no large bias present as a consequence of institutional quality affecting natural resource rents and to find out to what extent those variables are correlated with capital flight. As explained previously, we believe that institutional quality will affect the relationship in two separate ways, through affecting capital flight directly and through affecting natural resource rents. The relationship with capital flight would be negative if good institutions lessen the propensity for capital flight, while the effect on total natural resource rents would be positive if good institutions ease the process of extracting resources. However, the effect on natural resource rents as a percentage of GDP is ambiguous. While good institutions supposedly increase the natural resource rents it also increases the size and efficiency of other sectors. We include interaction terms since it could be the case that both natural resource rents percentage and a certain quality institutions are required to affect capital flight. As stated earlier there needs to be both a motivator to move capital (bad institutional protection) and capital for capital flight to occur. Without both insufficient institutions and rents, capital flight might not happen to the same extent. Removing the interaction from the natural resource rents percentage variable gives a more unbiased coefficient.

Adding a control variable for former soviet countries and democracy only slightly changes the coefficient for natural resource rents as a percentage of GDP and does not affect its significance. Adding a control for rule of law and its interaction with natural resource rents percentage in column (6) changes the coefficient dramatically but this is possibly due to limiting the data to years after 1995 and not the effect of rule of law. Investigating the data more closely reveals that it is the interaction term between rule of law and natural resource rents as a percentage of GDP that has the largest effect on the change in the coefficient. The interaction terms both generate significant positive effects on capital flight at the 10% level for rule of law, straddling zero, and at the 1% level for democracy. This

implies a negative relationship between the institutional variables and natural resource rents as a percentage of GDP. Thus, the belief that an increase in other sectors due to better institutional quality will diminish the percentage of the economy that relies on natural resource rents seems to be correct. Increased institutional quality will affect other sectors more than it will affect natural resources proving that the natural resource sector is less endogenous of institutional quality than other sectors.

Table 3: Random effects regressions

LNCFP	(1)	(2)	(3)	(4)
nrp	.02816285***	.02786351***	.02774337***	.02694103***
	(.0046637)	(.0046102)	(.0043505)	(.0042992)
lngdp		-.006775 7	-.2046858***	-.194896***
		(.0452276)	(.0604384)	(.0617715)
lngdpc			.3851125***	.3933335***
			(.0894075)	(.0887314)
gdpg				.3107142
				(.538971)
cccp				
democracy				
nrpdemo				
RoL†				
nrprol†				
R^2	.0231	.0258	.1240	.1250
Number of groups	107	107	107	107
Observations	1656	1656	1656	1628

Notes: Dependent variable: natural logarithm of capital flight.

Robust standard errors in parentheses. *** p<0.01, **p<0.05, *p<0.1

Definition of variables: nrpdemo = interaction term between nrp and democracy, nrprol = interaction term between nrp and RoL.

† Rule of Law data only available from 1996.

Table 4: Random effects regressions cont.

LNCFP	(5)	(6)
nrp	.0253423***	.0423369***
	(.0044717)	(.0087091)
lngdp	-.2070347***	-.2501529***
	(.0748536)	(.0802082)
lngdpc	.4179657***	.4354481***
	(.0996937)	(.1088888)
gdpg	.6490899	.5513137
	(.5634725)	(1.345569
cccp	.1666786	-.0317311
	(.298603)	.2984811
democracy	-.0119682	
	(.007703)	
nrpdemo	.1248855***	
	(.0350084)	
RoL†		-.2979926
		(.2471928)
nrprol†		1.660451*
		(.9995051)
R^2	.1207	.1109
Number of groups	100	101
Observations	1543	595

Notes: Dependent variable: natural logarithm of capital flight.

Robust standard errors in parentheses. *** p<0.01, **p<0.05, *p<0.1

† Rule of Law data only available from 1996.

Fixed effects

To control for all time invariant variables we have also run a number of fixed effects regressions. In the fixed effects regressions we will estimate the following relationship:

$$\ln(Capital\ Flight\ \%\ of\ GDP)_{it} - \overline{\ln(Capital\ Flight\%\ of\ GDP)}_i = \beta_1 * (Natural\ Resource\ Rents\ \%\ of\ GDP_{it} - \overline{Natural\ Resource\ Rents}\ \%\ of\ GDP_i) + u_{it} - \bar{u}_i$$

The disadvantage with using fixed effects is that we lose important cross sectional variation in our data set and it is thus less representative of our hypothesis. However, using fixed effects eliminates the need to control for other previously not included time invariant variables. In some of the fixed effects regressions we keep both the GDP and the GDP growth measure as they measure slightly different things. This would not be necessary if we were using first difference regressions. The GDP and the GDP per capita measure are very strongly correlated if ignoring cross sectional variation, why we have removed the GDP measure since a measure for size of the economy is unnecessary in the fixed effects regression as we only consider the deviation from the mean. Controlling for both would not necessarily remove any bias from the regression and could possibly remove the significance of the control variables.

Robustness of results

We ran all the random effects regressions in the same way as fixed effects regressions with the only exception of removing the GDP variable. Overall, the fixed effects regressions generate similar results for the natural resource rents coefficient as the random effects regressions, indicating that there are no important time invariant variables. The variances are generally higher possibly explained by the lost cross-sectional variation.

All our regressions include a robustness adjustment for heteroskedasticity of the error terms. Testing for the normal distribution of the error terms for the pooled OLS regression of regression (4) in table 3 rejects the null hypothesis that there exists skewness but cannot reject kurtosis. The distribution of the error terms show that a normal distribution is the closest estimation of their actual distribution. The same is true for most of our dependent and independent variables with the exception of natural resource rents as a percentage of GDP.

Using the logarithm of natural resource rents percentage gives a distribution that is more reminiscent of a normal distribution. Applying the logarithm of natural resource rents percentage in our regression generates a less linear relationship between capital flight percentage and natural resource rents percentage but the relationship is still positive and significant at the 10% level in the regression in column (4) in table 3. The effect of the distribution of the errors is however small why we argue that not using the logarithm of natural resource rents percentage does not significantly decrease the robustness of our results.

We have controlled for several variables that have a significant impact on the regression but there is still a possibility of omitted variable bias. As mentioned in section (2), for natural resource rents to be an entirely exogenous variable all variables that affect the cost of extraction and the quantity of available resources that are extracted need to be controlled for. We have controlled for several variables connected to GDP that reflect current events, the size of the economy, and the wealth of its citizens as well as some variables capturing institutional quality. In addition to these variables there could be other factors that affect natural resource rents and capital flight, for example the openness of the economy. We have not been able to control for more variables due to lack of data and the risk for overcontrolling. Although omitted variable bias is a potential problem that could reduce the significance of our results a large portion of the rents stem from exogenous market prices, why we believe that omitted variables would only bias the natural resource rents percentage coefficient peripherally.

Another possible source of bias in our study is that our regressions do not include high income countries. High income countries should not be subject to large quantities of capital flight since the economic and political situation is more stable than in low income countries. High income countries are by definition rich and so will tend to have large manufacturing and service sectors implying that a small percentage of GDP stems from natural resource rents. If these proposed attributes are correct, adding high income countries would add correlation between natural resource rents as a percentage of GDP and capital flight as a percentage of GDP that strengthens the previous correlation. Therefore we argue that the exclusion of high income countries should not affect the robustness of our results to a large extent.

Summary of results

The regressions we have run have rather low R^2 values, the highest being an overall R^2 of 0.1250 for the random effects regression including all control variables except institutions. The variation that is left unexplained by our variables could potentially be caused by institutional variables that affect political and economic variation that are not solely explained by natural resource rents. As stated previously, we believe that most of these variables do not affect natural resource rents why there should be no significant omitted variable bias even though we have low R^2 values.

The R^2 values for the fixed effects or the within variation are very small and our variables only explain about three percent of the variation in capital flight as a percentage of GDP within states. A possible reason for this is that a most of our variables, excluding GDP growth, are not very time variant. Their explanatory power lies in describing differences between countries and not within a country over time. Other variables, not interesting to this study, such as changes in tax rates could have a larger explanatory power for the within variation.

One explanation to our low R^2 values is that we use a relative measure for capital flight. Therefore the size component of capital flight that is mostly explained by GDP is not represented among the independent variables as it is included in the dependent. Removing the scaling in the dependent variable increases the R^2 dramatically without affecting the coefficients but only due to the scaling now being included in the regression. Not including this part of the R^2 value gives a better indication of how much of the variation that we are actually interested in that is explained. We get a better picture of the actual explanatory power of our variables.

The one control variable that significantly affects the natural resource rents coefficient is the interaction term between these rents and rule of law. Not including the interaction variable biases the rents coefficient negatively. The interaction between natural resource percentage and rule of law seems to be an important component for the relationship between natural resource percentage and capital flight. Worth noting is that the interaction term and rule of law variable are limited to years after 1995 why their implications for the underlying relationship should be considered carefully due to the issue of years included.

In summary, our results indicate that there is a significant positive correlation between capital flight and natural resource rents for our chosen time period in line with our hypothesis. The causation most likely goes from natural resource rents to capital flight. As explained in the introduction, it is not the natural resources in themselves that is the cause of the increased capital flight but rather the effect natural resources have on the political and economic climate and the characteristics of the extracted rents, since we make the assumption that it is only through these channels that natural resources can affect capital flight.

Discussion

Our results support the hypothesis that capital flight increases with increased natural resource abundance. This is harmful to the domestic economy as capital flight reduces the total capital stock in a country, removing a crucial component of economic development. However, the extent to which natural resources harm the economy by affecting capital flight depends on the underlying mechanisms. There are several different reasons to engage in capital flight but they are all implications of domestic situations that are connected to slow or stagnant economic development, whether it is an unstable political climate prone to conflict or an economy that is vulnerable to price shocks. Of the models discussed in the theoretical framework the most relevant for the interpretation of the results are the models by Lane and Tornell, in which a wealth endowment makes capital flight a rational decision. Below follows a discussion of what our results imply about the underlying conditions in the resource extracting country.

If the extraction of natural resources reduces the normal returns or increases the risk or uncertainty of holding capital domestically it could increase capital flight, since the benefit of holding capital inside the country of origin has been reduced. This requires natural resources, or rather their extraction and sale, to have an effect on the country's political and economic climate. At first glance, our results seem to support the view that there exists a resource curse of sorts, at least as far as to increase capital flight. Under the assumption that natural resources affect capital flight by altering institutions, our results also support the definition of the resource curse, a dissipation of rents of above 100%. This, however, is an assumption we cannot make when interpreting our results.

The profitability of a natural resource source is primarily due to factors outside of human control. As such, a resource may be profitable to extract even in an otherwise poor

economic climate. Resources may thus form an uncharacteristically profitable sector in an otherwise anemic economy. Capital that would otherwise not have accumulated in a state will do so if there is a possibility to extract rents. Rents, the profits above the natural rate of return, thus owe their existence to circumstance. When the rents are extracted and there exist no new possibilities to profitably invest, there is a strong incentive for the rent-earner to move his capital to a country with a more profitable investment climate. Even if the original investment is not external the capital generated through the resource rents will not stay in the domestic economy if it is more profitable to engage in capital flight and invest it elsewhere. Capital generated through rents would thus be more prone to be moved through capital flight than capital generated via normal returns in a state. This is one possible explanation as to why we see an increase in capital flight with an increase in natural resource rents. The direct effect is that the country of origin fails to capture the wealth generated from natural resources but in addition, the characteristics of rent-seeking may cause the foundations for future growth to deteriorate (Lane and Tornell, Tornell and Lane, Mehlum et al., and Hodler).

The traditional resource curse hypothesis, that natural resource dependence hobbles GDP growth, requires resources to harm the institutions that aid growth or that the resource sector itself is incapable of long-term sustained growth. Should the entirety of the relationship we found be attributable to capital flight that does not harm the country beyond reducing the domestic capital stock, our results do not indicate a resource curse in the traditional sense. But if our results can be at least partly attributed to the effect that natural resources have on the political and economic climate, our results would correspond to a suggested mechanism by which resources lower growth over time.

We make an attempt to remove some of the effect that natural resources have on capital flight via institutions, a mechanism that could also affect growth, by including control variables for democracy and rule of law. Including variables for democracy and rule of law did not change the coefficient for natural resource rents indicating that most of natural resources' effect on capital flight did not come from affecting those institutions directly. However, both interaction terms are significant and the interaction term between natural resource percentage and rule of law does affect the coefficient for natural resource rents percentage significantly. Rule of law seems important as a mechanism with which either natural resource rents or capital flight interacts. Institutional effects cannot be dismissed

when considering natural resources effect on capital flight and subsequently we cannot dismiss the traditional resource curse.

No definite conclusions can be drawn from our results regarding the validity of the resource curse. Our results could indicate both that natural resources have no effect on the economy outside of its own sector and that it does have an effect. But the purpose of this paper is not to confirm or reject the resource curse hypothesis but rather to illuminate one factor that could possibly have a contributing effect, how natural resources affect capital flight. In that respect, our study provides clear results supporting a causal positive effect between natural resources and capital flight.

Due to the broad scope of this study we are not able to draw any conclusions on exactly how capital flight is affected by natural resources. The broad scope was a deliberate decision to summarize the overall effect, but more specific results need to be developed to fully ascertain the effect on capital flight and economic development, for example by differentiating between resources or using other measures for capital flight.

4. Conclusion

The literature on the resource curse primarily concerns itself with whether an abundance of natural resources causes endemic slow growth, and as an implication, whether catch-up growth is better achieved by resource-poor countries. While there is no consensus on whether resources cause slow growth (Sachs and Warner, 1997b; Brunnschweiler, 2008; Gylfason, 2001), there is a multitude of proposed mechanisms by which it could. We have explored a sub-mechanism by which growth implicitly slows: the outflow of capital by illicit means. We found a statistically and economically significant positive relationship between natural resource rents and capital flight as a percentage of GDP. This relationship is in line with our hypothesis and with theory on the subject, in particular the Lane and Tornell (1992; 1996; 1999) voracity models that concern movements of capital from unsafe locations to safe but less profitable ones. While this paper provides empirical support for the models it is important to keep in mind that we have not confirmed the decline in formal sector returns that the models predict is the cause of capital flight.

Previous research on this topic has been done in two fields that have rarely interacted, the resource curse literature and the capital flight literature. For instance, Busse and Gröning (2013) state that resource abundance leads to corruption and Le and Rishi (2006) state that corruption leads to capital flight but no connection is made between the two. This thesis connects research in the resource curse field with its counterpart in the capital flight field and supports the implied correlations present in the literature. In the resource curse literature this relationship has previously not been explored empirically, but rather assumed to exist based on qualitative studies of resource rich economies. In contrast to previous research by Demachi (2013) in the capital flight field, our research builds on all available country data rather than restricting it to selected countries. Furthermore our paper puts the results in the context of the resource curse as opposed to treating capital flight as an independent factor. By using a broader dataset and connecting the hypothesis to resource curse theories and empirical observations, we arrive at a more general conclusion than Demachi. This paper does not however try to lend any further support to the resource curse hypothesis as a whole.

The existing research on the resource curse subject often uses GDP growth as a dependent variable with natural resources as an independent. Some studies have a more narrow focus, concentrating for example on the effect resources have on internal conflict (Fearon, 2005; Brunnschweiler and Bulte 2009). To bring clarity to the ultimate question

of whether a resource curse exists, the mechanisms through which natural resources affect development need to be studied in more depth. We have contributed to this by exploring one harmful factor that seems to be affected by natural resources, namely capital flight, but there are many more phenomena whose relationship to natural resources remain unclear, for example entrepreneurship. A good point of departure for further studies could involve a similar unbundling to that of Boschini et. al. (2013), to ascertain whether or not certain resources are equally harmful or if some are stronger drivers of capital flight. Another way of deepening the result would be to explore in-depth the identity of the primary agents of capital flight, an unbundling at the actor level rather than resource level. By disentangling the resource curse and actually confirming its mechanisms of operation, policy could be adapted to reduce its potential damage.

References

Andersen, J. & Aslaksen, S. 2008, "Constitutions and the resource curse," *Journal of Development Economics,* vol. 87, no. 2, pp. 227-246.

Andersen, J., Johannesen, N., Lassen, D., Paltseva, E. 2012, *Petro Rents and Hidden Wealth: Evidence from Bank Deposits in Tax Havens*, EPRU Working Paper Series 2013-03, Economic Policy Research Unit, University of Copenhagen, Copenhagen.

Atkinson, G. & Hamilton, K. 2003, "Savings, Growth and the Resource Curse Hypothesis," *World Development,* vol. 31, no. 11, pp. 1793-1807.

Arezki, R. & van der Ploeg, F. 2007, *Can the Natural Resource Curse Be Turned Into a Blessing?* , Working Paper edn, Oxford Centre for the Analysis of Resource Rich Economies, Oxford.

Auty, R. 1993, *Sustaining Development in Mineral Economies: The resource curse thesis,* Routledge, London.

Auty, R. 1997, "Natural resource endowment, the state and development strategy," *Journal of International Development,* vol. 9, no. 4, pp. 651-663.

Auty, R. 2001, "The political economy of resource-driven growth," *European Economic Review,* vol. 45, pp. 839-846.

Baland, J-M & Francois, P. 2000, "Rent-seeking and resource booms," *Journal of Development Economics,* vol. 61, pp. 527-542.

Boschini, A., Pettersson, J. & Roine, J. 2007, "Resource Curse or Not: A Question of Appropriability," *Scandinavian Journal of Economics,* vol. 109, no. 3, pp. 593-617.

Boschini, A., Pettersson, J. & Roine, J. 2013, "Unbundling the Resource Curse and its Potential Reversal," *World Development,* vol. 43, March 2014, pp. 19-41.

Brunnschweiler, C. 2008, "Cursing the Blessings? Natural Resource Abundance, Institutions, and Economic Growth.," *World Development,* vol. 36, no. 3, pp. 399-419.

Brunnschweiler, C. & Bulte, E. 2009, "Natural resources and violent conflict: resource abundance, dependence, and the onset of civil wars," *Oxford Economic Papers,* vol. 61, pp. 651-674.

Busse, M. & Gröning, S. 2013, "The resource curse revisited: governance and natural resources," *Public Choice,* vol. 154 no. 1-2, pp. 1-20.

Claessens, S. & Naudé, D. 1993, *Recent Estimates of Capital Flight*, Working Paper 1186, The World Bank, Washington D.C.

Collier, P. & Hoeffler, A. 2005, "Resource Rents, Governance, and Conflict," *Journal of Conflict Resolution,* vol. 40, no. 4, pp. 625-633.

Cuddington, J.T. 1987, "Capital flight," *European Economic Review,* vol. 31, pp. 382-388.

Damania, R. & Bulte, E. 2008, "Resources for Sale: Corruption, Democracy and the Natural Resource Curse," *The B.E. Journal of Economic Analysis & Policy,* vol. 8, no. 1, pp. 1-30.

Deacon, R.T. & Rode, A. 2012, *Rent seeking and the resource curse*, Unpublished paper.

Demachi, K. 2013, *Capital Flight and Transfer from Resource-Rich Developing Countries*, *Working Paper edn,* Munich Personal RePEc Archive, Munich.

Fearon, J.D. 2005, "Primary commodity exports and civil war," *The Journal of Conflict Resolution,* vol. 49, no. 4, pp. 483-507.

Gylfason, T. 2001, "Natural resources, education, and economic development," *European Economic Review,* vol. 45, pp. 847-859.

Haber, S. & Menaldo, V. 2011, "Do Natural Resources Fuel Authoritarianism? A Reappraisal of the Resource Curse," *American Political Science Review,* vol. 105, no. 1, pp. 1-26.

Harrigan, J., Mavrotas, G. & Yusop, Z. 2002, "On the determinants of capital flight," *Journal of the Asia Pacific Economy,* vol. 7, no. 2, pp. 203-241.

Hodler, R. 2006, "The curse of natural resources in fractionalized countries," *European Economic Review,* vol. 50, pp. 1367-1386.

Isham, J., Woodcock, M., Pritchett, L., & Busby, G. 2003, *The varieties of resource experience: How natural resource export structures affect the political economy of economic growth*, Discussion Paper edn 03-08, Middlebury College Economics, Middlebury, Vermont.

Lane, P.R. & Tornell, A. 1996, "Power, Growth, and the Voracity Effect," *Journal of Economic Growth,* vol. 1, no. 2, pp. 213-241.

Le, Q. & Rishi, M. 2006, "Corruption and Capital Flight: An Empirical Assessment," *International Economic Journal,* vol. 20, no. 4, pp. 523-530.

Mehlum, H., Moene, K. & Torvik, R. 2006, "Institutions and the Resource Curse," *The Economic Journal,* vol. 116, no. 508, pp. 1-20.

Mikkelsen, J.G. 1991, "An econometric investigation of capital flight," *Applied Economics,* vol. 23, pp. 73-85.

Policy and Economics Team – Environment Department, World Bank. 2006, *A Guide to Valuing Natural Resources Wealth*, Guide edn, World Bank.

Polity IV Index. 2010, *Individual Country Regime Trends* [Homepage of Systemic Peace], [Online]. Available: http://www.systemicpeace.org/polity/polity4.htm [2014, 03/15].

Rigterink, A. 2010, *The wrong suspect. An enquiry into the endogeneity of natural resource measures to civil war.*, MPRA Working Paper No. 45263, Munich Personal RePEc Archive, Munich.

Sachs, J.D. & Warner, A.M. 1997a, "Fundamental sources of long-run growth," *The American Economic Review,* vol. 87, no. 2, pp. 184-188.

Sachs, J.D. & Warner, A.M. 1997b, *Natural Resource Abundance and EconomicGrowth*, Working Paper edn, Center for International Development and Harvard Institute for International Development, Cambrigde MA.

Sachs, J.D. & Warner, A.M. 2001, "Natural Resources and Economic Development The curse of natural resources," *European Economic Review,* vol. 45, pp. 827-838.

Schneider, B. 2003, *Measuring Capital Flight: Estimates and Interpretations*, Working Paper 194, Overseas Development Institute, London.

Stevens, P. 2003, "Resource Impact: Curse or Blessing? – A Literature Survey," *The Journal of Energy Literature,* vol. 9, no. 1, pp. 3-42.

Stijns, J. 2005, "Natural resource abundance and economic growth revisited," *Resources policy*, vol.30, no.2, pp. 107-130.

Tornell, A. & Lane, P.R. 1999, "The Voracity Effect," *The American Economic Review,* vol. 89, no. 1, pp. 22-46.

Tornell, A. & Velasco, A. 1992, "The tragedy of the commons and economic growth: Why does capital flow from poor to rich countries?," *Journal of Political Economy,* vol. 100, no. 6, pp. 1208-1231.

Torvik, R. 2002, "Natural resources, rent seeking and welfare," *Journal of Development Economics,* vol. 67, pp. 455-470.

Torvik, R. 2001, "Learning by doing and the Dutch disease," *European Economic Review,* vol. 45, pp. 285-306.

Wick, K & Bulte, E. 2006, "Contesting resources – rent seeking, conflict and the natural resource curse," *Public Choice,* vol. 128, pp. 457-476.

Wood, A. & Berge, K. 1997, "Exporting manufactures: human resources, natural resources, and trade policy," *The Journal of Development Studies,* vol. 34, no. 1, pp. 35-59.

World Bank 2011, *The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium*, The World Bank, Washington D.C.

World Bank. 2014, June-05-2014-last update, ***World Development Indicators*** [Homepage of World Bank], [Online]. Available: http://data.worldbank.org/data-catalog/world-development-indicators [2014, 03/15].

World Bank. 2011, *The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium*, World Bank, Washington D.C.

World Bank. 2013, September-27-2013-last update, ***Worldwide Governance Indicators*** [Homepage of World Bank], [Online]. Available: http://info.worldbank.org/governance/wgi/index.aspx#home [2014, 03/15].

Appendix

Table A1: List of countries

Afghanistan	Central African Republic	Hungary
Albania	Chad	Iceland
Algeria	Chile	India
Angola	China	Indonesia
Antigua and Barbuda	Colombia	Iran, Islamic Rep.
Argentina	Comoros	Iraq
Armenia	Congo, Rep.	Ireland
Australia	Costa Rica	Israel
Austria	Cote d'Ivoire	Italy
Azerbaijan	El Salvador	Kyrgyz Republic
Bahamas, The	Equatorial Guinea	Lao PDR
Bahrain	Eritrea	Latvia
Bangladesh	Estonia	Lebanon
Barbados	Ethiopia	Lesotho
Belarus	Fiji	Liberia
Belgium	Finland	Libya
Belize	France	Lithuania
Benin	Gabon	Luxembourg
Bhutan	Gambia, The	Macedonia, FYR
Bolivia	Georgia	Madagascar
Bosnia and Herzegovina	Germany	Malawi
Botswana	Ghana	Malaysia
Brazil	Greece	Maldives
Brunei Darussalam	Grenada	Mali
Bulgaria	Guatemala	Malta
Burkina Faso	Guinea	Mauritania
Burundi	Guinea-Bissau	Mauritius
Cabo Verde	Guyana	Mexico
Cambodia	Haiti	Moldova
Cameroon	Honduras	Mongolia
Canada	Hong Kong SAR, China	Montenegro

Morocco
Mozambique
Myanmar
Namibia
Nepal
Netherlands
New Zealand
Nicaragua
Niger
Poland
Portugal
Romania
Russian Federation
Rwanda
Samoa
Sao Tome and Principe
Saudi Arabia
Senegal
Serbia
Seychelles
Sierra Leone
Singapore
Slovak Republic
Slovenia
Sao Tome and Principe
Saudi Arabia
Senegal
Serbia
Seychelles
Sierra Leone
Singapore
Slovak Republic
Slovenia
Solomon Islands
South Africa
Spain
Sri Lanka
St. Kitts and Nevis
St. Vincent and the
St. Lucia
Grenadines
Sudan
Suriname
Swaziland
Sweden
Switzerland
Syrian Arab Republic
Tajikistan
Tanzania
Thailand
Togo
Timor-Leste
United States
Uruguay
Vanuatu
Venezuela, RB
Vietnam
Yemen, Rep.
Zambia
Zimbabwe

Table A2: VIF

Variable	VIF
lngdp	1.21
lngdpc	1.19
nrp	1.02
gdpg	1.01
Mean VIF	1.11

Table A3: Fixed effects regressions

LNCFP	(1)	(2)	(3)	(4)
nrp	.0314373***	.0303085***	.0275064***	..0439067***
	(.005775)	(.0057337)	(.0058234)	(.0114732)
lngdpc	.1612151**	.1926094**	.2007165**	.2526875**
	(.0780154)	(.0773621)	(.078075)	(.1189301)
gdpg		.3489394	.6745409	.6901371
		(.5428751)	(.5626308)	(1.402149)
democracy			-.0144203*	
			(.0080802)	
nrpdemo			.0013964***	
			(.000418)	
RoL†				-.4454404
				(.0173356)
nrprol†				.0173356
				(.0132039)
R^2	.0359	.0374	.0415	.0363
Number of groups	107	107	100	101
Observations	1656	1628	1543	595

Notes: Dependent variable: natural logarithm of capital flight.

Robust standard errors in parentheses. *** p<0.01, **p<0.05, *p<0.1

† Rule of Law data only available from 1996.

Table A4: Removed scaling

LNCFP	(1)
nrp	.02694103***
	(.0042992)
lngdp	.805104***
	(.0617715)
lngdpc	.3933335***
	(.0887314)
gdpg	.3107142
	(.538971)
R^2	.5668
Number of groups	107
Observations	1628

Notes: Dependent variable: natural logarithm of capital flight.

Robust standard errors in parentheses. *** p<0.01, **p<0.05, *p<0.1

Table A5: Relationship between GDP and natural resource percentage

LNNRP	(1)
lngdp	-.0759597
	(.0682348)
R^2	.0247
Observations	1614

Notes: Dependent variable: natural logarithm of capital flight.

Robust standard errors in parentheses. *** p<0.01, **p<0.05, *p<0.1

Table A6: Skewness/Kurtosis test for normality using nrp

	Observations	Pr(Skewness)	Pr(Kurtosis)
Uhat1	1600	.2250	.0000

Table A7: Skewness/Kurtosis test for normality using lnnrp

	Observations	Pr(Skewness)	Pr(Kurtosis)
Uhat2	1600	.3289	.0000

Table A8: Random regressions using the logarithm of natural resource rents percentage

LNCFP	(1)
lnnrp	.0869644*
	(.0527207)
lngdp	-.2107689***
	(.0641782)
lngdpc	.470675***
	(.0933965)
gdpg	.6029068
	(.5976319)
R^2	.1154
Number of groups	104
Observations	1597

Notes: Dependent variable: natural logarithm of capital flight.

Robust standard errors in parentheses. *** p<0.01, **p<0.05, *p<0.1

Appendix diagram 1: Distribution of error terms