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Review of Economic Perspectives – Národohospodářský obzor
Vol. 22, Issue 1, 2022, pp. 3–23, DOI: 10.2478/revecp-2022-0001

Natural Resource Revenue Management: Which Institutional Factors Matter?

Monika Smělá[1] and Jiří Sejkora[2]

Abstract: The paper deals with the topic of natural resource revenue management and the institutional background, it researches the impact of the institutional environment on a particular part of resource governance, the revenue governance. The Resource Governance Index is used as the crucial concept for the whole analysis. Using qualitative comparative analysis, it aims to find out which conditions, and their combinations, concerning the institutional background, lead to higher levels of revenue management. Firstly, it was found that individual institutional aspects impact the revenue management differently. The second finding is that voice and accountability is a sufficient condition for reaching higher levels of revenue management. On the contrary, the dimension of political stability and the absence of violence is an irrelevant condition. All the institutional aspects excluding political stability and the absence of violence create a consistent pathway to better achievements in revenue management, namely national budgeting, and subnational resource revenue sharing.

Keywords: qualitative comparative analysis, institutions, natural resource management

JEL classification: Q28, Q34, O43

Received: 8 May 2021 / Accepted: 12 January 2022 / Sent for Publication: 10 March 2022

Introduction

Since Sachs and Warner (1995) empirically proved the existence of the natural resource curse, highlighting the fact that there is a negative relation between natural resource abundance and economic growth, a lot of papers on this topic have been published. The papers researched the issue from various points of view to find the factors by which this interdependence is caused and why natural resource deposits become a blessing for some countries, while it is a curse for other territories.

Some authors lean towards an explanation of this issue through the phenomena of the Dutch disease. According to this theory, when a boom in an extractive sector happens, this sector starts to be preferred, which consequently leads to neglecting non-extractive

[1] Corresponding author. Prague University of Economics and Business, Faculty of International Relations, Department of International Economic Relations, nam. Winstona Churchilla 1938/4, 130 67, Prague 3, the Czech Republic. E-mail: xsmem28@vse.cz
[2] Prague University of Economics and Business, Faculty of International Relations, Department of International Economic Relations, nam. Winstona Churchilla 1938/4, 130 67, Prague 3, the Czech Republic. E-mail: jiri.sejkora@vse.cz

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sectors. Especially agricultural and manufactural exports are hindered, and these sectors are crowded out. This becomes the channel through which the real exchange rate appreciation is spread, and the economy suffers from the Dutch disease. In fact, the country endowed with the natural resource is worse off after the extractive boom.

Other researchers pioneered the role of taxation and poor performances in this field (Busse, Gröning 2011), another presented an opinion on this topic outlining the volatility of commodity prices. However, there are plenty of papers and research implying that the role of the institutional background becomes a crucial aspect in countries rich in natural resources (Haufler 2010, Gupta 2008, Empremian et al. 2016, Joshi 2013). The papers emphasise various institutional aspects, such as corruption (Bhattacharyya, Hodler 2009, Torvik 2000), rule of law (Bulte et al. 2005, Murshed 2004) or violent conflicts (Alao 2007, Collier, Hoeffler 2002, Humphreys 2005), having generally a negative impact on the natural resource governance.

This paper empirically examines the relations between institutional background in countries endowed with natural resources and their impact on the natural resource management, specifically on the part of revenue management. The main goal of the paper is to find out which conditions of institutional settings, or their combinations, lead to a higher level of revenue management of natural resources. As natural resource revenue management is a complex problem covering a lot of aspects and issues, the goal of the paper is not to provide any information or best practices on how efficient revenue management should be performed. We adopt the method of fuzzy-set qualitative comparative analysis (fsQCA), focusing on combinations of conditions producing an outcome rather than on an analysis of effects on individual variables. By employing this method, we want to address this topic from a different point of view that has not been performed yet. The institutional background in this paper is examined by its individual dimensions which contrasts with other research in this field aiming at one individual institutional issue or institutional background from a general perspective (Raagle 2017, Mehta et al. 1999).

The study is based on data available from the Resource Governance Index (RGI), measuring the quality of governance in the oil, gas, and mining sectors in three basic areas – value realisation, revenue management and enabling environment. The areas of revenue management and enabling environment will be used in the following research. Our dataset includes 17 developing countries from the whole world. These countries were chosen based on the fullness of data reported by the 2017 Resource Governance Index. Moreover, this sample size fulfils all the criteria put on the sample size in QCA research.

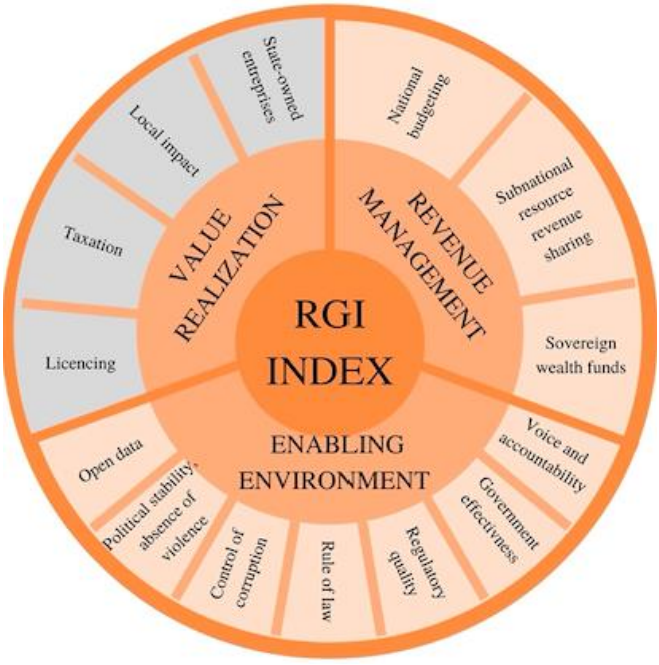
The paper is organised as follows; section 2 provides a theoretical background to the topic introducing the most important institutional elements that can undoubtedly influence the natural resource governance in all the countries. In addition, the approach of RGI is explained in this section, as the paper is based on this concept. Consequently, section 3 presents the method of qualitative comparative analysis itself, to become familiar with the applied methodology. Section 4 covers the empirical outcomes, as it reports the way and the results of the performed analysis. This section is followed by a discussion on the main findings.

Literature review

Natural resource management plays a crucial role in some economies, especially the ones dependent on activities associated with natural resources. There are a few concepts and initiatives aiming at the evaluation of such countries. The Resource Governance Index (RGI), measuring the quality of governance in the oil, gas and mining sectors, issued by the Natural Resource Governance Institute (NRGI), is the only international index dedicated to resource governance (Natural Resource Governance Institute 2021). It is also used as an underlying concept in the paper. For this reason, the whole chapter first presents an overview of the RGI as the crucial framework of the research and consequently the individual dimensions of enabling environment and their impact on revenue management are introduced.

As its concept will be used in the following analysis, it is important to define what is exactly assessed by the RGI. There are three components in the RGI – value realisation, revenue management and enabling environment, each of them representing a certain aspect of resource governance. Consequently, these components are hierarchically divided into individual subcomponents, indicators, and questions (see Figure 1). All these elements are combined to create a score for an assessed country.

Figure 1. Detailed decomposition of the Resource Governance Index



Source: NRGI 2021, own adaptation

The questions create a backbone to the questionnaire which is given to certain independent researchers with knowledge of resource governance as well as knowledge of

the country they evaluate. Afterwards, these answers, their justification and underlying arguments are validated by peer reviewers to avoid any errors. Finally, the answers by the researchers and peer reviewers are appraised by the NRGI staff to find out if there are any differences in the answers of the researcher and peer reviewer.

Concerning the value realisation and revenue management scores, the answers are scaled from 0 to 100 (meaning the extent to which the question corresponds to the practice in the country), moreover, there is always a possibility to choose the answer "not applicable/other" in case the field of natural resource governance does not correspond to the overall score. The scores for the component of the enabling environment are sourced from the Worldwide Governance Indicators project, disregarding one subcomponent – the open data. It is scored on the basis of three databases dealing with this topic (Natural Resource Governance Institute 2021).

As all the individual elements of the RGI are equal, the same weights are given to them and the final RGI score is assigned on the basis of a simple average of three components, which are calculated as the simple average of the scores across subcomponents and similarly to the last level of individual questions.

As the research deals with two RGI components – revenue management and enabling environment, it is necessary to understand what they cover in a more detailed way. Revenue management reflects three main precepts – taxation, revenue distribution and revenue volatility. For this reason, it deals with the most crucial aspects like budgeting, resource revenue sharing and sovereign wealth funds.

The management of revenues gained from extractive activities is extremely important for countries rich in natural resources. If it is based on good practices, it provides public revenues, which are a certain compensation for extracting the country's wealth (Durst 2016). However, many countries are not able to create a taxation system reflecting extractive activities. For this reason, they are not able to make use of their potential to generate economic growth. The enabling environment covers voice and accountability, government effectiveness, regulatory quality, rule of law, control of corruption, political stability and the absence of violence and lastly open data, meaning aspects that measure the governance quality in a country as a whole.

The RGI index includes this component assuming that resource production and the way how it affects individual countries is a combination of both specific rules and practices applied to the extractive sector, the revenues from these activities, and the general governance in a country. Its level impacts resource management in both ways, it can either enable or disable the way how the natural resources are governed.

This fact is also outlined by other researchers and academics, who highlight the importance of institutional factors in the context of natural resource governance (Gupta 2008, Haufler 2010, Mason 2010, Empremian et al. 2016, Lujala, Empremian 2017, Isham et al. 2005). If these factors are not kept on a certain level, it consequently contributes to a phenomenon called the natural resource curse, a hypothesis outlining the fact that countries rich in natural resources tend to grow more slowly than the less resourced ones or the ones without any natural resource wealth (Auty 1995). Effective natural resource governance, especially in developing countries, is the key element in

natural resource sustainability. The following literature review is based on research and findings from existing literature on developing countries unless otherwise stated.

Generally, there has been an increasing interest in transparency in the extractive sector in recent decades. For this reason, the RGI dimension of open data is relational to the voice and accountability dimension. Transparency is understood as the ability of governments, companies, and organisations to disclose information freely, regularly and in a clear way (Transparency International 2021). It means to provide the public with open data. In the case of the mining sector, it means that all the institutions involved in the extraction process act understandably, visibly, and predictably regarding the revenue management practices. As is observed in some papers, transparency as a moral imperative is closely associated with the idea of accountability and, consequently, inclusive governance (Gupta 2008, 1-2).

Proponents of open data in natural resource revenue management argue that there should be public disclosure both by mining companies and governments. Concerning the scope of information which should be published, they deal with a huge list, covering not just revenue topics, but e. g., detailed information on the binding process, details on signed mining contracts, payments made by companies to governments, etc. The efforts to enhance open data and accountability are present primarily in states which are either failed or where a repressive regime is applied (Haufler 2010, 58).

Thanks to open data and accountability, revenue management is performed efficiently, cooperation is developed as well as mismanagement is reduced and the legitimacy of institutions increases (Greif, Laitin 2004, Gupta 2008). Enhancing open data disclosure in the mining sector leads to the most important goal of performing better management of high-value natural resources, particularly the incomes arising from natural resource extraction (Haufler 2010, 59). Increasing these two RGI dimensions is a basic element to enhancement as it subsequently influences other aspects of institutional settings. Providing open data and supporting accountability will lower both the level of corruption and fraud activities, contribute to more equal distribution of revenues, and reduce the risk of conflicts (Haufler 2010, 58-60).

Moreover, the disclosure of the above-mentioned information results in higher mobilisation of the public and its voice, which can afterwards use it to verify the government's accountability. According to Publish What You Pay (PWYP), an influential initiative promoting transparency in revenue management in the extractive sector, this approach towards voice and accountability will establish a debate over effective resource allocation and will be used to fulfil some development objectives (Publish What You Pay International Secretariat 2019, 8-9). However, promoting these practices in natural resource management does not improve only this area, it goes even beyond it. As open data and accountability are relational, it supports other social purposes and values (Mason 2010, 9), which consequently builds up foundations for more effective and stable governance from the general point of view, which is reflected in natural resource revenue management.

Understanding open data disclosure as a causal process was also highlighted by other authors (Epremian et al. 2016, Lujala, Epremian 2017), in fact open data, voice and accountability in the extracting sector are underpinned by the fact that providing the general public with information will lead to their empowerment (Joshi 2013, 7).

Afterwards, it will lead the government to become more responsive to these active citizens (Epremian et al. 2016, 7-10) and consequently take certain actions in the field of revenue management in the mining sector. Nowadays, most open data, voice and accountability policies and initiatives are based directly on this relationship.

Following this pattern, many open data, voice and accountability initiatives were formed in the mining sector to improve these issues in the field. One of the most influential ones is the Extractive Industries Transparency Initiative (EITI) promoting extraction transparency in its member countries. Alongside the engagement of PWYP, it supports strengthening the role and impact of civil society in the management of natural resources (EITI 2021a). Despite certain criticism of these transparency and accountability initiatives (including EITI), like the fact they lack robust theories of change to explain how improved governance is linked to improving development outcomes (Acosta 2013, 93-94), the initiatives show some results. They are more encouraging in a longer time period after the initiative is implemented in a certain country. A study on the example of Ghana, an EITI member country since 2007 (EITI 2021b), was made on this topic and the final results are mixed. Basically, access to open data and broader information on resources was not able to reach much of the population, however, it is difficult to state to which extent this can be associated with Ghana's negative mining experience. On the other hand, citizens informed about these issues are more likely to share it further with their family or friends and they are also more likely to provoke a debate on this topic (Brunnschweiler et al. 2019, 14-23).

Regardless of certain gaps of open data and accountability initiatives, generally, the idea of promoting these principles in the extractive sector became pivotal for actions in other agendas, such as the fight with corruption, conflicts, or rule of law (Haufler 2010, 68-70). Extractive transparency is a rational basic step that can be taken to mitigate the risk of natural resource exploitation in countries rich in natural resources and to create an environment to promote its revenue management on a higher level.

The dimension of the control of corruption is widely discussed in association with natural resource governance. A few theoretical models tackling the relations between corruption and natural resources were published. Resource revenues and rents tend to decrease market competition, which creates an environment where bureaucracy and corruption are encouraged (Ades, Di Tella 1999). A lot of research confirmed the assumption that the higher the exports of natural resources in a certain economy, the higher the level of corruption, and less effective natural resource revenue management is conducted. This relationship was confirmed by Treisman (2000), who shows that the proportion of total exports numbering fuel, minerals and metals is a robust determinant for corruption. The same dependency was found by Isham et al. (2005), moreover, he revealed that this interdependency is the most significant with so-called point source natural resources, meaning those extracted from a narrow geographical or economic base (Isham et al. 2005, 143).

A study led by Bhattacharyya and Hodler (2009), also considering the role of democratic institutions in forming relationships between corruption and natural resource management, came to an interesting conclusion. Natural resources feed corruption and negatively affect the revenue management only if the quality of democratic institutions is below a certain level. Particularly, resource revenues are positively correlated with

corruption in countries that have a POLITY2[3] score of 8.5 points or less (Bhattacharyya, Hodler 2009, 609). This is a finding indicating that countries rich in natural resources tend to be corrupt as a result of their governments taking part in rent-seeking. Generating higher productivity is associated with the fact that each group of citizens desires to gain a higher share of production in the form of transfers, which harms the revenue management of natural resources. However, the redistribution effect can lead to a fall in growth (Lane, Tornell 1996). Taking into consideration another RGI dimension of government effectiveness, governments are responsible for managing the resources for both current and future generations. For this reason, an inclusive and comprehensive strategy should be set on a national level. Such a strategy should be long-term, since transforming natural resources into wealth takes a long time. The success of the national strategy is supported by inclusivity, the public, as well as all other stakeholders, should be involved in the process (NRGI 2021, 7-9). Moreover, Torvik (2000) developed a simple theory as to why natural resources diminish welfare, and the key element of this dependency is the phenomena of rent-seeking. Basically, being endowed with more natural resources increases the number of politicians taking part in rent-seeking, which reduces revenues arising from natural resource extraction. On the basis of this research, natural resource revenue management is less effectively run in countries rich in natural resources compared to their counterparts. Government effectiveness is closely connected to another RGI dimension, regulatory quality. Bulte et al. (2005), exploring the impact of natural resources on human development indicators through the channel of institutional quality, concluded that point resources are typically associated with less productive social institutions. Moreover, performed regression analyses confirmed that countries abundant with natural reserves, namely point resources, end up with lower regulatory quality and governments which perform in poorer ways (Bulte et al. 2005, 1034). In the paper, the institutional quality was measured by two major variables, rule of law and government effectiveness, both derived from the World Development Indicators.

A regulatory framework should be established to govern natural resource management. Jurisdiction covering the whole mining process from the licensing procedure to mine closure should be introduced in advance to reach a higher level of natural resource management (NRGI 2021, 13-15). In addition, the existence of property rights under national laws supports the quality and level of the management (Heltberg 2002).

The findings highlighting the influence of point resources are consistent with the previously published literature on the topic. The development towards higher regulatory quality and government effectiveness slows down in countries rich in point resources, the same pattern works for the RGI dimension of the rule of law (Murshed 2004), point resource countries perform worse in revenue management in the mining sector. Based on the findings of robust negative effects of natural resource abundance on regulatory quality and the rule of law, it can be assumed that resource rich countries with underdeveloped institutions are more likely trapped in a circle of ineffective policy improvements, including the ones applied in revenue management, and consequently the resource curse. Moreover, this overlaps another RGI dimension, government effectiveness, as implemented policies have an impact on it.

[3] The POLITY2 score is the difference between the democracy and autocracy scores.

The role of point resources, especially minerals and oils, and their impact on regulatory quality, was also stressed by a study by Sala-i-Martin and Subramanian (2003). They revealed a significant robust nonlinear impact of these resources on the level of institutional quality on the Nigerian example, which is consequently reflected in the field of revenue management. Generally, higher point resource reserves deteriorate the institutional quality and vice versa, for this reason, the authors do not see the Dutch disease as a crucial problem. They stated that corruption arising from oil production triggers the process leading to such a poor economic performance in Nigeria (Sala-i-Martin, Subramanian 2003).

One of the demonstrations of institutional problems is the presence of violence, reflected in the RGI dimension of political stability and the absence of violence, which can even lead to violent conflict. Concerning the topic, there is also evidence that natural resource wealth significantly impacts the presence of violent civil conflicts in a certain territory. This relationship is proved by a study performed by Collier and Hoeffler (2002). They found that the risk of conflict is consistent with the role primary commodities hold as a source of rebel financing. Moreover, they also confirmed the interdependence of governance and conflict risk, poorer resource governance, including revenue, all lead to a higher potential of violent conflicts and vice versa (Collier and Hoeffler 2002, 34).

In his paper, Alao (2007) studied conflicts in association with natural resources on the African continent, the territory with most violent conflicts of this type. He asked two basic questions concerning this territory, why there are so many conflicts of this category in Africa in comparison to other continents and secondly, why some natural resources tend to provoke an issue of conflicts and others do not. He concluded that it is mostly caused by the local government, especially its two factors, national constitutions, and political elites, meaning especially RGI dimensions of the rule of law, government effectiveness and control of corruption (Alao 2007, 246-251). National constitutions should theoretically guide all the acts of governments and alongside political elites should govern natural resources according to the constitutions. If bad practices are applied in both fields, a conflict over natural resources arises. Such conflicts can also be established on the basis of poorly set revenue management. The possibility of the presence of conflict increases in the case of solid minerals and oil as resources that are extracted.

A majority of the papers focusing on resource-conflict relations are based on the hypothesis of rebel greed. However, this was proved just partially by Humphreys (2005), who found some mechanism supporting this hypothesis, but he mentioned that it is not the only root of conflicts of this type. Moreover, he concluded that conflicts based on the presence of natural resources usually last less time and they likely end with a military conflict rather than with a negotiated consensus.

Many authors and experts on this topic claim that natural resource abundance becomes a curse for institutional quality, however, different opinions on this issue can be found in the existing literature. Brunnschweiler et al. (2008) challenges the whole concept of a natural resource curse, as they point out the fact that the measurement of resource abundance is an endogenous factor underlying the institutional framework. For this reason, they used a different variable to measure it, natural capital per capita, and they were not able to find a negative correlation between natural resources and the institutional quality. In addition, Brunnschweiler and Bulte (2008) critically evaluated the traditional

causality that countries rich in natural resources tend to evince a lower level of institutional quality. They even outlined the reverse causality that countries with institutional gaps always fail to develop non-extractive sectors and consequently they become dependent on the primary one. An interesting fact which was revealed by this study is that resource scarcity can become a blessing for the institutional development of a country.

Methodology

Qualitative comparative analysis (QCA) was introduced by Charles Ragin in the late 1960s alongside the wave of innovative approaches towards qualitative methods. Originally, it was developed for comparative research in the field of political and social sciences, however, nowadays, the method is widely used in other research areas, e.g., business, economics, and sociology. It bridges the qualitative and quantitative methods, contrasting some of them the QCA aims at finding out which combinations of conditions can produce a certain outcome of interest rather than to isolate the effect of a particular variable (Ragin 1987). However, it is still a case-oriented method using a medium sample size, thanks to which it regards their individual heterogeneity and diversity.

For this reason, QCA deals with the causal complexity principles, which are covered by three basic concepts – causal asymmetry, conjunctural causation and equifinality. Causal complexity outlines the fact that a combination of certain conditions leading to a positive outcome cannot be seen as an inverse one in case of a negative outcome (Misangyi 2016). Secondly, conjunctural causation highlights that a combination of conditions is more probable to result in a certain outcome than a single condition (Schneider, Eggert 2014). These two concepts are supplemented by the equifinality principle underlying the fact that the same outcome can be achieved in multiple ways, meaning various conditions and their combinations.

The logical connections between conditions, alternatively their combinations, and the outcome are found thanks to the logic of necessity and sufficiency. A condition is a necessary one if it must be present for an outcome to occur. It means it is needed for the outcome, which cannot exist without the presence of the condition. On the contrary, a sufficient condition arises when it can produce an outcome itself, meaning it always produces the outcome (Schneider, Wagemann 2012). The conditions of necessity and sufficiency apply the above-mentioned concepts of causal complexity and they all together facilitate the understanding of the cases from a holistic point of view.

Originally, QCA was based on crisp-set relations, which means that each case can be attributed just two values – 1 referring to membership in the set and 0 referring to non-membership in the set (Skaaning 2011). However, the conditions and outcomes are not always dichotomous and there is a wide variety of sets between these two extreme poles. As Ragin (2009) stated, using so-called crisp-set QCA (csQCA) leads to an oversimplification of reality, moreover, it can be applied with significant limitations as it is based on just two values.

For this reason, the theory was deepened by Ragin and the fuzzy-set qualitative comparative analysis (fsQCA) was introduced. Even this paper is based on the fsQCA principle allowing partial memberships, the decimal values between 0 and 1 reflecting

various degrees of inclusion in the set. In this case, the values of 0 and 1 represent the extreme ones meaning either "fully out", or "fully in" the set (Vassinen 2012). The value of 0.5, called the cross-over point, tends to hold a special role in fsQCA. It is usually used as a threshold for determining either membership or non-membership in a set (Ragin 2008, Schneider, Eggert 2014).

While performing fsQCA, two other parameters excluding cross-over point need to be specified, consistency and coverage. Consistency represents the extent to which the cases sharing a certain condition, or combination of conditions, correspond to the presence of a certain outcome. The consistency value ranges between 0 and 1 and it shows the accordance the empirical evidence is in with hypothetical relations (Woodside 20113). On the contrary, the coverage evaluates the degree to which a condition, or combination of conditions, accounts for cases out of the outcome.

The following research uses two RGI dimensions in accordance with the defined goal as it was mentioned in the previous text – revenue management and enabling environment. For better understanding and easier orientation in the next chapter, a closer division of these dimensions into individual subcomponents is provided.

Revenue management consists of three subcomponents, which are:

- national budgeting (BUDG)
- subnational resource revenue sharing (REVEN)
- sovereign wealth funds (FUND)

The second component of enabling environment is subsequently divided into seven subcomponents as follows:

- open data (DATA)
- political stability and absence of violence (STABIL)
- control of corruption (CORRUP)
- rule of law (RULE)
- regulatory quality (REGUL)
- government effectiveness (EFFECT)
- voice and accountability (ACCOUNT)

To fulfil one of the basic conditions for using the fsQCA, a middle size sample (10 to 50 individual cases) of cases should be analyzed (Ragin 2008). For this reason, 17 cases representing individual countries are comprised in the analysis. Regarding the country sample, it is important to mention that it includes only developing countries, any developed economy is not included. However, their total average scores rank from failing to good ones according to RGI (see Annex 1).[4] The countries were selected on the basis of available values of 2017 RGI. Regarding the fact that some subcomponents in some countries are not evaluated (represented by value "not covered"), the specification of "not covered" appears in subcomponents of subnational resource revenue sharing and sovereign wealth fund in case the countries do not apply these institutions; we had to cope

[4] The RGI score is between 0 and 100, 100 score meaning the best performance in natural resource governance.

with this issue. For this reason, only countries having a full dataset and countries scoring "not covered" in the dimension of sovereign wealth funds are included in the analysis. Moreover, countries evaluated as "not covered" in the dimension of sovereign wealth funds were consequently examined as to whether the sovereign wealth funds are not present in the mining sector to verify that they can assign value 0 in this dimension[5].

The first step when conducting fsQCA is to set membership values for the data. Following the practices concerning the fsQCA method, the existing RGI criteria/standards evaluating the level of natural resource governance are applied for calibration (Kahwati, Kane 2020, 87). The membership values are as follow:

RGI score > 74: good level

RGI score between 60-74: satisfactory level

RGI score between 45-59: weak level

RGI score between 30-44: poor level

RGI score < 30: failing level

Based on these standards and using steps calibration[6], a seven-value fuzzy set was created (see Table 1). The cross-over point, as a determining threshold for membership or non-membership, is right in the middle of the 'Weak' category (i.e., value 52).

Table 1. Membership values and calibration

RGI values	Set membership values	Calibration category
>74 Good	1	fully in
60-74 Satisfactory	0.8	mostly but not fully in
53-59 Weak	0.6	more in than out
52 Weak	0.5	crossover point
45-51 Weak	0.4	more out than in
30-44 Poor	0.2	mostly but not fully out
<30 Failing	0	fully out

Source: NRGI 2021, own adaption

Afterwards, both necessary and sufficient conditions are found. Following the recommendations formulated by Rihoux and Ragin (2009, 118), the consistency threshold for necessary conditions is set at 0.75, to find out which conditions will be dismissed, and which will be understood as sufficient to cause the result. Consequently, truth tables, which are crucial for QCA, are established. Truth tables are analytic tools based on formal logic principles which display all the possible combinations and their membership in the

5 For further information, see Resource Governance Index and Natural Resource Governance Institute.

6 Steps calibration input is as follows: "(29;0.2)(44;0.4)(51;0.5)(52;0.6)(59;0.8)(74;1)"

outcome set as well as the number of cases within each configuration (Kahwati, Kane 2020, 266). Solely configurations with consistency equal to or higher than 0.75 can consistently produce the presence of the outcome[7]. The consistency of each row in a truth table is calculated in the following equation

$$\frac{\Sigma(\mathrm{i}=1)\min\,(Xi,Yi)}{\Sigma(\mathrm{i}=1)\ \mathrm{Yi}}$$

where X_i indicates the condition SMV for each case, Y_i indicates the condition SMV for each case (Ragin 2008, Schneider, Wagemann 2012).

As fsQCA uses Boolean algebra, for this reason, the operations of conjunction, disjunction, and negation are used when establishing truth tables (see Table 2). Truth tables make it possible to visualise the possible combinations of conditions and the results of conjunction.

Table 2: Conjunction and disjunction

C_1	C_2	$C_1 C_2$	$C_1 + C_2$
1	1	1	1
1	0	0	1
0	1	0	1
0	0	0	0

Finally, the Boolean minimization tables processing the minimization are established. Based on these tables a Boolean expression containing the prime implicant is created. The causal condition distinguishing two rows of a truth table differing in one causal condition is irrelevant. For this reason, it can be removed, and a simpler combination of conditions can be created (Ragin 1994, 125).

Empirical results and discussion

Following the conducted research, several conditions may be deemed necessary for achieving a high level of revenue management; in terms of national budgeting, it is one condition, in terms of subnational resource revenue sharing one condition as well and in terms of sovereign wealth funds even six conditions were revealed as necessary ones (see Table 3).

Voice and accountability are necessary conditions in terms of national budgeting, meaning that voice and accountability itself should be sufficient for acquiring a higher level of natural resource management. This finding affirms the knowledge from literature, where authors put at the forefront voice and accountability, which is relational and when it is present, it influences other fields (Greig, Laitin 2004, Gupta 2008). Voice and accountability are promoted to combat corruption, promote government effectiveness and

[7] The frequency threshold is set at 2.

the rule of law, which consequently leads to avoiding the mismanagement of revenues. In addition, accountability is a crucial element to building inclusive institutions and supporting democratisation (Epremian et al. 2016).

The importance of transparency and accountability can be realised from the experience of Latin America and the Caribbean, the most dynamic region regarding implementing transparency and accountability. Ten of eleven countries that are part of the Extractive Industries Transparency Initiative managed to fulfil the criteria on information publishing through the extractive sector value chain (EITI 2021). The overall positive effects of the promotion of accountability in this territory can be seen in the individual RGI scores. Regarding the 2017 RGI evaluation, only three countries from twelve were scored as countries with poor resource revenue governance (NRGI 2021). Despite higher accountability triggering positive development in other areas, a higher level of resource revenue management can be supported by a combination of accountability and other RGI dimensions.

The complexity of sovereign wealth funds is supported by proving six necessary conditions represented by the presence of all institutional aspects, excluding political stability and the absence of violence. Generally, experience (e. g. from Angola or Chad) proves that countries with weaker institutions face challenges in establishing sovereign wealth funds (Torvik 2016). Relations of a weak institutional and democratic environment on a general level are highlighted in this context, which supports the findings.

Table 3. Necessary and sufficient conditions

	BUDG	**REVEN**	**FUND**
Condition	**Necessary Sufficiency**	**Necessary Sufficiency**	**Necessary Sufficiency**
accoun	0.8148	0.7273	0.9091
~accoun	0.4074	0.4545	0.2727
effect	0.6481	0.4876	0.9091
~effect	0.537	0.6612	0.2727
regul	0.6296	0.5537	1
~regul	0.5556	0.6446	0.0909
rule	0.6019	0.4793	0.9091
~rule	0.5648	0.6694	0.2727
corrup	0.5926	0.5372	0.8182
~corrup	0.6111	0.6777	0.3636
stabil	0.4259	0.3967	0.4545
~stabil	0.7222	0.7686	0.6364
data	0.6667	0.6364	0.8182
~data	0.5	0.4959	0.2727

Source: authors' calculations using Tosmana v. 1.61

As the truth tables show (see Tables 4, 5, 6), two configurations of conditions are associated with high levels of revenue management in terms of national budgeting and two configurations lead to the same outcome in terms of subnational resource revenue sharing. In terms of sovereign wealth funds, there are not any configurations of conditions resulting in a higher level of revenue management in the mining sector. The Kyrgyz Republic and Niger are dropped from further analysis because both countries have at least one value precisely at the crossover point and for this reason, they cannot be processed in the further analysis.

Political stability and the absence of violence is an irrelevant condition in terms of national budgeting and subnational revenue sharing as a higher level of management is reached both with and without the presence of this dimension. Relating the dimension of political stability and the absence of violence to the existing literature, political stability itself is not stressed as a key factor impacting natural resource revenue management. Talking about the absence of violence, there is reversed dependence that poorer resource governance leads to a higher potential of violent conflicts (Hoeffler 2002, Alao 2007, Humphreys 2005) rather than the fact that violent conflicts cause a lower level of natural resource management. Unfortunately, no further findings can be stated in terms of sovereign wealth funds which are caused by the presence of six necessary conditions.

Table 4. Truth table in terms of national budgeting (BUDG)

Country	Accoun	Effect	Regul	Rule	Corrup	Stabil	Data	BUDG	Consistency
Mongolia, Brazil	1	1	1	1	1	1	1	1	0.9231
Colombia, India, Indonesia, Philippines	1	1	1	1	1	0	1	1	0.7778
Malaysia, Ghana	1	1	1	1	1	1	0	0	0.7000
Angola, Chad, Sudan, Venezuela, DRC, Iraq, South Sudan	0	0	0	0	0	0	0	0	0.4250

Source: authors' calculations using Tosmana v. 1.61

Table 5. Truth table in terms of subnational revenue sharing (REVEN)

Country	Accoun	Effect	Regul	Rule	Corrup	Stabil	Data	REVEN	Consistency
Mongolia, Brazil	1	1	1	1	1	1	1	1	0.8462
Colombia, India, Indonesia, Philippines	1	1	1	1	1	0	1	1	0.8056
Angola, Chad, Sudan, Venezuela, DRC, Iraq, South Sudan	0	0	0	0	0	0	0	0	0.5500
Malaysia, Ghana	1	1	1	1	1	1	0	0	0.3000

Source: authors' calculations using Tosmana v. 1.61

Table 6. Truth table in terms of sovereign wealth funds (FUND)

Country	Accoun	Effect	Regul	Rule	Corrup	Stabil	Data	FUND	Consistency
Malaysia, Ghana	1	1	1	1	1	1	0	0	0.3000
Colombia, India, Indonesia, Philippines	1	1	1	1	1	0	1	0	0.2778
Mongolia, Brazil	1	1	1	1	1	1	1	0	0.2308
Angola, Chad, Sudan, Venezuela, DRC, Iraq, South Sudan	0	0	0	0	0	0	0	0	0.0000

Source: authors' calculations using Tosmana v. 1.61

According to the principle of equifinality, one consistent pathway to a higher level of revenue governance was empirically proven based on Boolean minimisation tables (see Tables 7, 8). In terms of national budgeting and subnational resource revenue sharing, the conditions of voice and accountability, government effectiveness, regulatory quality, rule of law, control of corruption and finally data openness, alternatively their combination, should be present to generate a higher level of revenue governance in the extractive sector. On the other hand, the outcome can be reached both with and without this factor.

These findings are consistent with the outcomes of existing literature (Haufler 2010, Epremian et al. 2016, Treisman 2000), as all the institutional aspects named above as crucial for a higher level of revenue management in extractive industries are pointed out by experts as the ones impacting the general level of natural resource management. Changes and reforms in the extractive industry are often made to react to conflicts and political instabilities. The final impact on revenue management is mixed depending on the individual settings of applied measurement. For this reason, the dimension is not a consistent pathway to a higher level of revenue management.

Regarding sovereign wealth funds, we cannot derive any consistent pathway, as there are too many necessary conditions. It consequently leads to the fact that there is no space for further minimization. This result can be rooted in the fact that sovereign wealth funds are not applied in the majority of sample countries. For this reason, the value of 0 is assigned to them, which can afterwards lead to skewed results. However, this finding is in accordance with the current theory addressing a high level of discipline, both fiscal and institutional, in the case that sovereign wealth funds are established and they should be administered efficiently.

Table 7. Boolean minimization table – national budgeting

BUDG	Consistency	Coverage	Unique cov.
ACCOUN * EFFECT * REGUL * RULE * CORRUP * DATA	0.8148	0.4074	
ACCOUN * EFFECT * REGUL * RULE * CORRUP * DATA	0.8148	0.4074	**

Source: authors' calculations using Tosmana v. 1.61

Table 8. Boolean minimization table – subnational revenue sharing

REVEN	Consistency	Coverage	Unique cov.
ACCOUN * EFFECT * REGUL * RULE * CORRUP * DATA	0.7963	0.3554	
ACCOUN * EFFECT * REGUL * RULE * CORRUP * DATA	0.7963	0.3554	**

Source: authors' calculations using Tosmana v. 1.61

In comparison to previously published papers (Moshiri, Hayati 2017, Raggl 2019), the research conducted above took a further step to analyse which combinations of institutional environment and their conditions lead to a higher level of natural resource governance. It was confirmed that the institutional environment should be decomposed into individual factors, which should be analysed concurrently rather than focusing on the institutional background as a general aspect (Raagl 2019, Bulte et al. 2005). In fact, this idea is one of the basic pros of the QCA method, and it was even proved by the research that individual institutional factors impact the final outcome differently, i.e., the natural resource revenue management. This outcome confirms that using the fsQCA method is reasonable to examine the individual relations between institutional factors and their impacts on the level at which natural resource revenues are governed.

Conclusion

In the paper we aimed at finding which conditions of institutional settings, or their combinations, result in a higher level of revenue management. For this purpose, fsQCA was conducted as one of the broadly used methods of a configurational approach towards the analysed phenomena. The dataset available from the RGI, the index evaluating natural resource governance, was used. Respectively, data on two of its dimensions, revenue management and enabling environment, were employed in the analysis to reveal any configurations of institutional background resulting in a higher level of revenue management in the extractive field.

First, an overview of the RGI, serving as an underlying concept, was presented, so that the concept is clear from the beginning of the paper. Afterwards, theoretical background on individual dimensions of the enabling environment followed to outline how the institutional factors impact the revenue governance as well as the overall natural resource governance. On the basis of the provided information in these sections, the theoretical background to the topic was introduced.

Consequently, the analysis was conducted, meaning the individual scores were calibrated, so that further steps of analysis could be taken. Sufficient and necessary conditions were identified and truth tables in terms of all three revenue management dimensions were created. In order to come up with a certain outcome, a minimization process was conducted. The results of the fsQCA can serve for establishing a discussion in the field of natural resource governance.

It was found that the institutional environment should be decomposed into individual factors rather than be analysed as a whole, because individual institutional dimensions have a diverse effect on the natural resource revenue management. Moreover, the analysis revealed a consistent pathway to a higher level of revenue management in terms of national budgeting and subnational resource revenue sharing. Conditions of voice and accountability, government effectiveness, regulatory quality, rule of law, control of corruption and finally data openness, or their combinations, should be present to result in a high level of resource governance. However, it is necessary to mention that the sample of countries for analysis consists solely of developing countries.

Alongside the found pathway, it can be stated that to reach the desired outcome, the condition of political stability and the absence of violence does not have to be present.

For this reason, according to the findings, it could be possible not to incorporate this dimension in the RGI as there is no proven relation between the dimension and revenue resource governance regarding developing countries. On the contrary to this irrelevant condition, the dimension of voice and accountability should always be present to generate a higher level of revenue management in terms of national budgeting and subnational resource revenue sharing, as it was proven to be a necessary condition.

Regarding the results in terms of sovereign wealth funds, no consistent pathway between these funds and a higher level of revenue governance was found. Six conditions were identified as necessary, which means these institutional aspects must be present to reach better revenue governance in the mining sector.

To sum it up, natural resources may be a blessing or a curse for each country and the way how natural resource endowment affects the development of each country depends on various conditions and variables. However, our paper shows that there is a substantive impact of various institutional aspects combined together on the revenue resource management.

As the paper aimed solely at one part of the RGI, revenue management, many possibilities for further research are offered. The same analysis could be performed in the third RGI dimension of value realisation in order to search for configurational conditions of the enabling environment that result in a high level of value realisation in the extractive sector. The analogous analysis can be performed in the opposite direction in order to reveal which conditions of the enabling environment, or their combinations, lead to lower levels of RGI dimensions. Obviously, there is also space to narrow the research to different sample countries, e.g., from one territory or region.

Acknowledgements: This paper has been established as a part of IGA project called "Case studies in developing countries – comparison of attitudes in natural resource management and project management of development aid", no. 6/2020 registered at the University of Economics and Business.

Conflict of Interest: No potential conflict of interest was reported by the authors.

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