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Fishing for red herrings: Scrutinizing the relation between natural resources and economic growth through institutional quality and resources abundance perspectives

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Acknowledgments

To my family and friends.

Para a minha família e amigos.

Abstract

Natural resources have served a very important purpose for countries' economic growth. Many of the world's leading innovations are due to them, and much of the workforce depends on them. Some countries have managed to turn nature into a blessing, while others seem to be cursed by its existence. Research has highlighted the role of institutions in shaping economic outcomes, as well as the need for better natural resource measurements. This dissertation contributes to the literature by examining the dichotomy in the natural resource abundance/ dependence measures, as well as the mediating role of institutions to understand the heterogeneity of results in previous studies.

To do so, we have collected data on a panel of 131 countries, concerning economic growth, natural resource dependence and endowments. The data were analysed with panel data methodology.

The results show that: (i) the impact of natural resources on economic growth is largely dependent on how natural resources are measured: resource intensity does not affect economic growth, whereas resource abundance positively affects economic growth; (ii) natural resource endowments significant and positively impact on economic growth in both high and low institutional quality contexts; and (ii) in contrast with the (literature) expectations, in contexts characterized by low institutional quality the positive impact of natural resource endowments on countries' economic growth is higher than that observed in high institutional quality contexts.

These results present two important policy implications. Firstly, one can infer from them that the fear of a resource curse might be exaggerated. Secondly, it appears that natural resource trade is a powerful weapon at the disposal of countries, especially developing ones, and has the potential to leverage their positions.

JEL Classification: O11; O13; O43

Keywords: Natural Resources; Resource Curse; Economic Growth; Institutions

Resumo

Os recursos naturais cumpriram um papel importante no crescimento de vários países. Muitas das inovações mundiais devem-se a eles e muita da força de trabalho depende deles. Alguns países conseguiram retirar o melhor dos seus recursos, enquanto outros parecem amaldiçoados pela sua existência. A literatura sublinha o papel das instituições, bem como a necessidade de melhores medidas de recursos naturais para a determinação dos resultados económicos. Esta dissertação contribui para a literatura ao analisar a dicotomia entre medidas de abundância e dependência de recursos e o papel mediador das instituições para entender a heterogeneidade dos estudos anteriores.

Para tal, recolheram-se dados para um painel de 131 países, relativos ao crescimento económico, dependência de recursos naturais e reservas dos mesmos. Os dados foram analisados com metodologia de dados em painel.

Os resultados mostram que: (i) o impacto dos recursos no crescimento depende largamente da forma como estes são medidos: medidas de dependência não são significativas, enquanto a abundância tem um efeito positivo no crescimento; (ii) a abundância de recursos naturais influencia significativa e positivamente o crescimento económico em países com alta e baixa qualidade institucional; (iii) em contraste com a expectativa (da literatura), o efeito da abundância de recursos naturais parece ser maior em países de baixos contextos institucionais.

Estes resultados apresentam duas implicações importantes de política. A primeira, que o receio da maldição dos recursos pode ter sido exagerado, e estes devem ser usados. Em segundo lugar, estes podem uma arma ao serviço dos países, em especial dos países em desenvolvimento, que os podem usar para alavancar as suas posições.

Classificação JEL: O11; O13; O43

Palavras-chave: Recursos Naturais; Maldição dos Recursos; Crescimento Económico; Instituições

1. Introduction

Natural resources play a significant role in many countries' rents and employment, with mineral resource rents representing worldwide roughly USD 380 billion a year (World Bank, 2018) and accounting for 400,000 direct and 700,000 indirect jobs in the U.S.A. alone (Minerals Make Life, 2018), and 7% of Australian employment (OECD, 2019). One particular form of natural resources, ores and metals, has accounted for 4% to 5% of yearly global exports in the past decade (World Bank, 2020).

Natural resources have had a clear impact on certain individual economies as well. Oil has taken Norway from being a mainly fishing country to one of the most developed nations in the world, with accumulated revenues of roughly NOK 15,700 billion – about USD 1,850 billion as of 09.03.2021 – since 1972 (Government.no, 2020). Australia's coal supplied 68% of its total energy consumption in 2019, which employs 170,000 Australians and accounts for USD 69.5 billion in exports (Mineral Council of Australia, 2020).

And yet, they have left a mixed legacy. Not every country engaged in extraction activities has experienced similar, if any, growth trends. The *resource curse*, as it is commonly addressed, refers to a negative link between a country's resource dependence and its economic performance, which associates a 10 percentage point increase in resource export intensity to a 7% drop in long run GDP per capita, on average (Kakanov et al., 2018).

The negative link suggests natural wealth does not equate national wealth (Mittelman, 2017). For instance, despite its riches in oil and other minerals, Brazil continues to dwell on corruption and violence (Transparency International, 2021a), while middle eastern states remain subject to authoritarian leaders,[1] despite larger welfare spending. African countries like Angola or Nigeria, perform poorly on health and poverty indicators, despite all their underground prosperity (Harvey, 2021).

Botswana, though, one of the world's largest diamond miners, has managed to revert the 'curse' by applying all diamond proceeds to health, education and infrastructure, while other countries, such as Chile or Peru, also come as success stories (Korinek, 2014). Regulatory stability, clear goals and targets for resource revenues and good quality information have been highlighted (OECD, 2019) as good practices. Several other countries have chosen to

[1] Whose persistence in power arguably relates to oil wealth (Andersen & Ross, 2014; McFerson, 2010).

be monitored by the *Extractive Industries Transparency Initiative* (EITI, 2021), which aims to improve resource management and decrease corruption.

Still, a considerable debate revolves around this topic. It is obviously of great importance, given the numbers involved. Most importantly, natural resources industries are in a process of self- reinvention (Maennling & Toledano, 2019), which will lead them through increasing pressures to create real benefits for surrounding communities and not just some governing elites, as well as dealing with "rising geopolitical risk and economic protectionism".[2]

No one knows for sure what is causing or what is preventing the natural resource curse. The fact that resource endowed countries have poor economic indicators, however, has been a growing topic in the literature (Gilberthorpe & Papyrakis, 2015). And the initial idea that "easy riches lead to sloth" (Sachs & Warner, 1995, p. 5) has evolved largely.

The term *Dutch Disease* (The Economist, 1977, p. 82), equivalent to the *resource curse*, came about in the late 1970s, inspired by how Groningen gas fields had created a contrast between "external health and internal ailments". At the time, Holland had seen a drastic rise in unemployment, especially in the manufacturing sector. However, externally, it appeared to be strong, with current accounts averaging USD 2 billion surpluses yearly between 1972-76.

The fear this phenomenon would eventually spread to other countries has made researchers study it deeper (The Economist, 1977). At this stage, both macroeconomic and political economy mechanisms have been used to gain insight into how it operates (Dauvin & Guerreiro, 2017).

Regarding economic factors, recurring channels include commodity price volatility, crowding out of manufacturing and cyclical Dutch disease (Frankel, 2012), or exchange rate regimes (Kakanov et al., 2018). The idea behind this reasoning is that, in the presence of a resource boom, the booming sector will create inflationary pressures (given increases in wages) on the whole economy, provoking resource movements and exchange rate appreciation (Corden, 1984). From this it follows that the flexibility of exchange rates plays a major role in exacerbating the curse (Kakanov et al., 2018).

The fact some countries do not seem to suffer as much as others has fostered a whole new discussion. While Nigeria's oil has seen it succumb to a curse while Botswana managed its

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[2] In https://www.weforum.org/agenda/2019/03/seven-trends-shaping-the-future-of-the-mining-and-metals-sector/, accessed 09.03.2021.

diamond wealth (Dauvin & Guerreiro, 2017) suggests the type of resource must not be discarded, but also opens up the door to institutional analysis. In this sense, to correctly evaluate the impact resource discoveries have on economic development, we must account for certain institutional factors that mediate these links, such as, for instance, the "effectiveness of the government bureaucracy, the incidence of corruption, the rule of law, and more broadly, the state's capacity to promote economic development" (Ross, 2015, p. 248), bearing in mind resources affect, and are affected by, institutional quality.

An additional reason why different studies provide such disparate results might be related to the proxy selected for measuring the level of a country's endowment (Brunnschweiler & Bulte, 2008): "scaled variables that reflect intensity measures" (dependence) versus "stocks that may include rents and production" (abundance) (Dauvin & Guerreiro, 2017, p. 3), with the first type of proxy receiving more extensive attention.

In this context, the aim of this research is twofold. First, by further studying institutional quality as a mediating variable, we hope to contribute to the literature by providing extra evidence of the role institutional quality plays in the whole resource curse analysis. Our second contribution comes from analysing the same nexus (natural resources → economic growth), considering both abundance and dependence of natural resources. By doing this distinction, we expect to help enlighten the debate of whether the chosen variable has a significant impact on the overall effect, and to understand whether the choice of variable is determinant to understand the role of institutions. In other words, whether institutional quality still mediates the natural resource – economic growth nexus, regardless how natural resources is measured.

This dissertation is divided as follows. Section 2 presents a revision of literature, including the concepts, the relation between natural resources and economic growth and the mediating effect of institutional quality. Section 3 proceeds with methodological considerations. Section 4 is devoted to the analysis and discussion of the empirical results. Finally, Section 5 summarizes the main conclusion, contributions, and limitations of the study.

2. Revision of Literature

2.1. Definition of key concepts

The discussion of whether natural resources affect economic growth, and whether this effect is mediated by institutional quality presupposes answers to at least three questions: 1) What are natural resources and how are they measured?; 2) What is economic growth and how is it measured?; and 3) What are institutions and how are they measured?.

Natural Resources

A first relevant question concerns natural resources. The World Trade Organization (WTO) defines them as "stocks of materials that exist in the natural environment that are both scarce and economically useful in production or consumption, either in their raw state or after a minimal amount of processing"(World Trade Organization, 2010, p. 5).

Agriculture, for instance, has been consistently left out of the natural resource pool due to the processing it requires (Ross, 2015). Seawater, on the other hand, is not economically viable and, thus, does not qualify as a natural resource either (World Trade Organization, 2010).

Generally, authors tend to quantify total value of production, the value of exports or rents derived from resource extraction (Dauvin & Guerreiro, 2017). The scale used, however, is something not consensual, with authors using dependence and abundance proxies interchangeably (Badeeb et al., 2017).

The difference between the two forms of measuring resource wealth[3] relates to how each is coded. So, as far as resource dependence refer to "scaled variables that reflect intensity measures", abundance measures "stocks that may include rents and production" (Dauvin & Guerreiro, 2017, p.3).[4] Much of the present research has been using dependence measures (Dauvin & Guerreiro, 2017).

[3] Potentially the source of much of the heterogeneity in results of previous studies.
[4] Badeeb et al. (2017) provide some examples of commonly used variables for each, such as: primary exports/ GDP or Rents from Natural Resources/ GDP as dependence measures; $ per capita in subsoil wealth or Total natural capital and mineral resource assets as abundance variables.

Economic growth

Economic growth, or more broadly, economic development, remains a pertinent focus for both society and economists (Acemoglu, 2012). Economic development diverges from economic growth in the sense it requires a much more holistic approach, not just about changes in aggregate output but also about everything that surrounds it (Kuznets, 1967).

Economic growth, more narrowly defined, is devoted to uncovering trends in long run, endogenous growth (Barro & Sala-i-Martin, 2004). Many authors have had a say in this, but in general endogenous growth models determine the interplay between population growth, per capita levels of GDP, technological progress and saving rates.

Simon Kuznets described it as "a long-term rise in capacity to supply increasingly diverse economic goods to its population" (Kuznets, 2021).[5] From here, it follows growth is quite a more quantitative measure than development.

The capacity to provide diverse goods and services to populations entails some variables one can use to assess a country's economic growth. The evolution of any (domestic or national) per capita output variable is often the benchmark (Barro & Sala-i-Martin, 2004), although other variables such as the physical capital to worker ratio can also be used.

Institutions

Typically, institutions are seen as both the source of political power inside a country and of the constraints to said power (Acemoglu et al., 2005). North (1991, p. 97) defines them as "humanly devised constraints that structure political, economic and social interaction". Both under the form of informal constraints and of formal rules, they reduce the "uncertainty of exchange". Taken together with physical constraints, they define the choice set and, thus, determine human action (Dauvin & Guerreiro, 2017).

Institutional quality is at the heart of the matter when it comes to explaining why certain countries consistently perform better than others (Acemoglu et al., 2005). Indeed, institutions set the rules and determine how agents perceive incentives, and agents act accordingly (Mehlum et al., 2006).

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[5] In https://www.nobelprize.org/prizes/economic-sciences/1971/kuznets/facts/ accessed 11.03.2021.

There is no conventional measure for institutional quality. Rather, there is a wide set of variables commonly used, including the rule of law, government effect, transparency and bureaucratic quality (Sarmidi et al., 2014; Williams, 2011), although democracy (Boschini et al., 2007; Deacon, 2011) is also a commonly used variable.

2.2. Growth enhancing natural resources

2.2.1. Main mechanisms

Natural resources and economic growth share a complex and ever-changing link. Adam Smith and David Ricardo would be quick to call them a blessing (Badeeb et al., 2017). In fact, this belief was still held as mainstream among many post war economists. Economics historian Walt Rostow summarizes it very succinctly in an article published on the prerequisites for economic growth (Rostow, 1960). Among education and agriculture (arguably a natural resource), he includes overhead capital, where new sources of power are essential for the whole process.[6]

More recently, Badeeb et al. (2017) and Sachs (2006) point to the following three channels through which natural resources can be growth enhancing: 1) higher living standards resulting from higher income streams; 2) higher levels of investment (either public or private); and 3) infrastructure and core public goods can become more readily accessible.

2.2.2. Empirical evidence

Evidence of resource exporters striking a good balance and actually using resources for growth typically focuses on two developed countries, with stable democracies and good institutions: Australia and Norway (Bjørnland & Thorsrud, 2015). These two countries seem to defy the whole resource curse theory. Commodities represent roughly 3 quarters of their exports, 10% of gross value added in Australia and 20% in Norway. Yet, both have grown at rates 0.5 p.p. higher than comparable developed economies.

[6] "A high proportion of investment in Africa in the 1960's will have to create these sources of energy. And Africa contains, as we all know, some exceedingly promising natural resources in this respect" (Rostow, 1960, p. 7).

Charnavoki & Dolado (2014) find similar results for Canada, who, in their analysis, only suffers from Dutch disease[7] effects when commodity prices rise as a result from a commodity specific shock,[8] which is responsible for a minority of the volatility. Otherwise, real output and expenditure tend to be stimulated uniformly across the economy.

As for developing countries, Korinek (2014) highlights Botswana as a success story among its African neighbors. More broadly, in 18 oil exporting developing countries for the period 1965- 1989, Spatafora & Warner (1999) find little evidence of Dutch disease, with positive terms of trade shocks generally increasing investment, especially public.

2.3. Natural resources and subpar economic development

2.3.1. Main mechanisms

The resource curse has been a research topic for relatively shorter time (Gilberthorpe & Papyrakis, 2015), but produces more paradoxical results (Dauvin & Guerreiro, 2017; Sachs & Warner, 1995). The Dutch economy decline in the late 1970s (The Economist, 1977) motivated further study, a call to which many economists answered.

The term "resource curse" itself is rather recent. It were the economists Auty & Warhurst (1993) who first proposed it, when analyzing how endowed nations seemed unable to turn natural into social wealth. Later that decade, Sachs & Warner (1995) produced what is, arguably, the first quantitative evidence that a too high reliance on natural resource trade can damage a country. Since these, a lot of effort has been put to uncovering underlying causes of this "conceptual puzzle" (Sachs & Warner, 1995, p. 3).

In general, resource curse mechanisms are bundled into one of the following: 1) long run trend and volatility of world commodity prices; 2) crowding out of manufacturing and learning by doing; and 3) macroeconomic and aspects of resource booms (Frankel, 2012).

[7] "[R]aising real commodity prices, again via an appreciation of the real exchange rate, lead to a fall in competitiveness and thus to a decrease in the output of the non-commodity tradable sectors in SCEEs" (Charnavoki & Dolado, 2014, p. 208). SCEE stands for Small Commodity Exporting Economies.

[8] The authors identify 3 types of shocks: 1) global demand shocks (e.g. global expansions and recessions); 2) global non commodity supply shocks (e.g. technology and productivity growth); and 3) global commodity specific shocks (e.g. wars or natural disasters in commodity-producing countries) (Charnavoki & Dolado, 2014).

Commodity price trends and volatility

The prices of raw commodities tend to move together (Pindyck & Rotemberg, 1990),[9] and a general upward trend from 1870 to WWI, downward in the inter war period and in the 1980s and 90s, with upward movements in the 1970s and the first decade of the 21st century is visible.

Regarding future movements, both the view commodity prices will increase or decrease offer compelling arguments. The Prebisch- Singer hypothesis (Harvey et al., 2010), that claims downward trend for commodity prices relative to those of manufactured goods, still finds support today. At the same time, the Malthusian (Frankel, 2012) idea that resources exist in limited and perishable amounts, together with assumptions of safe property rights, provides a simple intuition of why an upward long term trend in commodity prices is also a reasonable expectation.[10]

Either way, natural resources prices are highly volatile (Van der Ploeg & Poelhekke, 2009). It can be argued that it is this volatility, and not a trend of decreasing prices that is causing the resource curse.

James Hamilton suggests 5 in 6 U. S. recessions from 1947 to 1975 were preceded by oil price shocks (Hamilton, 1983). The causation is not clear, as both price shocks and recessions could be merely coincident in time or both triggered by a third event, but the author finds support to claim the correlation is not entirely spurious.

Together with Hamilton, Kim & Loungani (1992) also find support for the idea that countries with resources tend to have more volatile outputs, as a result of resource price volatility.

The volatility in terms of trade introduces serious problems for resource endowed nations, especially in weak institutions settings, as governments can become tempted to pursue procyclical spending (Badeeb et al., 2017). This is especially perverse in developing countries, who experience almost twice the volatility as developed countries (Baxter & Kouparitsas, 2006).

[9] There is a high correlation of prices of oil and minerals, in particular.
[10] See Frankel (2012) for the full argument.

Crowding out of manufacturing and Learning By Doing (LBD)

Literature on the resource curse finds in this its most widespread explanation (Matsen & Torvik, 2005), based on the works by Matsuyama (1992), who claims that, while manufacturing is characterized by LBD*,* the primary sectors are not.

Resource booms have been found to provoke resource movements away from manufacturing, and into resource sectors (Corden, 1984; Matsen & Torvik, 2005). This, together with the considerations of Matsuyama (1992), shows why a too high natural resource reliance can be damaging to the economy as a whole. "Natural resources bring risks. One is that too many people become locked in low-skill intensive natural-resource-based industries" (Gylfason, 2001, p. 858). Sachs & Warner (1995) find support for this in their seminal paper.

However influential this view may be, it is met with skepticism by some researchers. Frankel (2012) claims there is no reason primary sectors (where natural resources are included) cannot enjoy LBD.

Czelusta & Wright (2004) also cast their doubts in the assertion, stating that minerals (in particular) is one of the most advanced tech industries of the world. In addition, the authors claim that, even though it has been like that for at least two centuries -fears of scarcity sparking innovation-, it rarely appears in the resource curse literature, and call attention to institutions. "Many other resource-based economies have performed poorly, not because they have overemphasized minerals but because they have failed to develop their mineral potential through appropriate policies" (Czelusta & Wright, 2004, p. 8).

Gylfason (2001) concurs that countries with natural resources tend to overlook their human capital formation but attributes the blame to governments and not resources themselves. Later, other authors have shown the cases for Australia and Norway, to prove the point that natural resource sectors can still have substantial spillover effects for the economy as a whole (Bjørnland & Thorsrud, 2015).

Macroeconomic and business cycle aspects of resource booms

Resource booms typically have certain undesired repercussions at the level of monetary and fiscal policies. And although the resource curse might be seen as a simple reversal of the previous boom (Frankel, 2012), there are some regularities that merit our attention.

The first of which relates to the real exchange rate. Foreign investments and commodity price volatility will translate to exchange rate volatility (Van der Ploeg & Poelhekke, 2009). Together with fragile financial systems, this provides some intuition into why natural resources hamper economic growth.

Since resource rents account for most of public budgets, with little taxation comes little public scrutiny (Mohaddes & Raissi, 2017).[11] Local governments will have a tendency to overexpand their public apparatus (Badeeb et al., 2017), which will create inflationary pressures, especially in the non- traded sector (such as housing).

Factors shifting away from manufacturing and into extraction, in search for higher salaries, together with the inflation from the positive income shock, will decrease export competitiveness outside commodity sectors (Gilberthorpe & Papyrakis, 2015).

Again, this effect seems to be more present in developing countries. The rationale is that, when anticipating a positive shock, voters would rather the money is spent straight away, than leave it in the hands of corrupt[12] politicians (Alesina et al., 2008). One additional fact on resource economies fiscal policy includes resources crowding out non resource output, which later is revitalized by fiscal expansion (Arezki et al., 2011).

2.3.2. Empirical evidence on the resource curse

Ever since Sachs and Warner announced a "statistically significant, inverse, and robust association between natural resource intensity and growth" (Sachs & Warner, 1995, p. 21), many other researchers have tried to replicate the results (Gilberthorpe & Papyrakis, 2015). And, indeed, history provides generous examples of resource reliant economies failing to achieve economic prosperity (Satti et al., 2014).[13]

Many are the variables associated with this puzzling evidence. Gerlagh & Papyrakis (2006) associate each additional percentage point of natural resources on total capital stock to a decrease of between 0.22 p.p. and 0.39 p.p. on savings, and between 0.18 p.p. and 0.19 p.p. on investments.

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[11] McFerson (2010) finds resource revenues to be a powerful weapon at government's disposal to retain power for themselves.
[12] As they are perceived.
[13] The Netherlands' eclipse of the gold enriched Spain in the XVII century, Switzerland and Japan rising over resourceful Russia in the XIX, or more recently the Asian Tigers (Sachs & Warner, 1995).

Natural resource booms were also proven to increase sovereign bond spreads, although only for authoritarian countries (Arezki & Brueckner, 2012), which connects to the volatility in terms of trade, which transmits to volatility in state revenues and ability to service debt uncertainty (Baxter & Kouparitsas, 2006).

Natural resource booms also impact economic output through their impact on other variables, such as education and create spillovers to the whole economy. In general extractive industries are less highly skilled labour intensive, thus creating negative incentives for education in resource endowed countries (Gylfason, 2001). Major petroleum exporters were found to have lower levels of human capital, which makes the resource curse hit them the hardest (Behbudi et al., 2010).

Creating benefits for the wider economy comes as one of the factors that explains the heterogeneity of results in previous studies. The ability to generate these spill overs such that resource gains are not confined to resource sectors is, thus, essential to produce healthy and lasting benefits of resource extraction (Bjørnland & Thorsrud, 2015).

Majumder et al. (2020) find significant negative association between oil abundance and economic growth. In a panel of 95 countries over the period 1980- 2017, the authors find every additional 1% increase in oil rents to cause, on average, a 0.04% reduction in the real GDP per capita, although this result can be softened by trade openness.

2.4. Natural resources and institutions

2.4.1. Main mechanisms

Institutions rule society (North, 1991). It is, thus, only natural that they rule, or at least influence, economic variables through their action. Indeed, the uncertain impact resource endowments bring to economic growth is better explained through the quality of institutions that surround it (Frankel, 2012; Ross, 2015).

Once again, history has created abundant examples of resource "winners" and resource "losers".[14] Botswana, whose diamonds account for 40% of its GDP, managed to secure the highest growth rate of any other country in the 1965 - 2000 period, due to the adoption of

[14] Wording by Mehlum et al. (2006).

"good policies" (Acemoglu et al., 2002, p. 32),[15] an thus is clearly a "winner". Norway, the U.S.A. or Australia are other notable examples (Mehlum et al., 2006).

The Congo is one notorious "loser". Since its independence from Belgium in 1960, it was unable to turn 15% of the world's copper deposits and numerous other riches into sustainable growth for its population. A dictatorship and general poverty help explain this (Acemoglu et al., 2004). Maddison (as cited in (Acemoglu et al., 2004)) claims its GDP per capita was less than half in 1992 than it had been in 1960. Nigeria, Venezuela and Mexico are other notable examples (Mehlum et al., 2006).

The role of institutions is not clear cut (Badeeb et al., 2017), although many researchers tend to look at them as mediating factors in the natural resources – economic growth nexus (Deacon, 2011; Smith & Waldner, 2015), and as a source of heterogeneity in results of previous studies.

In the presence of weak institutions, the resource curse can be exacerbated via the following: 1) rent seeking, voracity effect, and grabber friendliness; or 2) autocratic/ anarchic institutions[16] (Frankel, 2012; Ross, 2015; Vahabi, 2018). It is also important to note that many of these mechanisms overlap between each other and with what was said previously on the macroeconomic effects of natural resources.

Rent seeking, voracity effect, and grabber friendly institutions

Having readily available natural resources creates an excess of funds, which is the effect this chapter concerns. The ease with which they can be captured by powerful groups is of the essence here (Tornell & Lane, 1999).

The general argument is that the natural resource curse depends on the institutions that surround them (Dauvin & Guerreiro, 2017). Brunnschweiler (2008) goes as far as to say it may only happen in low quality institutional settings. Understanding governing elites reactions to natural resource shocks is critical to understanding natural resources effects on economic growth (Vahabi, 2018).

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[15] It is also the highest ranked African country in the Corruption Perception Index 2020 (Transparency International, 2021b) from https://www.transparency.org/en/cpi/2020/index/nzl accessed on 24.03.2021.
[16] "[U]nenforceable property rights, unsustainably rapid depletion, or civil war" (Frankel, 2012, p. 4).

One reason why worse quality institutions are more likely to create the resource curse is because they foster rent seeking, or incentives for unproductive activities. Additionally, resource booms increase the value of staying in power, which leads weaker governments to engage in "politically important but economically unproductive projects (white elephants)" (Kolstad & Wiig, 2009, p. 5318).

Lane & Tornell (1996) note that, in an effort to buy political support (again, in weak institutional settings), governments intensify rent redistribution among powerful groups. The increasing pace of transfer recipients, at times higher than that of rents, induces the voracity effect – the ability some groups create, for themselves, to appropriate all revenues from resource trade (Gilberthorpe & Papyrakis, 2015) –, which reduces the rate of return in the extractive industries and in the overall economy.

Grabber friendly institutions – as opposed to producer friendly – encourage corruption in mineral economies (Mehlum et al., 2006). Besides individual agents' inclinations, this argument refers to public states' handling of resource revenues. Weak institutions are associated with excessive public spending and patronage (Robinson et al., 2006), while low levels of corruption are found to improve wealth management (El Ansashy & Katsaiti, 2013).

Autocratic/ anarchic institutions

Democracy is one specific institutional to which many authors have paid attention (Gilberthorpe & Papyrakis, 2015). It appears resource wealth helps stabilize both democracies and autocratic regimes (Ross, 2015), although, in this particular case, the persistence of autocracies is a more pressing matter.

Resource booms increase the value of staying in power for dictators, as well as the chances of having their power threatened (Kolstad & Wiig, 2009). Authoritarian leaders will, thus, use up much of the resource revenues to prolong their power, via "populist or patronage spending" (Andersen & Aslaksen, 2013, p. 105), or internal security spending and free information blockades (Ross, 2001).[17]

The relatively high dependence on resource revenues rather than taxation further dampens the transition to democracy, and thus prolongs the above-mentioned negative effects. This will bring little public scrutiny and demand for democratic accountability (Mohaddes &

[17] The authors use the term "repression effect" (Ross, 2001).

Raissi, 2017), in a self-sustaining dynamic where "lack of accountability enables elite appropriation of resources which in turn raises the monetary value of political control and finances continued repression" (McFerson, 2010, p. 1). Williams (2011) further associates the lack of transparency in resource economies with slowed economic growth.

The rate at which resource depletion occurs is critical to understand to which extent the natural resource curse will play its part (Frankel, 2012). One important aspect that governs this is the trust citizens put in the legal structure of countries, and the quality of the rules themselves (Dauvin & Guerreiro, 2017).

When resource pools are publicly owned, there is a tendency for over extraction (Robinson et al., 2006). Typically, weaker institutions regard the future too little[18] -or the present too much-, and so extract more than the efficient quality of resources, and its rents (Frankel, 2012).

Otherwise, if resources are privately owned, the security of property rights is very important (Ross, 2015). The argument follows the same lines as before, only now it is the uncertainty as to whether continuous exploration is possible, and not about continuity in power, that guides the decisions. Generally, security of property rights and good rule of law are associated with better economic outcomes (Boschini et al., 2007; Sarmidi et al., 2014).

2.4.2. Empirical evidence on the mediating role of institutions

The curse "does not lie in resource richness per se, but in the combination of poor institutions and resource wealth" (Boschini et al., 2007, p. 614). Many authors have analyzed the resource curse in this lens. And even though the studies are not consensual as to what variables to target, there seems to be support for the view that institutions drive, at least partly, some of the curse.

Analyzing a sample of 71 countries in the period 1970- 1990 and with a 5-index[19] average proxying institutional quality, Mehlum et al. (2006) find that natural resources are harmful only when institutions fail to "constrain the predatory behavior of political power holders" (Dietsche, 2007, p. 267). In fact, if institutional quality is high enough, it can even create a

[18] The future is discounted by the probability of remaining in power (Robinson et al., 2006).

[19] This index includes rule of law, bureaucratic quality, corruption in government, risk of expropriation and government repudiation of contracts (Mehlum et al., 2006).

natural resource blessing (Mehlum et al., 2006). Sarmidi et al. (2014), focusing on 90 countries in the 1984- 2005 period, find similar results in a threshold analysis.[20]

Looking at democracy as a specific measure of institutions, when examining the effect of resource windfalls on sovereign bond prices of 30 developing countries in the period 1997-2007, Arezki & Brueckner (2012) find that resource booms lead to significant increases in sovereign bond spreads in authoritarian countries only. Scrutinizing 115 countries in the period 1980- 2010 Rosenberg & Tarasenko (2020) find natural resources to be nefarious to technological progress and innovations, but only in autocracies, while Turan & Yanikkaya (2019), addressing over 100 countries in the period 1980- 2015, find them to prevent funds towards education, especially, once again, in authoritarian regimes.

With a sample of 80 countries in the period 1975- 1998, Boschini et al. (2007) find that besides institutional quality, the type of resource is also of importance. As such, bad institutions will be especially perverse in countries with more problematic types – i.e., more appropriable - of resources.

For Deacon & Rode (2012, p. 2), the degree of rent seeking and appropriation, by political elites, of resource revenues could explain why the curse of natural resources is "neither universal nor inevitable". The same authors note Nigeria, whose per capita GDP was 30% lower in 2000 compared to 1965, despite 350 billion (1995 USD) in resource revenue during the period.[21] Venezuela's per capita GDP has declined at a rate of 1.4% yearly, while terms of trade have risen 13.7% per year in the 1970 – 1990 period (Lane & Tornell, 1996). This is an example of the voracity effect.

There are also certain countries who managed to escape the temptation to rent seek and create real benefits for their population. Botswana, for instance, has managed to seize one of the world's largest diamond reserves and secure the world's second highest public education expenditure, as a share of GNP (Wadho, 2014). Contrary to other countries, diamond reserves in Botswana are not state owned, but the government has partial ownership, mainly through joint ventures.[22] Most importantly, the government has little to no discretion over diamond revenues, since all expenses must be documented in the 6 years long National

[20] The variables used to proxy institutional quality are rule of law, government effect, corruption and bureaucratic quality.
[21] Also, in Nigeria, by 2000, the income of the 2% richest equaled that of the 55% poorest, while in 1970 it equaled the income of the 17% poorest.
[22] Mostly with De Beers, the world's largest private diamond producing firm (Korinek, 2014).

Development Plans (NDP). As a result, expenditure in productive activities, such as education, health and infrastructure has been on the rise since the 1980s (Korinek, 2014).

2.5. Skepticism on the resource curse thesis and the abundance/ dependence debate

Following the influential works of Auty & Warhurst (1993) or Sachs & Warner (1995), many other economists have gone in search of this paradoxical association between natural resource abundance and delayed economic growth.

Authors have mostly resorted to either market or political economy mechanisms to explain it (Dauvin & Guerreiro, 2017; Gilberthorpe & Papyrakis, 2015), but have not been able to explain it fully without raising some skepticism. Perhaps one of the most pressing relates to the choice of abundance of natural resources proxy (Badeeb et al., 2017).

Sachs & Warner's (1995) first empirical strategy was to include the share of natural exports. Economists have since largely preferred this variable to conduct their studies on the resource curse (Kropf, 2010), despite it not fully capturing the essence of the resource curse.

Most recent studies have addressed the issue of whether resource wealth creates any sort of curse (Frankel, 2012; Ross, 2015). Yet, it can be argued that resource wealth/ abundance is not properly accounted for by the share of natural exports on GDP, and that this rather refers to a measure of intensity/ dependence (Dauvin & Guerreiro, 2017).

There was a general idea that "for most countries, however, changes in the definition of natural resources is not as quantitatively important as one may think" (Sachs & Warner, 2001, p. 831). However, recent literature has turned this around, with some authors (e.g., Brunnschweiler & Bulte, 2008; Kropf, 2010) calling for better resource abundance measures. Brunnschweiler & Bulte (2008) have shown the curse of natural resources might simply be due to the erroneous use of resource intensity measures.

The general argument is that scaling mineral exports, or even mineral rents, on total rents or GDP, not only misinterprets the concept of the curse of natural resources (Brunnschweiler & Bulte, 2008), but might also create a bias towards developing countries (Kropf, 2010). Because, generally, underdeveloped nations will be too impoverished to consume domestically, they will be more prone to exporting it than a wealthy nation would. Scaling natural resource by their relative export intensity, for instance, might not be the best way to assess its effects on growth, since "both might be independently boosted by a country's poverty" (Ross, 2015, p. 242).

For 59 countries, in the 1970- 2000 period and proxying natural resource abundance by the per capita values of natural capital and subsoil assets,[23] Brunnschweiler & Bulte (2008) find the first dissociation between natural resource abundance and dependence, with clear and distinct effects each of the variables plays in sparking economic growth.

In their study, the authors uncover the statistical insignificance of resource dependence, proxied by natural and mineral exports share of GDP – as in Sachs & Warner (1995)– in providing a contribution to economic growth, but find it to be a result of the interplay between natural resource abundance and institutions. So, a resource boom typically leads to greater intensity (comparative advantages direct effect), although it also facilitates the adoption of superior institutions, which reduce the share of natural exports (institutions indirect effect). In their estimations, Brunnschweiler & Bulte (2008) find the comparative advantages direct effect tends to be dominant. More importantly, they find a positive and significant association between natural resource abundance and economic growth, which seems "to turn received wisdom upside down" (Brunnschweiler & Bulte, 2008, p. 250).

The common hunting practice of placing a red herring to mislead dogs (Merriam Webster, 2021) sets the tone for the analysis. In fact, it appears the resource curse, itself, might just be misallocated attention.

This dissertation aims to contribute to current literature in two ways. First and foremost, we expect to further corroborate or falsify the resource curse thesis and its variations, using a panel data framework. This way, not only inter, but also intra country heterogeneity can be accounted for. Our second contribution concerns institutions and the way they potentially mediate the natural resource- economic growth nexus. By subsampling according to institutional quality settings, and not only controlling for them, we are able to better understand the way different mechanisms at play for different types of countries, meaning we can reach more robust conclusions.

[23] With data from World Bank (1997) regarding the year 1994.

3. Methodology

3.1. Main research objectives and econometric specification

The objective of this dissertation is to shed light on the links between natural resource endowments, institutional quality, and economic growth.

The baseline specification is presented by (1).

$$EG_{it} = \beta_0 + \beta_1 NR_{it} + \beta_2 IQ_{it} + \beta_3 Z_{it} + u_{it} \quad (1),$$

where

> i represents the country.
>
> t the time period.
>
> EG_{it}, NR_{it}, and IQ_{it} are proxies for economic growth, natural resources, and institutional quality, respectively.
>
> Z_{it} is a vector of control variables.
>
> u_{it} captures random errors.

Given that the distinction between natural resource abundance (NRA) and dependence (NRD) measures is at the core of one of the objectives of the dissertation, and that we seek to assess the extent to which institutional settings influence and mediate the relation between natural resource abundance / dependence and economic growth, equations (2) and (3) will be estimated as part of the empirical strategy.

$$EG_{it}^k = \beta_0^k + \beta_1^k NRA_{it}^k + \beta_2^k IQ_{it}^k + \beta_3^k Z_{it}^k + u_{it}^k \quad (2);$$

$$EG_{it}^k = \alpha_0^k + \alpha_1^k NRD_{it}^k + \alpha_2^k IQ_{it}^k + \alpha_3^k Z_{it}^k + \vartheta_{it}^k \quad (3).$$

The superscript k takes the values H and L, attesting for high and low institutional quality, respectively. The objective is to split the sample, to better understand the mediating role institutions have.

Finally, it is worth mentioning the expected results, based on the extant literature (see Section 2). The first relevant distinction to be made is between natural resource abundance and dependence measures. In general, studies tend to find disparate results, depending on how each chooses to measure resourcefulness, with resource abundance (e.g.: total natural capital, subsoil wealth) being linked with positive growth outcomes, and dependence (e.g.: primary share of exports or GDP) linked with negative growth outcomes over the past decade

(Dauvin & Guerreiro, 2017). This constitutes, then, the first expected result of this paper: $\hat{\beta}_1^H > \hat{\alpha}_1^H$ and $\hat{\beta}_1^L > \hat{\alpha}_1^L$.

Greater institutional quality tends to produce more positive growth outcomes. This happens either via the lack of public scrutiny and democratic accountability (McFerson, 2010), which invites rulers to spend discretionarily,[24] the fact that weaker institutions discount future revenues too much and tend, thus, to over extract (Frankel, 2012), and, similarly, that unsafe property laws and low corruption levels are essential in maintaining steady levels in economic activity (Ross, 2015). We expect all institutional quality coefficients to be positive and significantly non null.

Regarding the utilization of resource pools, institutional quality operates similar mechanisms. Generally, a discovery of some kind creates excess rents and the way each country seizes those depends on certain factors such as the level of democracy/ autocracy, rule of law and corruption. So, although a resource boom generates revenue windfall, and more optimism about the future, other things, such as the ability to service debt eventually contracted (Arezki & Brueckner, 2012) or incentives for innovation (Rosenberg & Tarasenko, 2020) might suffer. It is, then, expected that $\hat{\beta}_1^H > \hat{\beta}_1^L > 0$ and that $\hat{\alpha}_1^H > \hat{\alpha}_1^L$.

Additionally, we control for human capital, trade openness, physical capital investment, and technological development. In doing so, we expect to cover common variables in growth regressions (Acemoglu, 2012; Aparicio et al., 2016), such as physical capital formation, human capital and technological progress. Our expectations are for positive and significantly non null coefficients for all these, regardless of institutional quality level, although higher for the high institutional quality subsample (North, 1991).

Estimating equations (2) and (3) will allow us to understand how influential institutional quality is in determining a course of natural resources, while equation (1), for the full sample, will illuminate the debate of whether the choice of natural resource proxy is a critical factor is determining the magnitude or existence of the curse.

[24] "[W]hite elephants", as referred to by Kolstad & Wiig (2009, p. 5318).

3.2. Proxies for the relevant variables and data sources

Table 1 presents a summary of previous literature, including employed variables, their effects and significance, while Table 2 describes the variables to be included in the present study, as well as their sources.

Economic growth can be generally measured quantitatively, using GDP/ GNP growth rates, or per capita values, or in a broader sense, with a more holistic approach, measuring more than just monetary factors, using indexes such as the HDI. There is no consensus on which the most appropriate proxy for it is in the resource curse literature. In this dissertation, the preferred variable is the growth rate of GDP per capita, in constant 2020 international USD, in Purchase Power Parity (The Conference Board, 2021a). Despite its criticism (World Economic Forum, 2016)- namely that it does not measure inequal income distribution-, we find this measure to be the most readily accessible and reliable. Furthermore, it allows for the common interpretation of $\hat{\alpha}_1$ and $\hat{\beta}_1$ found in Arezki & Brueckner (2012), Brunnschweiler & Bulte (2008) or Sachs & Warner (1995), although with slight alterations.

Once again, natural resource intensity measures are far from unanimous. While some authors resort to commodity specific ratios (such as Boschini et al. (2007) and Majumder et al. (2020) do), we will be using a more general approach, not specifying any type of resource, but rather its value, as a whole. Our preferred natural resource dependence variables are the share resource rents in GDP and the ratio of fuel, ores, and metals exports to total merchandise exports (as in Frankel (2012)). Both these indicators were obtained from the World Bank's World Development Indicators and measure the relative reliance of countries on natural resources for growth. They are also useful to assess the original resource curse argument that a country's intensity/ dependence on commodity trade can slow down their growth (Sachs & Warner, 1995). However, these latter variables are likely endogenous (Czelusta & Wright, 2004; Frankel, 2012) – given their formulation as ratios not independent from the economic cycle or the institutions that create it -, and their treatment as exogenous could harm the model. A better, and more independent measure of resource abundance should cover stock variables, rather than flows (Badeeb et al., 2017). Accordingly, in this study, we make use of natural capital per capita in subsoil assets, at constant 2014 USD (Lange et al., 2018). Regarding this variable, and since only quinquennial data is available, we use two different specifications. For the first, we have assumed a constant growth rate between observed periods, allowing for a linear growth in per capita wealth. In the second specification, we have equated missing data to the last available value, to account for the fact that resource booms are generally discrete in time and not a continuous movement.[25]

The measures of institutional quality employed in the present study are commonly found in the literature. We make use of the Polity database for the quality of democracy (Center for Systemic Peace, 2020), Corruption Control, Bureaucracy Quality and Law & Order indexes, from the International Country Risk Guide.[26]

The Polity2 score (Center for Systemic Peace, 2020) ranges from -10 (hereditary monarchy) to 10 (consolidated democracy) and groups countries into one of three categories: those scoring between -10 and -6 are considered autocracies; those scoring between -5 and 5 are considered anocracies/ semi democracies; those scoring between 6 and 10 are considered democracies. The index is calculated based on individual scores of executive recruitment, the independence of the executive authority and political competition/ opposition in central government (Marshall & Gurr, 2020), which makes it a comprehensive measure on democratic/ autocratic institutions.

All the other measures of institutional quality follow the International Country Risk Guide methodology (PRS Group, 2021). Regarding Corruption Control[27] within the system, the score ranges from 0 (worst) to 6 (best) and ranks countries in terms of how frequently they resort to patronage, excessive nepotism or 'favor for favor' associations. Law & Order provides two independent scores for each country- year: *law,* ranging from 0 (worst) to 3 (best), accounting for the strength and impartiality of the legal system; and *order,* also from 0 (worst) to 3 (best), translating the popular observance of the law. The last of our institutional quality measures, Bureaucracy Quality, quantifies countries on a 0 (worst) to 4 (best) scale that attests for respective bureaucracies' capacity to govern without any major disruption to policies or services. Low scoring countries lack a certain "cushioning" bureaucracy that prevents traumatic and dysfunctional changes in government (PRS Group, 2021). It is important to note that none of these variables were constructed for the purposes of growth regressions, but rather to aid firms in their foreign investment decisions.

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[25] The results presented later do not report to the interpolated variable, although they were similar.
[26] In The International Country Risk Guide (ICRG) | PRS Group
[27] The original variable is denominated "corruption". In this dissertation, we use the term "corruption control" because the scale (ascending, from 0 to 6) makes it easier to understand this way.

The control variables to be included in the model reflect the fact that this is, indeed, a growth equation. As such, our aim is to include variables that not so obviously correlate to the natural resource curse but are, in fact, important to explain long run economic growth (Acemoglu, 2012). Here, we will consider the mean schooling years, trade openness, physical capital formation and technological change.

Human capital is measured by the mean schooling years (UNDP (2020) based on projections by Barro and Lee).[28] Education is actually thought to be a transmission mechanism of the resource curse in some samples. For instance, in Gylfason (2001), the author posits that, because resource intensive activities are low skilled labor intensive, many people lose their interest in education, and workers will be 'trapped' in this. Gylfason (2001), however, considers enrolment rate, a flawed proxy for education, since it is not very informative about the current stock of human capital in the country (de la Fuente & Doménech, 2000). Additionally, enrolment rates respond to stimuluses with a considerable lag and very gradually, thus making it inferior to a variable of mean schooling years, which records the actual human capital stock of each country in each specific time.

Trade Openness is measured by the ratio of external trade (imports + exports) to GDP, with data from the World Bank's World Development Indicators (World Bank, 2021e). Our aim, by introducing this variable, is to examine the argument by Dowrick & Golley (2004), namely, that the benefits of trade openness accrue mostly to developed countries (in this case high vs. low institutional settings). The selection of this particular variable to proxy trade openness relates solely to data availability and reliance. Additionally, it allows for interpretations found in Brunnschweiler & Bulte (2008) or Sachs & Warner (1995).

The last set of variables we intend to include relates to physical capital formation levels and technological progress. For this, we will use total investment as a share of GDP (World Bank, 2021c) for physical capital formation. To account for technological progress, we have collected data on the growth rates of total factor productivity, from the Conference Board's Total Economy Database (The Conference Board, 2021b). This is the variable that more closely proxies technological progress (Madsen, 2007). We can argue this is an important variable, as it expands extraction and utilization possibilities, in fact making abundant countries even more abundant (Czelusta & Wright, 2004).

[28] In Barro-Lee Educational Attainment Data (barrolee.com).

Table 1: Summary of extant empirical literature regarding results, variables and methodology

Paper	# Countries	Period	Methodology	Economic Growth	Natural Resources	NR→EG	Institutions	Inst.→EG	Other Controls	Other→EG
Sachs & Warner (1995)	40 in the final specification; 89 in the full sample	1971-89	OLS	Real pc GDP growth	Primary Exports to GDP ratio	- -	Bureaucratic quality	0	Trade Openness	+ + +
									Investment	+ + +
									Ext. Terms of Trade	0
									Top to bottom 20% income ratio	+
									Initial Income	- - -
Arezki & Brueckner (2012)[1]	30 developing countries	1997-2007	Fixed Effects Panel Data	Real pc. Growth rate of GDP	Commodity Price Shock (CPS)	- - -	Political Checks & Balance	+ + +	Country Income Indicator	+
					CPS	+ + +	Autocracy		Country Income Indicator	+
					CPS	0	Polity2	+ + +	Country Income Indicator	+ +
Gylfason (2001)	86	1965-98	SUR; OLS	Annual growth rate of GNP pc.	Share of fuel on total exports	- - -			Investment	+ + +
									Initial Income	- - -
									Enrolment Rate	+ + +
Behbudi et al. (2010)	21 "major" oil exporters	1970-2004	Panel Data Estimation	Growth rate of real pc. GDP	Fuel (% of total exports)	- - -			Terms of Trade	- - -
									Trade Openness	+
									Investment/ GDP	+ + +
									Initial GDP	+ + +
									Human Capital×NR	- - -
Behbudi et al. (2010)	8 "other" oil exporters	1970-2004	Pooled OLS	Growth rate of real pc. GDP	Fuel (% of total exports)	-			Terms of Trade	0
									Gov. Expenditure/ GDP	-
									Trade Openness	+ + +
									Investment/ GDP	0
									Initial GDP pc.	-
									Human Capital×NR	+
Boschini et al. (2007)	80	1975-98	OLS	Average yearly growth rate of GDP	Primary Exports/ GNP	0	Institutions[2]	+ + + across all specification	Initial GDP	- - -
					Ores/ Metals Exp./ GDP	- - -			Trade Openness	0/ +
					Min. Prod. / GNP	- - -			Investment	+ + +
					Gold, Silver, Diam./ GNP	- - -				
Mehlum et al. (2006)	71 in the final estimation; 87 in the full sample	1970-90	OLS	Real GDP pc. average growth rate	Primary Exports to GNP	-	Instit. Quality[3]	0	Initial Income	-
							NR×IQ	+	Openness	+
									Investment	+
Brunnschweiler & Bulte (2008)	59	1970-2000	Pooled OLS	Average income growth	Log(subsoil assets)	+ + +	Rule of Law	+ +	Initial GDP	- - -
					Minerals (% of exp.)	0	Gov. Eff.	+ +		
Sarmidi et al. (2014)	90	1984-2005	OLS	Real GDP pc. (2000 constant prices)	Primary Exports to GDP	0	Rule of Law	+ +	NR* Inst. Qual. (avg)	+
						0	Gov. Effectiveness	+	Latitude	0
						0	Corruption	0	Initial GDP	0
						0	Bur. Quality	0		
Sarmidi et al. (2014)	90		OLS		Total Natural Capital	+ +	Rule of Law	+ +	NR* Inst. Qual. (avg)	Mostly 0

Paper	# Countries	Period	Methodology	Economic Growth	Natural Resources	NR→EG	Institutions	Inst.→EG	Other Controls	Other→EG
		1984-2005		Real GDP pc. (2000 constant prices)		+ +	Gov. Effectiveness	+ +	Latitude	Mostly 0
						+	Corruption	0	Initial GDP	Mostly 0
						+ +	Bur. Quality	+ +		
Sarmidi et al. (2014)	90	1984-2005	OLS	Real GDP pc. (2000 constant prices)	Subsoil Wealth	+ +	Rule of Law	+ +	NR* Inst. Qual. (avg)	Mostly 0
						+ +	Gov. Effectiveness	+ +	Latitude	+ + for cor. and BQ
						+ +	Corruption	+ +	Initial GDP	0
						+ +	Bur. Quality	+ +		
Majumder et al. (2020)	95	1980-2017	OLS	Real GDP pc.	Oil rents (% of GDP)	- - -			Real GDP pc. (-1)	+ + +
									FDI (% of GDP)	0
									Current Acc. Balance	- -
									Military Expenses	- - -
									Child Mortality	+ + +
									Trade Openness	+ +
									TO×NR	+ + +
Lashitewa & Werker (2020)	95	1981-2014	3SLS	HDI	Dependence: rents (% of GDP)	0	Polity2	+ + +	GDP pc.	+ + +
									Investment Price	0
									Financial Openness	0
									Trade Openness	+
Lashitewa & Werker (2020)	95	1981-2014	3SLS	HDI	Abundance: rents pc.	+ +	Polity2	+ + +	GDP pc.	+ + +
									Investment Price	0
									Financial Openness	0
									Trade Openness	+ +
Apergis & Katsaiti (2018)	27 oil exporters	1992-2014	Panel Data Estimation	Headcount Poverty Index	Oil exports (% of total exports)	+ + +	EFW[4]	- - -	GDP pc.	- - -
							Democracy[5]	- - -	Enrolment rate (sec. educ.)	- - -
							Corruption[6]	+ + +		
Apergis & Katsaiti (2018)	31 natural gas exporters	1992-2014	Panel Data Estimation	Headcount Poverty Index	Nat. gas exports (% of total exports)	+ + +	EFW	- - -	GDP pc.	- - -
							Democracy	- - -	Enrolment rate (sec. educ.)	- - -
							Corruption	+ + +		
Apergis & Katsaiti (2018)	15 coal exporters	1992-2014	Panel Data Estimation	Headcount Poverty Index	Coal exports (% of total exports)	+ + +	EFW	- - -	GDP pc.	- - -
							Democracy	- - -	Enrolment rate (sec. educ.)	- - -
							Corruption	+ + +		

Notes:
[1] All the institutional variables and other controls are interaction terms between resource intensity and the variable;
[2] Average of indexes for the quality of the bureaucracy, corruption in government, rule of law, the risk of expropriation of private investment, and repudiation of contracts by the government;
[3] Unweighted average of five indexes based on data from Political Risk Services: a rule of law index, a bureaucratic quality index, a corruption in government index, a risk of expropriation index and a government repudiation of contracts index;
[4] The degree of economic freedom in five main areas: size of government; legal system and security of property rights; sound money; freedom to trade internationally; regulation of business, credit, and labor;
[5] The level of democracy is conceived as three essential elements: the presence of institutions and procedures through which citizens can express effective preferences about alternative policies and leaders, the presence of institutionalized constraints on the exercise of power by the executive, and the guarantee of civil liberties to all citizens in their daily lives and in acts of political participation;
[6] It ranges from zero to six, with higher scores indicating lower corruption levels. For the sake of simplicity, this index has been rescaled so that greater values correspond to more, rather than less, corruption.

Table 2: Summary of the variables to be used in the present study and their sources

Measure	Proxy	Code	Description	Period	Source
Economic Growth	Growth rate GDP pc, in 2020 int. USD, PPP	gdppcgr	Growth rate of GDP per capita, in 2020 international USD, PPP	1950- 2020	The Conference Board (2021) and own calculations
Natural Resource Dependence	Ratio of Natural Resource Rents to GDP	resrents	Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.	1970- 2018	World Bank (2021d)
Natural Resource Dependence	Ratio of Fuel, Ores, Metal exports to total exports	resexp	Fuels: SITC section 3 Ores and metals: SITC sections 27, 28, 68 [1]	1962- 2020	World Bank (2021a, 2021b)
Natural Resource Abundance	Natural capita per capita, in subsoil assets (constant 2014 USD)	natcap	Natural capital includes the valuation of fossil fuel energy and minerals, agricultural land, forests, and protected areas. Values are measured at market exchange rates in constant 2014 US dollars, using a country-specific GDP deflator.	1995- 2014	Lange et al. (2018)
Institutional Quality	Polity2	polity2	The Polity2 score captures regime authority by three categories: key qualities of executive recruitment, constraints on executive authority, political competition/ opposition -10→-6: Autocracy -5→5: Semi- Democracy 6→10: Democracy	1800- 2018	Center for Systemic Peace (2020); Marshall & Gurr (2020)
Institutional Quality	ICRG Corruption Index	corruption	Assesses the degree of corruption control/ prevention within the central political system on a scale from 0 (worst) to 6 (best)	1984- 2016	PRS Group (2021)
Institutional Quality	ICRG Law & Order Index	lorder	Assesses fairness of law and citizen abidance by it, on a scale from 0 (worst) to 6 (best)	1984- 2016	PRS Group (2021)
Institutional Quality	ICRG Bureaucracy Index	burquality	Assesses bureaucracy quality on a scale from 0 (worst) to 4 (best)	1984- 2016	PRS Group (2021)
Human Capital	Mean Schooling Years	mschooly	Average number of completed years of education of a country's population aged 25 years and older, excluding years spent repeating individual grades	1990- 2019	UNDP (2020)
Trade Openness	Ratio of External Trade to GDP	trade	Ratio of external trade (imports +exports) to GDP	1960- 2019	World Bank (2021e)
Physical Capital Formation	Ratio of Investment to GDP	invest	Expressed as a ratio of total investment in current local currency and GDP in current local currency. Investment or gross capital formation is measured by the total value of the gross fixed capital formation and changes in inventories and acquisitions less disposals of valuables for a unit or sector	1980- 2019	World Bank (2021c)
Technological Progress	Total Factor Productivity growth	tfpg	TFP refers to economic growth not captured by capital or labor accumulation	1990- 2019	The Conference Board (2021b)

Notes:
[1] SITC: Standard International Trade Classification, revision 4 (implemented in 2006)
Sections 3: Mineral fuels, lubricants and related materials; 27: Crude fertilizers (excluding coal, petroleum and precious stones; 28: Metalliferous and metal scraps; 68: Non ferrous metals (United Nations, 2006)
The full glossary can be consulted in SITC Rev 4 FINAL FOR PRINTING-6 Nov 2006-without APPENDICES.doc (un.org)

3.3. Methodology for analyzing the data

Our dataset consists of 131 countries over the period 1985- 2018 (34 years). Given it contains both cross sectional and time series data, we could opt by a pooled cross section method or panel data estimation (Woolridge, 2013).

Independently pooling cross sectional data consists in "sampling randomly from a large population at different points in time (usually, but not necessarily, different years)" (Woolridge, 2013, p. 448). In our case, and in a very simplified manner, it would imply gathering a random sample on economic growth, and natural resources measures, and other control variables deemed fit. Brunnschweiler & Bulte (2008), for instance, achieve this by averaging the variables each country produced for the period and conducting the regression as if it were a simple cross-section study. However, running an equation such as that might lead us to suffer from omitted variable biases (Woolridge, 2013). Including additional controls in the model can help our pursuits but remains a difficult task for some factors. Using longitudinal data, we can box unobserved factors into one of two groups: constant and varying ones. In the case of this paper, it would materialize as follows:

$$EG_{it} = \beta_0 + \sum_{i=2}^{34} \delta_i d_i + \beta_1 X_{it} + \alpha_i + u_{it},$$

where EG stands for economic growth, X is a vector of explanatory variables, and u collects the error terms. The variable d_i, with i=2, 3, …, 34, is a dummy that captures time trends,[29] irrespective of countries, allowing for different intercepts across the set – e.g. for t=1, the intercept is β_0, while it is $\beta_0 + \delta_2$ for t=2.

The parameter α_i captures unobserved heterogeneities that are solely country dependent, hence the absence of the subscript t, and allows countries to be fundamentally different from each other for no reason other than their individual characteristics.

The main reason we chose to estimate the model using panel data is that its estimators outperform the pooled OLS ones. Importantly, for pooled OLS, we need to have that α_i[30] and X_{it} are uncorrelated, which is likely not the case (Woolridge, 2013). In this study, it is not too farfetched to assume that a country's unobserved characteristics correlate to its institutions. This makes the OLS estimators biased and inconsistent.

[29] $d_2 = 1$ if t=2; $d_3 = 1$ if t=3; …; $d_{34} = 1$ if t=34. By default, when t=1 all dummies are switched off.
[30] Let $\vartheta_{it} = \alpha_i + u_{it}$. A correct application of pooled OLS assumes $cov(\vartheta_{it}, X_{it}) = 0$. Even if u_{it} and X_{it} are uncorrelated, it is unlikely that α_i and X_{it} are as well.

4. Empirical analysis

4.1. Descriptive statistics

Our dataset comprises a time period of 34 years, from 1985 to 2018, for 131 countries. In the sample, countries' per capita income, in 2020 international USD, PPP adjusted, has grown at an average rate of 1.86%, with maximum and minimum recorded at -65.1% (Libya, 2011) and 136.04% (Libya, 2012), respectively. In fact, Libya has 2 of the 3 highest and lowest growth records in the period, and has gone through political turmoil since 2010 (BBC, 2021), which may explain its instability.

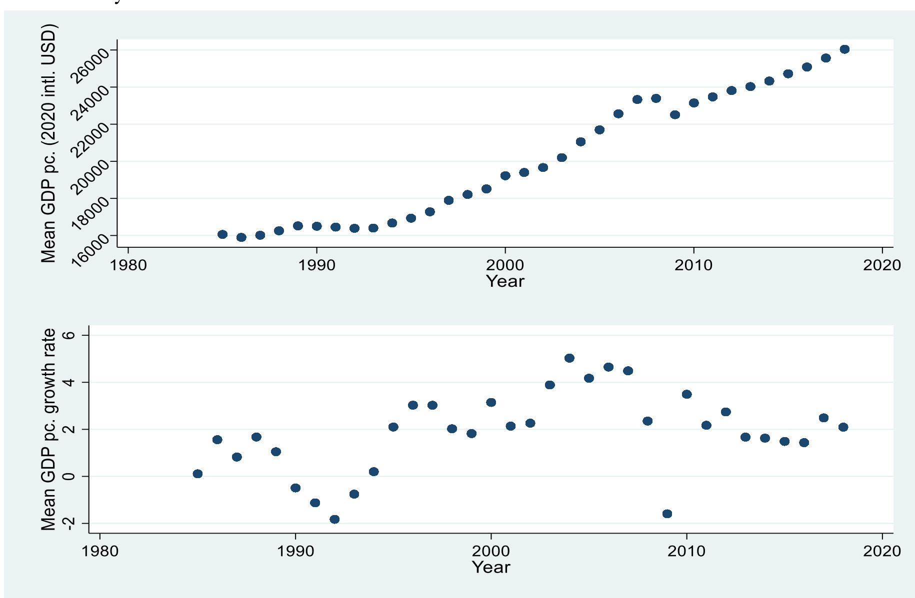

Figure 1: Evolution of per capita income (top) and growth rates (bottom)

In terms of the level, bottom observations are dominated by Mozambique, which accounts for the 13 lowest yearly per capita values of GDP, while top performing countries include the United Arab Emirates, which in 1985 recorded 152293.64 int'l USD (2020 prices), followed by Luxembourg, on six occasions. In general, both growth rates and levels' evolution, averaged over each period, are shown in Figure 1. In it, we can see, on average, GDP per capita has been growing consistently throughout the sample, although at very distinct rates over the years.

During the period, several countries have shown remarkably high resource dependence indicators. Namely, we find four countries (Turkmenistan, Kuwait, Libya, Iraq) to have, on average, a higher that 40% natural resources rents share of GDP, over the period, which constitutes quadruple the International Council on Mining and Metals (2018) threshold to be considered a resource dependent country. Additionally, several other countries exhibit close to 100% average resource exports to total exports ratios.

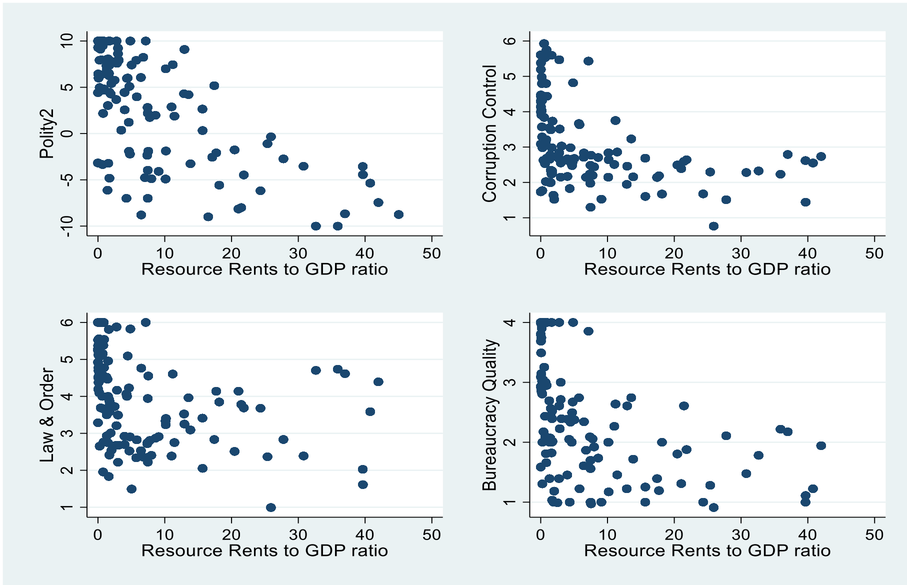

Figure 2: Resource Rents Intensity and Institutions

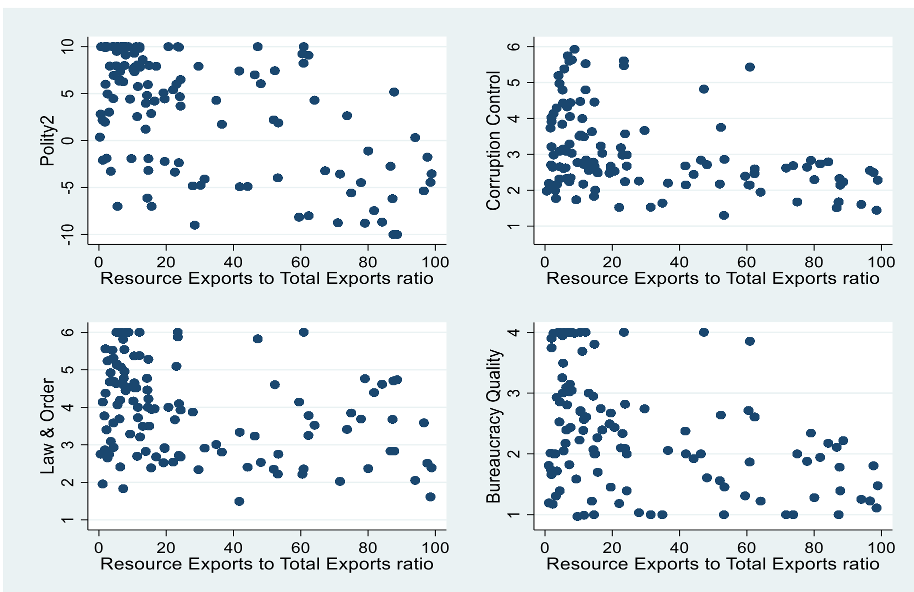

Figure 3: Resource Export Intensity and Institutions

On a second level of analysis, we found both these groups correlate negatively with our chosen institutional quality variables. The meaning of this, as Brunnschweiler & Bulte (2008) had predicted, is that excess reliance on natural resource dependence and the lack of variety of an economy is one of the results of weak institutions. Figure 2 and Figure 3 and show this.

Figure 4 summarizes the trends of institutional quality variables. The Polity2 series has seen improvement, especially in the 1990s, where it rose from an average 1.53 in 1990 to 2.93 in 1995 and then to 3.58 in 2000. In 2018 (last available year), it sits at 4.44, although it is still a very disparate index across countries. Indeed, only Europe & Central Asia, Latin America & Caribbean and North America qualify as democracies (Polity2 score≥6), on average, over the period, while the Middle East & North Africa region is the closest to dropping to an autocratic (Polity2 score≤-6) regime, with an average score of -4.25.

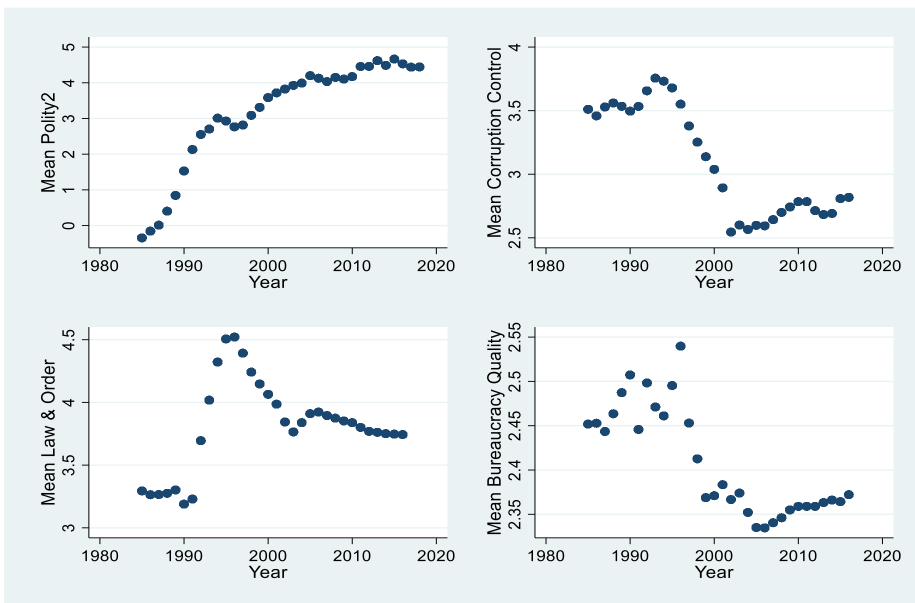

Figure 4: Institutional Quality over time

Other institutional variables exhibit similar patterns: an increase in the early 1990s, followed by a sharp decline and recovery in the early XXI century. Keeping in mind all these variables report to a scale, where higher values correspond to higher institutional settings, it is noteworthy to mention, over the period, corruption control, law & order, and bureaucratic quality averages have evolved from 3.73, 3.52 and 2.47, respectively, in 1985, to 2.84, 3.78 and 2.37 in 2016 (last available year). Only the Law & Order series has improved from start to the endpoints, and no series managed to recover fully from the drop. The maximum score for the corruption control index average was 3.76 in 1993, while for law & order it was 4.52 in 1996, and 2.54 in 1996 for bureaucratic quality. Regarding region specific averages, North America and Europe & Central Asia still present the best results, as in the Polity2 series, only now East Asia & Pacific takes the third place.

Independent control variables also show certain trends worth noting (Figure 5). Over the sample period, schooling years, trade openness and investment/ GDP have grown exhibited growing trends. The mean schooling years have risen over the period all over the world. Individually, the USA (12.92), Georgia (12.28) and Norway (12.26) present the highest mean schooling years, while Niger (1.28), Burkina Faso (1.37) and Mali (1.54) present the lowest. Region wise, and as in 1990, the leaders in 2018 are still Europe & Central Asia (8.61 to 11.69 years) and North America (11.3 to 13.35 years), although the most impressive growth has occurred in the Middle East and North Africa (78.9%) and South Asia (79.3%).

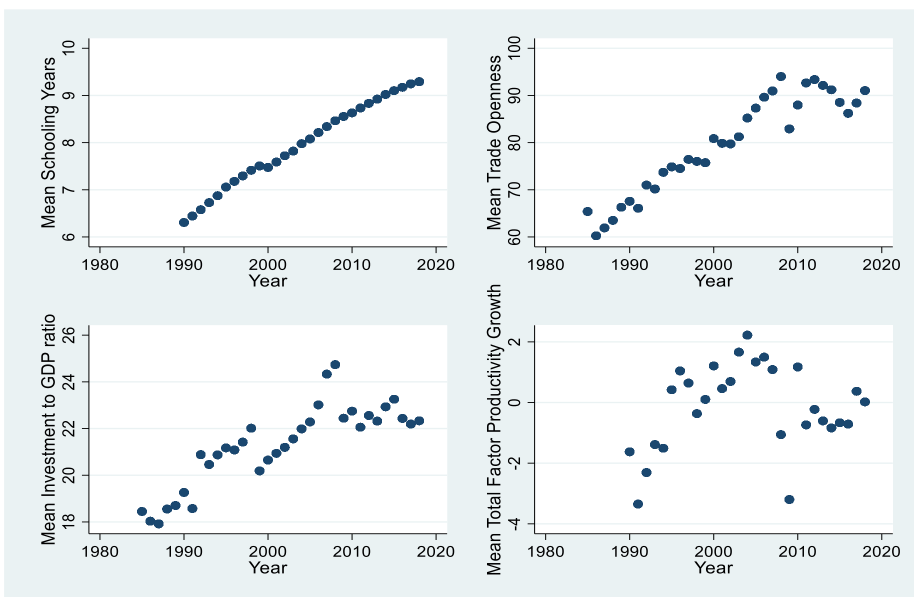

Figure 5: Control Variables over time

Trade openness has grown all over the world. The regions who opened up more to foreign trade were East Asia & Pacific (44.8%) and Europe & Central Asia (47.8%), although, globally, every region ended 2018 with a higher trade openness than in 1985.

Investment has been taking larger and larger shares of GDP in recent years. The countries who have invested the higher average shares are China (40.9%), Zambia (37,64%) and Angola (37.22%). By regions, East Asia and Pacific devotes the larger share to investment, on average (24.94%).

Total factor productivity growth, despite not following an obvious trend, seems to have grown consistently from 1990 to 2004, when it achieved its peak of 2.2% and has been falling since, with many negative average growth years.

4.2. Relation between natural resource intensity/ dependence and economic growth

The criteria employed here are the same employed by the International Council on Mining and Metals (2018): to be considered natural resource intensive/ dependent, a country's resources must account for more than 20% of export revenue; and resource rents must account for more than 10% of GDP. In our sample, 50[31] countries have satisfied this in at least one year and have, thus, been included in the resource dependent subsample. The descriptive statistics are summarized in Table 3.

Table 3: Values of GDP per capita growth for natural resource non-dependent and dependent countries

	# of observations	Max	Min	Mean	St. Deviation	Skewness	Kurtosis
Non Dependent	2753	53.67	-44.3	2.12	4.97	-1.45	19.59
Dependent	1700	136.04	-65.1	1.41	7.69	2.92	74.56

The first noteworthy fact is that resource dependent countries' growth exhibits a much higher volatility, and lower GDP per capita growth than the others, on average. The skewness of the distributions also hints at this: while resource dependent countries exhibit a positive skew, indicating a concentration of observations below the central value, non-resource dependent

[31] These are Algeria, Angola, Australia, Azerbaijan, Bahrain, Bolivia, Cameroon, Chile, China, Republic of Congo, Democratic Republic of Congo, Ecuador, Egypt, Gabon, Ghana, Indonesia, Iran, Iraq, Jamaica, Kazakhstan, Kyrgyz Republic, Libya, Madagascar, Malaysia, Mexico, Morocco, Mozambique, Niger, Nigeria, Norway, Oman, Peru, Qatar, Russia, Rwanda, Saudi Arabia, South Africa, Sudan, Syria, Trinidad & Tobago, Tunisia, Turkmenistan, United Arab Emirates, Uzbekistan, Venezuela, Vietnam. Zambia, Zimbabwe.

countries exhibit a negative one, which shows a concentration of above average results. Figure 6 illustrates just that. Also, the further countries rely on natural resources, tendentially more negative growth rates will be generated, irrespective of which subsample (resource intensive or not) each country belongs to.

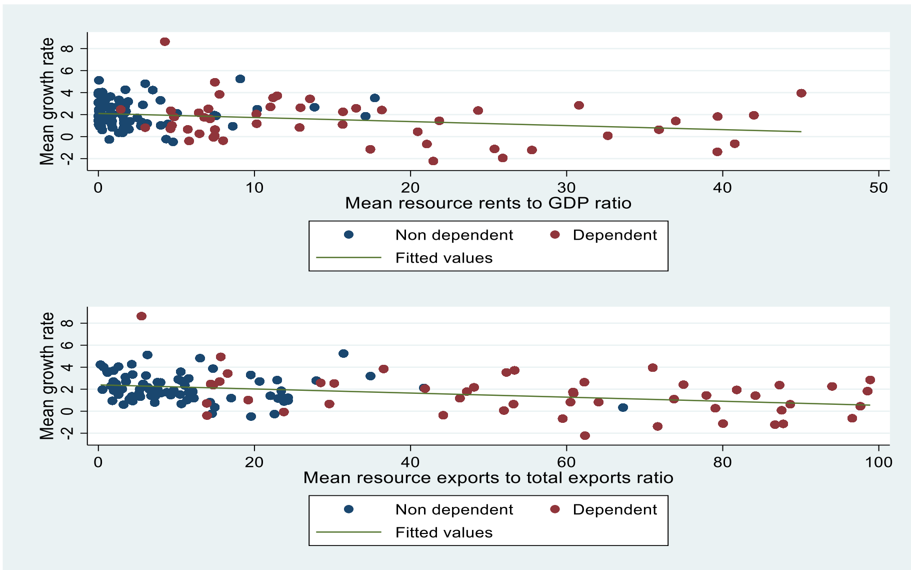

Figure 6: Growth rates of dependent vs non- dependent nations and their respective resource dependence

A more quantitative analysis of the difference in the subsamples requires the data to meet certain requirements. Namely, it must reasonably resemble a normal distribution, as well as having approximately equal variances (Corder & Foreman, 2014).

For the purposes of assessing the samples' normality, this dissertation relies on the results of three statistical tests – Shapiro- Wilk; Kolmogorov- Smirnov[32]; and Skewness- Kurtosis analysis. The fact that both subsamples' distributions are leptokurtic (i.e. they present a positive kurtosis) relative to the normal, with non-null skewness indicated what was now proven. None of them, including the full sample, adequately mimic a normal distribution.

These results forced the adoption of nonparametric testing since the assumptions of normality and approximately equal variances were not met. This might present as a drawback to this

[32] The Kolmogorov- Smirnov goodness of fit does not result from a straightforward STATA command like the others. Instead, it compares the distribution with a normal distribution of equal mean and standard deviation in two steps.

dissertation, as it complicates the generalization from sample to population, because they do not assume anything about the underlying distribution, and are generally weaker at identifying significant effects than parametric tests (Campbell, 2009).

Dependent countries seem to have grown at statistically significant lower rates than the others. For this, we have conducted the Mann- Whitney U- test, as well as a median analysis. Both work by ranking the observations, regardless of what group they belong to, and analyzing how clustered they are (Corder & Foreman, 2014). The Mann- Whitney statistic reveals the subsamples show no signs of a common distribution, while the median analysis shows (as had already been suspected by each distribution's skewness), that dependent countries concentrate below sample median while other countries concentrate above it.

Figure 7 was constructed by averaging each of the four control variables over the years, for both the natural resources dependent and non-dependent subsamples. As can be seen, there does not seem to be much separating both subsamples in terms of investment and growth rates of TFP. However, there is a significant difference between mean schooling years and trade openness, on which we will offer a brief comment.

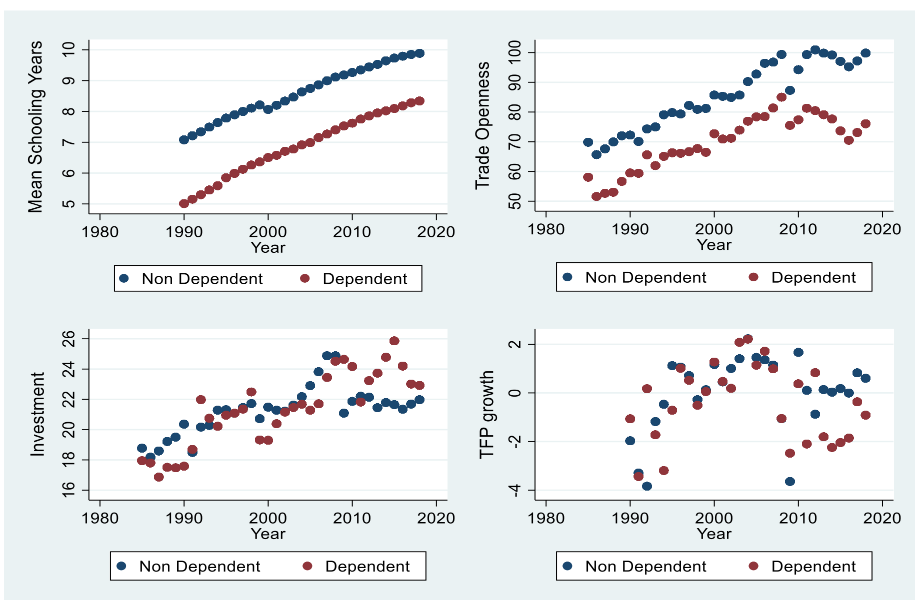

Figure 7: Dependent vs. non dependent nations' control variables evolution

The natural resources dependent countries subsample presents a considerable lag when it comes to education, visible on the first panel. Following an ever-increasing period, 2018 presented the largest mean schooling years for these countries of 8.34 years, which corresponds to only slightly more than 2002 values for the nondependent countries (8.33 years).

This result corroborates the evaluations by Behbudi et al. (2010) and Gylfason (2001). The first states a similar result as us: that oil (in their paper's case) rich countries tend to have lower levels of human capital. The second offers some insight into why that happens: because extraction activities are quite low skilled labor intensive, and generate higher rents, workers find no incentives to educate themselves and become 'locked' in this type of jobs.

As for the trade openness variable, both subsamples follow similar patterns, although natural resources non-dependent nations present an advantage of about 10 percentage points at the start of the period, which grows to roughly 14 p.p. at the end. This might be a symptom of the lack of export variety in dependent nations, as well as manufacturing sector's weaknesses. Furthermore, as can be seen on Table 1, there is robust evidence that trade openness is beneficial for growth, which might anticipate slower growth trends in natural resources dependent nations.

4.3. Econometric analysis

The main objective of this dissertation is assessing the traditional resource curse thesis (Sachs & Warner, 1995), i.e., whether a higher natural resource intensity results in slower economic growth. This relationship will be studied from the perspectives of natural resource intensity (using ratios of natural resources rents and exports to GDP and total exports, respectively) and abundance (using a measure of the value of subsoil assets), to test the extent to which different dependent variables produce significantly different results (Brunnschweiler & Bulte, 2008; Dauvin & Guerreiro, 2017).

According to the extant literature, we expect that institution quality has a positive impact on economic growth (North, 1991). We want to further develop this relationship, and understand whether it does, or not, determine the magnitude and signal of the effects (Frankel, 2012; Ross, 2015). This can be done by creating two subsamples for each institutional quality variable. This way, we can conduct different estimations for high and low institution quality contexts, besides the full sample estimation. The sampling of institutional quality variables is made according to their median values, so that the two subsamples, having similar numbers of observations, become more comparable.

Finally, the control variables we chose serve the purpose of clustering observations in groups and making them comparable (Angrist & Pischke, 2015). Thus, controlling for these variables produces similar results as we would obtain by running separate regressions for each group. Controlling for human, capital, trade openness and productivity growth allows us, then, to compare groups of countries with similar characteristics.

4.3.1. The impact of natural resources on economic growth

We conducted three different estimations: two for each of the natural resource dependence proxies and one other for the resource abundance variable.

For each, we analyzed the correlation matrix (Table A. 1, in Annex) and the variance inflation factors (VIF). Additionally, we tested for the homoskedasticity of the residuals resorting to the Breusch-Pagan/ Cook-Weisberg test. These diagnosis tests evidence that the residuals are heteroskedastic (for all models, the null hypothesis of homoskedasticity is rejected), so Huber-White consistent estimators' variances have been employed. Besides, no evidence exists of serious multicollinearity among the independent variables (very low VIF, well below 5). The models estimated are globally significant.

We find support for the hypothesis that a higher resourcefulness (Model C, in Table 4) is tendentially beneficial for economic growth, thus corroborating the expectation that $\hat{\beta}_1 > 0$. Specifically, we find evidence that, conditional on controls, a 1% change in natural resource abundance leads to an average of 0.06% change in GDP pc, all else constant. However, no significant statistical evidence emerges that natural resource rents or exports explain the variations in economic growth. Nonetheless, we can corroborate that, for the full sample, $\hat{\beta}_1 > \hat{\alpha}_1$, since both natural resource intensity coefficients are statistically null.

In a nutshell, for the countries in analysis over the last three decades, no evidence exists of a resource curse. Moreover, countries that are abundant in natural resources tend, on average, to observe significantly higher rates of economic growth.

The institutional quality proxies do not present clear-cut results. For the models of natural resource intensity (Models A and B), countries that have high institutional quality in terms of bureaucracy quality tend to growth faster, on average, but some slight evidence exists that autocratic regimes growth faster, on average, when natural resource dependence is proxied by rents (Model A). In the model of natural resource abundance (Model C), institutional quality fail to significantly determine economic growth.

Human capital, in its education dimension, emerges as a significant economic growth booster, regardless how the natural resource variables is measured. Trade openness is only statistically significant to enhance countries' economic growth when natural resource variable is measured by natural resource exports.

Table 4: The impact of natural resource dependence/ abundance on economic growth: full sample, fixed effect panel data estimations

		Natural resource dependence		Natural resource abundance
		Model A Natural Resource Rents	**Model B Natural Resource Exports**	**Model C Per capita Natural Capital (in subsoil assets)**
Natural Resources		0.0384 (0.0243)	0.0260 (0.0190)	**0.0694*** (0.0146)**
Institutional quality	**Polity2**	**-0.0869* (0.0525)**	-0.0432 (0.0422)	0.0116 (0.0515)
	Corruption	-0.0237 (0.0751)	-0.0422 (0.0577)	-0.0521 (0.0556)
	Law & Order	-0.0182 (0.0553)	0.0200 (0.0649)	-0.0928 (0.0769)
	Bureaucracy Quality	**0.2200*** (0.0765)**	**0.1733** (0.0802)**	0.1353 (0.1128)
Control variables	**Human Capital**	**1.069*** (0.0997)**	**1.0388*** (0.0997)**	**0.8282*** (0.1184)**
	Trade Openness	0.0010 (0.0007)	**0.0018** (0.0007)**	0.0010 (0.0008)
	Physical Capital Formation	-0.0002 (0.0031)	0.0020 (0.0021)	0.0030 (0.0021)
	TFP growth	0.0028 (0.0029)	-0.0035 (0.0022)	-0.0034 (0.0022)
No. Obs.		2689	2415	2037
No. Countries		113	112	101
Breusch-Pagan/ Cook-Weisberg Statistic [p- value]		200.61 [0.0000]	198.66 [0.0000]	152.07 [0.0000]
Mean VIF [Max VIF]		1.65 [2.27]	1.63 [2.34]	1.59 [2.13]
F- Test [p- value]		28.03 [0.0000]	24.65 [0.0000]	19.35 [0.0000]

Note: Institutional quality variables and human capital are expressed in natural logarithms. Robust errors in brackets. ***(**)[*] statistically significant at 1% (5%) [10%]. Estimations performed using Stata 16©

4.3.2. The mediating role of institutional quality

To assess the extent to which institutional quality plays a role in mitigating or augmenting the impact of countries' use of natural resources on economic growth, we have divided the sample countries into two groups, according to their positioning relative to the median of each institutional variable. We then proceeded to estimate the same specification for the two groups, to assess for differences. In Table 5 we present the estimations for resource rents in GDP and natural capital measures. [33]

Diagnosis tests (homoskedasticity and multicollinearity) suggest no evidence of serious multicollinearity exists. Thus, we corrected for heteroskedasticity considering the Huber- White consistent estimators of the variances, when necessary. We have also analysed correlation matrices for each model (see Table A. 2 to Table A. 9 in Annex).

As in the case of the full sample (Table 4), when we consider distinct institutional settings (Table 5), we find no evidence of a resource curse, i.e. a negative and significant association between natural resource intensity and economic growth. The regressors are generally insignificant, with even some positive and significant ones for countries with lower quality institutions.

This is not, however, completely antagonic to revised literature. This result might be connected to the types of resources covered in each specification. Many authors who find a significantly negative effect of natural resource intensity tend to find it especially when accounting for oil, gas and other minerals intensity (Badeeb et al., 2017). Majumder et al. (2020) for instance, find the preponderance of oil rents to, on average, decrease GDP pc., while Apergis & Katsaiti (2018) find natural gas intensity to increase poverty levels. The fact that we opted for a more general measure and received statistically insignificant results might be an indication that the effect is not so prevalent in other forms of resources, and the generalization of the term "resource curse" should be cautious.

One other relevant explanation for this phenomenon concerns period specific effects. Manzano & Rigoborn (2001), for instance, connect the "resource curse" to a drop in commodity prices in the 1980s relative to the 1970s. The rationale for this is quite simple. The decline in prices meant

[33] In Annex the results for natural resources exports are detailed – on Table A. 10, Table A. 11 and Table A. 12 . Results do not differ substantially.

many endowed countries, who had used expected resource revenues as debt collateral, were now in a position where they could hardly service the debt. We could argue (as Badeeb et al. (2017) does), that surpassing this problem, many endowed nations experienced high growth in the recent past, and that including a post-2000 period may revert the results.

Relative to the measure of per capita natural capital in subsoil assets, we find it to be positively related with economic growth across both subsamples. One interesting result is that, on average, natural resource abundance tends to create more benefits for the lower than for the higher halves. The explanation for this might lie in the way each of the institutional quality variables relates to natural resource intensity. Having a look at Figure 2 and Figure 3 above, one can grasp their behaviour. Both measures exhibit a negative association with institutional quality variables.

This might explain why increments in natural resource abundance are more beneficial for the lower halves of the samples. In face with a similar resource boom, and admiting similar extraction patterns, natural resources will have a larger impact in an economy where they present the main source of income.

Considering weaker institutions disregard future revenue streams too much (Frankel, 2012) and that high levels of corruption and unsafe property laws create the opportunity of excessive depletion (Kropf, 2010), together with the fact that resources typically make up a large share of these counties' economies, might explain these diverging results.

We may also want to consider the fact that a strong and spread out public sector, like autocracies typically are, might be more willing to absorb some of the losses to the overall economy, either through patronage and favor for favor associations (Robinson et al., 2006), excessive public spending, so they can remain in power.[34] Besides being very useful, from a political standpoint, these expenditures also help stimulate the economy. Additionally, from the public point of view, it might be preferable the revenues are spent right after being collected, than left in the hands of untrustworthy governors (Alesina et al., 2008). This may, as well, help explain why natural resource abundance produces more positive effects in lower institutional settings.

[34] The value of staying in power is increased, especially in the face of a resource boom that causes rents to be easily apprehensible by the elites (Kolstad & Wiig, 2009).

Table 5: The mediating effect of institutional quality on the impact of natural resource dependence/ abundance on economic growth: fixed effect panel data estimations

	Resource Rents/ GDP		Natural Capital pc.		Resource Rents/ GDP		Natural Capital pc.		Resource Rents/ GDP		Natural Capital pc.		Resource Rents/ GDP		Natural Capital pc.	
	Low Polity2	High Polity2	Low Polity2	High Polity2	Low corruption control	High corruption control	Low corruption control	High corruption control	Low Law & Order	High Law & Order	Low Law & Order	High Law & Order	Low bureaucracy quality	High bureaucracy quality	Low bureaucracy quality	High bureaucracy quality
Resource Rents/ GDP	0.0379 (0.0516)	0.0146 (0.0373)			0.0419 (0.0558)	0.0211 (0.0376)			0.0844*** (0.0157)	-0.0131 (0.0423)			0.0540** (0.0171)	0.0136 (0.0389)		
Natural Capital pc.			0.0824*** (0.0243)	0.0395*** (0.0120)			0.1347*** (0.0347)	0.0395** (0.0120)			0.0939*** (0.0057)	0.0495** (0.0237)			0.0946*** (0.0250)	0.0520*** (0.0187)
Human Capital	0.9722*** (0.1263)	1.2244*** (0.1148)	0.8004*** (0.1810)	1.0177*** (0.1450)	0.9197*** (0.1352)	1.2043*** (0.1181)	0.7140*** (0.1961)	1.0177*** (0.1450)	0.7952*** (0.0379)	1.4225*** (0.1768)	0.6121*** (0.0514)	1.2673*** (0.2111)	0.9878*** (0.0441)	1.0453*** (0.1611)	0.8719*** (0.1842)	0.9376*** (0.1901)
Trade Openness	-0.0009 (0.0013)	0.0016*** (0.0006)	-0.0008 (0.0011)	0.0017* (0.0010)	-0.0002 (0.0017)	0.0016 (0.0006)	-0.0001 (0.0013)	0.0017* (0.0009)	-0.0012* (0.0004)	0.0013** (0.0006)	-0.0007* (0.0004)	0.0014 (0.0010)	-0.0003 (0.0005)	0.0019* (0.0007)	-0.0001 (0.0012)	0.0015 (0.0011)
Physical Capital Formation	0.0011 (0.0034)	0.0053*** (0.0017)	0.0042 (0.0026)	0.0047** (0.0020)	0.0002 (0.0043)	0.0053 (0.0017)	0.0024 (0.0032)	0.0047** (0.0020)	0.0009 (0.0009)	0.0061** (0.0027)	0.0031*** (0.0009)	0.0061* (0.0032)	0.0014 (0.0010)	0.0031 (0.0025)	0.0033 (0.0032)	0.0029 (0.0023)
TFP growth	0.0020 (0.0017)	0.0015 (0.0017)	-0.0002 (0.0023)	0.0006 (0.0025)	0.0022 (0.0020)	0.0014 (0.0017)	-0.0012 (0.0022)	0.0006 (0.0025)	0.0024** (0.0008)	0.0015 (0.0018)	0.0018 (0.0012)	0.0012 (0.0024)	0.0022 (0.0008)	-0.0035 (0.0029)	-0.0011 (0.0020)	-0.0024 (0.0026)
No. Obs.	1600	1619	1251	1222	1515	1619	1164	1222	1562	1572	1186	1200	1543	1562	1183	1179
No. Countries	63	58	56	52	58	58	51	52	58	58	51	52	59	56	52	50
Breusch-Pagan Statistic [p- value]	46.42 [0.0000]	7.20 [0.0073]	37.01 [0.0000]	15.36 [0.0001]	32.59 [0.0000]	220.97 [0.0000]	25.71 [0.0000]	136.19 [0.0000]	2.66 [0.1032]	74.75 [0.0000]	0.63 [0.4285]	33.43 [0.0000]	1.29 [0.2557]	142.04 [0.0000]	2.87 [0.0904]	94.40 [0.0000]
Mean VIF [Max VIF]	1.10 [1.21]	1.11 [1.19]	1.18 [1.43]	1.11 [1.20]	1.13 [1.31]	1.13 [1.27]	1.15 [1.35]	1.08 [1.11]	1.10 [1.18]	1.11 [1.24]	1.09 [1.21]	1.07 [1.10]	1.12 [1.26]	1.10 [1.20]	1.12 [1.28]	1.07 [1.12]
F- Test [p- value]	15.00 [0.0000]	228.23 [0.0000]	14.73 [0.0000]	34.28 [0.0000]	12.02 [0.0000]	43.45 [0.0000]	70.31 [0.0000]	34.28 [0.0000]	115.01 [0.0000]	29.96 [0.0000]	184.85 [0.0000]	20.08 [0.0000]	129.12 [0.0000]	21.20 [0.0000]	95.31 [0.0000]	12.29 [0.0000]

Note: Institutional Quality variables and Human Capital are expressed in natural logarithms. Fixed effects; robust errors in brackets. ***(**)[*] statistically significant at 1% (5%) [10%]. Estimations using Stata 16©

5. Conclusions

Concern over the efficiency of resource-based growth have existed long before the 1970s and 80s drama on the Dutch continental shelf (The Economist, 1977). Indeed, one can say it is as old as resource-based growth, itself (Czelusta & Wright, 2004; Sachs & Warner, 1995).

To discuss this matter, it is useful to distinguish between resource dependence/ intensity measures —a flow variable that expresses income derived from resources at some point, it also expresses the degree to which countries have access to alternative sources of income—, and abundance —a stock variable that expresses a country's estimated resource wealth—. Although they are correlated, one does not necessarily lead to the other. A general idea that a high natural resource reliance would delay economic growth was formed in the later stages of the XX century (Gilberthorpe & Papyrakis, 2015). However, recent literature (Brunnschweiler & Bulte, 2008) has found that proxying natural resource abundance by a stock variable, such as the value of known resource pools, would significantly revert these results, and present a significantly positive regressor.

The aim of this research was to put both ideas to the test. For that purpose, we collected data on a panel of countries, over a period spanning from 1985 to 2018. Relevant variables include per capita income growth, the shares of natural resource rents per GDP and resource exports per total exports, as well as 2014 values of per capita subsoil assets.

We found no evidence of a resource curse, at least in the terms in which it was originally specified: a negative association between natural resource intensity and income. Furthermore, changing the natural resource abundance proxy was found to significantly alter the results, for the better.

The second question to which this dissertation aimed to respond was the mediating value of institutions. Indeed, many of the arguments supporting the purported resource curse seemed to be conditional on low quality institutions, that would promote appropriation and rent seeking behaviors (Frankel, 2012).

Our results, however, seem to contradict this hypothesis. None of natural resource intensity measures proved to be significant in explaining economic growth in the countries with better institutions, while often proving to be, in fact, enhancing economic growth in countries with lower quality institutions.

Reserves of a natural resource also proved to be positive and significantly related to economic growth across both subsamples but presented a higher average regressor for the lower halves of each division. This means that, ceteris paribus, in this sample, a resource discovery, or increasing terms of trade, are more beneficial to countries with lower quality institutions. We believe this is related to the profile of resource intensity of low-quality institution economies, as well as other political considerations.

With this study, we contribute to the resource curse literature in two ways. First and foremost, we find no evidence of a natural resource curse, as well as distinct growth implications according to the measurement chosen to proxy natural resource abundance. We corroborate the hypothesis that natural resources tend to be beneficial, rather than a curse, to the countries that hold them. Moreover, our regressions have demonstrated the growth potential of natural resources is higher in countries with lower institutional settings. In short, it appears the idea resources delay economic growth presents itself as a red herring. In fact, they present the potential for economic improvement, and focus should be cast on governing institutions.

These results, which partly run against our expectations, present relevant policy implications. The first, and most obvious, is that the fears over resource-based growth seem to have been exaggerated. The statistical insignificance of resource intensity, together with the positive effect of natural capital on growth, advise they be used according to each countries' comparative advantage in resource extraction.

Furthermore, the fact that natural endowments are seemingly more advantageous to developing nations, suggests they can and should be used as leverage to improve their positions. Provided they have national institutions who make sure resource revenues do not fall into the hands of an elite and are used to create actual benefits for a wider range of people, as well as the ability to transition to a more diversified economy, our results show natural resources industries have the potential to improve living standards.

However, these results should not be interpreted as definite. The inexistence of a resource curse in this particular sample, and for this period does not refute the concept altogether. More work needs to be done to assess the validity and robustness of our results.

Specifically, these results might be determined by other factors, correlated with the quality with which countries make use of resource pools or their revenues that were not included in our regression, or by the method we chose to create our subsamples. A study that addresses these issues in a different way might prove useful in falsifying or corroborating the results obtained here.

Additionally, it can be argued that the insignificance of the resource curse phenomenon in our sample may just mean natural resources do not affect our choice of variable: per capita income. A more thorough research, specifically resorting to a variable that better accounts for inequalities and/ or development in a broader sense, could be advised.

Furthermore, there is plausible evidence that there might be negative spillover effects from natural resource dependence on growth inducing variables, such as human capital (Behbudi et al., 2010) and on the transition to democracy (McFerson, 2010; Ross, 2015), and the inability of for certain resourceful countries to develop non- primary sectors and reducing their dependence (Brunnschweiler & Bulte, 2008). Testing on different samples, time periods and on different variables might help to produce more robust results.

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Annexes

Table A. 1: Correlation matrix for the full sample

	loggdppc	*logexp*	*logrents*	*lognatcap*	*Logpolity2*	*logcorr*	*loglaworder*	*logbq*	*loghumcap*	*trade*	*invest*	*tfpg*
Loggdppc	1											
Logexp	**0.0595***	1										
Logrents	**-0.3206***	**0.6271***	1									
Lognatcap	**0.3695***	**0.5911***	**0.4722***	1								
Logpolity2	**0.1913***	**-0.3226***	**-0.5586***	**-0.2837***	1							
Logcorr	**0.4640***	**-0.2654***	**-0.4295***	-0.0134	**0.2884***	1						
Loglaworder	**0.5730***	**-0.1797***	**-0.3384***	-0.0094	**0.1595***	**0.5793***	1					
Logbq	**0.6169***	**-0.2720***	**-0.5027***	**0.0527***	**0.3585***	**0.6358***	**0.5577***	1				
Loghumcap	**0.7240***	0.0295	**-0.3970***	**0.2443***	**0.2798***	**0.3883***	**0.4718***	**0.5339***	1			
Trade	**0.3644***	**-0.0684***	**-0.1854***	**-0.0452***	-0.0180	**0.1751***	**0.2934***	**0.233***	**0.3053***	1		
Invest	**0.0693***	**-0.0405***	**-0.0341***	-0.0300	**0.0818***	**0.1052***	**0.1471***	**0.0505***	**0.1088***	**0.1295***	1	
Tfpg	-0.039	-0.0268	-0.0071	**-0.0424***	0.0218	0.0006	**0.0472***	0.0283	**0.0498***	0.0122	**0.0497***	1

Note: * indicates 10% significance.

Table A. 2: Correlation matrix for countries with below median Polity2 mean score

	loggdppc	*logexp*	*logrents*	*lognatcap*	*lughumcap*	*trade*	*invest*	*tfpg*
Loggdppc	1							
Logexp	**0.4686***	1						
Logrents	**0.1311***	**0.5276***	1					
Lognatcap	**0.5914***	**0.6443***	**0.5482***	1				
Loghumcap	**0.5957***	**0.3126***	**-0.1121***	**0.3664***	1			
Trade	**0.4914***	**0.0832***	**-0.1180***	**0.0524***	**0.3845***	1		
Invest	**0.0768***	0.0188	0.0192	-0.0034	0.1828	**0.1828***	1	
Tfpg	-0.0189	-0.0383	-0.0099	-0.297	**0.0598***	-0.0081	0.0357	1

Table A. 3: Correlation matrix for countries with above median Polity2 mean score

	loggdppc	*logexp*	*logrents*	*lognatcap*	*lughumcap*	*trade*	*invest*	*tfpg*
Loggdppc	1							
Logexp	**-0.1587***	1						
Logrents	**-0.3953***	**0.7213***	1					
Lognatcap	**0.1527***	**0.5970***	**0.5785***	1				
Loghumcap	**0.7036***	**-0.0549***	**-0.2895***	**-0.1980***	1			
Trade	**0.2960***	**-0.1763***	**-0.2895***	**-0.1980***	**0.3272***	1		
Invest	**0.1023***	**-0.1717***	**-0.1986***	**-0.0993***	**0.0509***	**0.0623***	1	
Tfpg	**0.0938***	-0.0283	-0.0259	**-0.0897***	**0.1218***	**0.0412***	**0.0882***	1

Table A. 4: Correlation matrix for countries with below median Corruption mean score

	loggdppc	*logexp*	*logrents*	*lognatcap*	*lughumcap*	*trade*	*invest*	*tfpg*
Loggdppc	1							
Logexp	**0.4037***	1						
Logrents	**0.0928***	**0.5958***	1					
Lognatcap	**0.4953***	**0.5986***	**0.5366***	1				
Loghumcap	**0.6282***	**0.2960***	**-0.1096***	**0.2828***	1			
Trade	**0.4056***	**0.1218***	**0.0781***	**0.1415***	**0.4563***	1		
Invest	-0.0262	-0.0410	**0.0855***	0.0338	**0.1295***	**0.15111***	1	
Tfpg	-0.0083	-0.0420	-0.0063	-0.0281	**0.0445***	**0.0450***	**0.0830***	1

Table A. 5: Correlation matrix for countries with above median Corruption Control mean score

	loggdppc	*logexp*	*logrents*	*lognatcap*	*lughumcap*	*trade*	*invest*	*tfpg*
Loggdppc	1							
Logexp	0.0335	1						
Logrents	**-0.3672***	0.6187	1					
Lognatcap	**0.3412***	**0.5762***	**0.5036***	1				
Loghumcap	**0.7780***	**-0.0768***	**-0.4435***	**0.2234***	1			
Trade	**0.3099***	**-0.0461***	**-0.1801***	**-0.1279***	**0.1725***	1		
Invest	0.0285	0.0023	**-0.0911***	-0.0655	-0.0222	**0.1640***	1	
Tfpg	0.0024	**-0.0686***	**-0.0751***	**-0.0995***	**0.0415***	0.0078	-0.0752	1

Table A. 6: Correlation matrix for countries with below median Law & Order mean score

	loggdppc	*logexp*	*logrents*	*lognatcap*	*lughumcap*	*trade*	*invest*	*tfpg*
Loggdppc	1							
Logexp	**0.2626***	1						
Logrents	**-0.0533***	**0.5915***	1					
Lognatcap	**0.4739***	**0.6081***	**0.4939***	1				
Loghumcap	**0.6533***	**0.2137***	**-0.1631***	**0.3134***	1			
Trade	**0.2578***	**0.1477***	**0.1491***	**0.1467***	**0.2888***	1		
Invest	**0.0605***	**0.0919***	**0.1538***	**0.0875***	**0.1355***	**0.2241***	1	
Tfpg	-0.0120	0.0268	0.0199	0.0231	0.0329	0.0061	**0.0481***	1

Table A. 7: Correlation matrix for countries with above median Law & Order mean score

	loggdppc	*logexp*	*logrents*	*lognatcap*	*lughumcap*	*trade*	*invest*	*tfpg*
Loggdppc	1							
Logexp	**0.1409***	1						
Logrents	**-0.2612***	**0.6773***	1					
Lognatcap	**0.3289***	**0.5839***	**0.5637***	1				
Loghumcap	**0.6736***	-0.0264	**-0.4290***	**0.1211***	1			
Trade	**0.2382***	**-0.0523***	**-0.1413***	**-0.1759***	**0.1332***	1		
Invest	**-0.1259***	**-0.1922***	**-0.1351***	**-0.1302***	**-0.0742***	**0.0405***	1	
Tfpg	-0.0309	**-0.1119***	**-0.0516***	**-0.1407***	0.0329	0.0077	**0.0497***	1

Table A. 8: Correlation matrix for countries with below median Bureaucracy Quality mean score

	loggdppc	*logexp*	*logrents*	*lognatcap*	*lughumcap*	*trade*	*invest*	*tfpg*
Loggdppc	1							
Logexp	**0.3497***	1						
Logrents	**0.0465***	**0.6024***	1					
Lognatcap	**0.5444***	**0.6521***	**0.5376***	1				
Loghumcap	**0.6200***	**0.1773***	**-0.1733***	**0.3005***	1			
Trade	**0.3672***	**0.1801***	**0.1072***	**0.2159***	**0.4068***	1		
Invest	0.0081	**0.0564***	**0.0781***	0.0276	**0.1638***	**0.1896***	1	
Tfpg	-0.0226	-0.0025	0.0165	-0.0097	0.0301	0.0142	**0.0497***	1

Table A. 9: Correlation matrix for countries with above median Bureaucracy Quality mean score

	loggdppc	*logexp*	*logrents*	*lognatcap*	*lughumcap*	*trade*	*invest*	*tfpg*
Loggdppc	1							
Logexp	**-0.0546***	1						
Logrents	**-0.3063***	**0.7123***	1					
Lognatcap	**0.1656***	**0.5057***	**0.6001***	1				
Loghumcap	**0.7199***	**-0.1099***	**-0.3644***	**0.0747***	1			
Trade	**0.3204***	**-0.0919***	**-0.1864***	**-0.2125***	**0.1803***	1		
Invest	**0.0481***	**-0.2129***	**-0.1334***	**-0.0915***	0.0180	**0.1351***	1	
Tfpg	-0.-212	**-0.1466***	**-0.1041***	**-0.1503***	**0.0463***	0.0208	0.0643	1

Table A. 10: Natural Resource Exports/ Total Exports and its effects on growth

	Low Polity2	High Polity2	Low Corruption	High Corruption	Low L/ Order	High L/ Order	Low BQ	High BQ
Resource Exports/ Total Exp.	0.0293 (0.0271)	-0.0138 (0.0200)	0.0268 (0.0276)	-0.0058 (0.0187)	**0.0360***** (0.0104)	-0.0200 (0.0326)	0.0018 (0.0232)	0.0384 (0.0251)
Human Capital	**1.0951***** (0.1265)	**1.2775***** (0.1699)	**1.0748***** (0.1409)	**1.2262***** (0.1293)	**0.9338***** (0.0409)	**1.4407***** (0.1944)	**1.1510***** (0.1442)	**1.0663***** (0.1386)
Trade	0.0002 (0.0011)	**0.0027**** (0.0009)	0.0010 (0.0015)	**0.0017***** (0.0006)	0.0006 (0.0004)	**0.0014**** (0.0007)	0.0012 (0.0014)	**0.0017**** (0.0007)
Investment / GDP	0.0008 (0.0025)	**0.0076***** (0.0023)	0.0012 (0.0031)	**0.0044**** (0.0019)	0.0015 (0.0010)	**0.0055*** (0.0028)	0.0021 (0.0032)	0.0028 (0.0024)
TFP growth	-0.0023 (0.0028)	-0.0011 (0.0024)	-0.0037 (0.0033)	0.0014 (0.0018)	-0.0026 (0.0014)	0.0009 (0.0020)	-0.0012 (0.0027)	-0.0031 (0.0025)
Obs.	1253	1616	1251	1569	1306	1514	1269	1533
Countries	60	60	57	59	57	59	58	57
Breusch-Pagan/ Cook-Weisberg Statistic [p- value]	13.08 [0.0003]	15.92 [0.0001]	54.11 [0.0000]	267.37 [0.0000]	1.49 [0.2215]	88.50 [0.0000]	2.82 [0.0930]	167.64 [0.0000]
Mean VIF [Max VIF]	1.14 [1.35]	1.08 [1.17]	1.18 [1.41]	1.03 [1.06]	1.07 [1.13]	1.05 [1.08]	1.10 [1.22]	1.05 [1.06]
F- Test	23.91 [0.0002]	165.04 [0.0000]	13.39 [0.0000]	42.89 [0.0000]	135.13 [0.0000]	35.29 [0.0000]	15.63 [0.0000]	27.32 [0.0000]
Estimation Method	Fixed Effects	Random Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects

Note: Institutional Quality variables and Human Capital are expressed in natural logarithms. Robust errors in brackets. ***(**)[*] statistically significant at 1% (5%) [10%]. Estimations using Stata 16©

Table A. 11:Natural Resource Rents/ GDP and its effects on growth

	Low Polity2	High Polity2	Low Corruption	High Corruption	Low L/ Order	High L/ Order	Low BQ	High BQ
Resource Rents/ GDP	0.0379 (0.0516)	0.0146 (0.0373)	0.0419 (0.0558)	0.0211 (0.0376)	**0.0844***** (0.0157)	-0.0131 (0.0423)	**0.0540**** (0.0171)	0.0136 (0.0389)
Human Capital	**0.9722***** (0.1263)	**1.2244***** (0.1148)	**0.9197***** (0.1352)	**1.2043***** (0.1181)	**0.7952***** (0.0379)	**1.4225***** (0.1768)	**0.9878***** (0.0441)	**1.0453***** (0.1611)
Trade	-0.0009 (0.0013)	**0.0016***** (0.0006)	-0.0002 (0.0017)	0.0016 (0.0006)	**-0.0012*** (0.0004)	**0.0013**** (0.0006)	-0.0003 (0.0005)	**0.0019*** (0.0007)
Investment / GDP	0.0011 (0.0034)	**0.0053***** (0.0017)	0.0002 (0.0043)	0.0053 (0.0017)	0.0009 (0.0009)	**0.0061**** (0.0027)	0.0014 (0.0010)	0.0031 (0.0025)
TFP growth	0.0020 (0.0017)	0.0015 (0.0017)	0.0022 (0.0020)	0.0014 (0.0017)	**0.0024**** (0.0008)	0.0015 (0.0018)	0.0022 (0.0008)	-0.0035 (0.0029)
Obs.	1600	1619	1515	1619	1562	1572	1543	1562
Countries	63	58	58	58	58	58	59	56
Breusch-Pagan/ Cook-Weisberg Statistic [p- value]	46.42 [0.0000	7.20 [0.0073]	32.59 [0.0000]	220.97 [0.0000]	2.66 [0.1032]	74.75 [0.0000]	1.29 [0.2557]	142.04 [0.0000]
Mean VIF [Max VIF]	1.10 [1.21]	1.11 [1.19]	1.13 [1.31]	1.13 [1.27]	1.10 [1.18]	1.11 [1.24]	1.12 [1.26]	1.10 [1.20]
F- Test	15.00 [0.0000]	228.23 [0.0000]	12.02 [0.0000]	43.45 [0.0000]	115.01 [0.0000]	29.96 [0.0000]	129.12 [0.0000]	21.20 [0.0000]
Estimation Method	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects

Note: Institutional Quality variables and Human Capital are expressed in natural logarithms. Robust errors in brackets. ***(**)[*] statistically significant at 1% (5%) [10%]. Estimations using Stata 16©

Table A. 12: Natural Capital per capita and its effects on growth

	Low Polity2	High Polity2	Low Corruption	High Corruption	Low L/ Order	High L/ Order	Low BQ	High BQ
Natural Capital pc.	**0.0824***** (0.0243)	**0.0395***** (0.0120)	**0.1347***** (0.0347)	**0.0395**** (0.0120)	**0.0939***** (0.0057)	**0.0495**** (0.0237)	**0.0946***** (0.0250)	**0.0520***** (0.0187)
Human Capital	**0.8004***** (0.1810)	**1.0177***** (0.1450)	**0.7140***** (0.1961)	**1.0177***** (0.1450)	**0.6121***** (0.0514)	**1.2673***** (0.2111)	**0.8719***** (0.1842)	**0.9376***** (0.1901)
Trade	-0.0008 (0.0011)	**0.0017*** (0.0010)	-0.0001 (0.0013)	**0.0017*** (0.0009)	**-0.0007*** (0.0004)	0.0014 (0.0010)	-0.0001 (0.0012)	0.0015 (0.0011)
Investment/ GDP	0.0042 (0.0026)	**0.0047**** (0.0020)	0.0024 (0.0032)	**0.0047**** (0.0020)	**0.0031***** (0.0009)	**0.0061*** (0.0032)	0.0033 (0.0032)	0.0029 (0.0023)
TFP growth	-0.0002 (0.0023)	0.0006 (0.0025)	-0.0012 (0.0022)	0.0006 (0.0025)	0.0018 (0.0012)	0.0012 (0.0024)	-0.0011 (0.0020)	-0.0024 (0.0026)
Obs.	1251	1222	1164	1222	1186	1200	1183	1179
Countries	56	52	51	52	51	52	52	50
Breusch-Pagan/ Cook-Weisberg Statistic [p- value]	37.01 [0.0000]	15.36 [0.0001]	25.71 [0.0000]	136.19 [0.0000]	0.63 [0.4285]	33.43 [0.0000]	2.87 [0.0904]	94.40 [0.0000]
Mean VIF [Max VIF]	1.18 [1.43]	1.11 [1.20]	1.15 [1.35]	1.08 [1.11]	1.09 [1.21]	1.07 [1.10]	1.12 [1.28]	1.07 [1.12]
F- Test	14.73 [0.0000]	34.28 [0.0000]	70.31 [0.0000]	34.28 [0.0000]	184.85 [0.0000]	20.08 [0.0000]	95.31 [0.0000]	12.29 [0.0000]
Estimation Method	Fixed Effects	Fixed Effects	Random Effects	Fixed Effects	Fixed Effects	Fixed Effects	Random Effects	Fixed Effects

Note: Institutional Quality variables and Human Capital are expressed in natural logarithms. Robust errors in brackets. ***(**)[*] statistically significant at 1% (5%) [10%]. Estimations using Stata 16©