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Country-by-country Reporting Data of Firms in Extractive Industries

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Abstract

This thesis studies the mandatorily published data of companies in extractive industries, listing their payments to governments by types and countries, where the payments were paid. The first aspect of the thesis contains a comparison with the data describing the same phenomenon available before these mandatory reports were published and compares the competitiveness of extractive industries on national markets using the concentration Herfindahl-Hirschman Index. Then it estimates by different approaches the effect of tax rate and country's macroeconomic indicators on payments paid by companies from extractive industries and sum of payments collected by the government from the extractive sector. The econometric analyses using the panel data with significant results suggest that the corporate income tax has a negative parabolic effect on the elasticity of all types of payments summed by countries as well as on the elasticity of the collected taxes from the extractive industries.

Abstrakt

Tato práce studuje povinně zveřejněná data společností v těžebním průmyslu, obsahující platby vládám dle typu a země, kde byly platby provedeny. První aspekt práce obsahuje porovnání s daty popisující stejný fenomén, jež byly dostupné již před zavedením povinnosti zveřejňovat těchto informací a porovnává konkurenceschopnost těžebních sektorů národních trhů pomocí Herfindahl-Hirschmanovým indexem koncentrace. Poté práce různými postupy hledá efekt korporátní daňové sazby and makroekonomických ukazatelů na platby vládám provedené těžebními firmami a celkové platby náležící vládám od těžebního sektoru. Signifikantní výsledky ekonometrické analýzy panelových dat naznačují, že korporátní daň má negativní parabolický efekt na elasticitu součtu všech plateb státech i na elasticitu vládou vybraných daní od těžebních společností.

Keywords

Tax haven, extractive industries, transparency

Klíčová slova

Daňové ráje, těžební průmysl, transparentnost

Range of thesis: 76 303 symbols

Declaration of Authorship

1. The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

2. The author hereby declares that all the sources and literature used have been properly cited.

3. The author hereby declares that the thesis has not been used to obtain a different or the same degree.

Prague, July 31, 2019 Marta Batíková _____

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Research question and motivation

Lately, the topic of transparency was discussed among numerous organizations including the European Union, which resulted in the directive imposed on large multinational companies in extractive industries. According to the directive, these companies are obliged to publish their country-by-country reports containing the types of payments and amount they paid. As the data are finally available, there is an opportunity to answer the following question. Are multinational extractive companies' profits and tax payments affected by tax rates of respective countries?

Contribution

As I have read the research concerning the topic, I did not find any study using a similar or the same data set. There are several studies focusing on banks and financial institutions, which I use as an inspiration. As the country-by-country data were not mandatorily published before, there is no research similar to this thesis. Furthermore, this study might be the baseline for further research.

Methodology

To find the competitiveness of the market I use the Herfindahl-Hirschman Index (HHI), the sum of squared market shares of companies, where lower HHI means greater competitiveness of the market. In the econometric analysis, I use the fixed effects model, as it appears to be the only consistent model for the used data set and it controls for the omitted variable bias. The model analysing payments by companies is inspired by the previous research with added year dummy variables in order to control for unobserved year effects.

Outline

In the first part, I introduce the topic, the motivation, and I review the relevant literature. Then, I describe the legislation and directives imposed by governments or multinational organizations aiming to increase transparency and also non-governmental organizations which help countries suffering from tax avoidance. Next, I compare the newly obtained data with the previously existing sources and determine the competitiveness of the extractive markets on a national level. Then, I estimate several models to find the effects of the country's descriptive factors on the payments collected by the government. Lastly, I present and briefly discuss the results and suggestions for further research.

Core bibliography

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1 Introduction

Profit shifting and tax avoidance are world-wide phenomena occurring regularly on various levels. According to Cobham and Jansky (2017), all governments together lose about 500 billion USD annually due to corporate taxation avoidance, mostly in low- and lower-middle-income countries. The thesis is focusing on the companies in extractive industries because the society is still very dependent on oil, minerals, coal, and gas, which improves the bargaining power of extractive companies with incentives to maximize profits by tax avoidance. Furthermore, extractive companies make profits from the extraction of natural resources making the land less valuable for the country and its inhabitants. Therefore, their financial compensation to the government should be large enough to help the economy to re-orientate its direction after depletion of its natural resources. There are also other issues connected to the process of extraction. These often influence people living in surrounding areas directly, such as pollution of air, land, and water. One way of wealth redistribution from extractive companies to the negatively affected inhabitants are tax payments to the government, which makes tax avoidance in this context even more serious issue than in other industries.

There are several non-governmental organizations working on improving environmental issues, but the main actions and restrictions are imposed by governments and multinational governmental organizations. Even though it is usually a minor part of the governments' spending, the final amount spent on environmental problems can be increased by a precise and effective collection of taxes. According to the World Bank (WB), out of the 7.7 billion people living on the planet in 2019, natural resources play an important economic, social, and political role in the lives of 3.5 billion people in 81 countries.[1] Hence, natural resources impact the lives of almost half of the Earth's population. Additionally, there are certain imbalances among less developed but resource-rich countries. For example, the countries in Africa are home to about 30 % of the world's mineral reserves, 10 % of the oil reserves and 8 % of the natural gas resources. It seems sensible that especially these countries would benefit from proper taxation and other compensation from extractive companies.

With this in mind, one might wonder: Is there a way for governments to improve the collection of taxes and other payments from extractive companies? Apart from better

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[1] The article: "Overview." *World Bank*, www.worldbank.org/en/topic/extractiveindustries/overview#1

governance they can prevent tax leaks or adjust their tax rate imposed on the companies. As the environmental issues can be improved by tax and other payments collection by governments, the need for the information transparency persists. As there are usually few but large companies extracting in each resourceful country (due to high barriers to entry and limited resources for extraction), it may be difficult to compare their indicators, such as costs, revenues and profits.

There are other issues with reporting such information. Extractive companies may report lower revenues or profits with the intention to pay less in taxes, fees or royalties. In the case of multinational companies, profits can be transferred from one affiliate to another, for example, because of a lower tax rate, fees or other payments.[2] To prevent such practices a proper country-by-country reporting (CBCR) should be mandatory for extractive companies and effective policies should be imposed. Apart from monitoring the flow of fortune from the natural resources, Cobham, Grey and Murphy (2017) claim that making these data public could also work as an "engine" for improving the reporting behaviour of extractive companies.

In 2013, a directive on proper reporting was imposed in the European Union, similarly in Canada, and Norway. Additionally, the Natural Resources Governance Institute recently collected an expanded data set including extractive companies outside the aforementioned areas and their payments to local governments. These newly available data bring an opportunity to shed some light on tax avoidance by analysing the potential links between the tax rates and profits reported by extractive companies in respective countries.

In essence, my thesis is focusing on many aspects of these newly available data. Do they allow to infer the competitiveness of extractive industries on national markets? Do these data correspond to the previously published information describing the same phenomenon? Is it possible to estimate how macroeconomic and geographic indicators of resourceful countries affect the reported profits and consecutive tax payments of extractive companies?

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[2] This phenomenon is called profit shifting

2 Literature Review

Business transparency has been recently a frequently debated topic among numerous organizations; both governmental and non-governmental. This fact led to an increase in data collection and its availability for empirical research, but some studies concerned with this topic had been already published. In this chapter, I introduce two phenomena why are organizations, governments and researchers interested in business transparency. Then, I cover the research concerned with tax havens, transparency, and base erosion and profit shifting, focusing mainly on the financial sector. At the end of this chapter, I describe the research concerned with the same topics but focusing on companies in extractive industries.

There are several approaches to describe the motivation of the general transparency need. First, two terms describing transparency issues need to be explained: Illicit Financial Flows (IFFs) and Base Erosion and Profit Shifting (BEPS). The World Bank defines IFFs as "money illegally earned, transferred or used that crosses borders" and can be considered as a superior concept to BEPS[3]. Organisation for Economic Co-operation and Development (OECD) defines BEPS as "tax planning strategies that exploit gaps and mismatches in tax rules to artificially shifts profits to low or no-tax locations"[4]. The difference is that all the BEPS must be recorded in country-by-country reports of multinational companies and may not be illegal.

The final destinations, where companies transfer their profits to minimise tax payments, are referred to as tax havens. There are several definitions of tax havens, for example, the definition of OECD from 1998 consists of no or only nominal tax on relevant income, lack of effective exchange of information and lack of transparency[5]. A list of 41 jurisdictions that fulfil these criteria followed two years after.

In 2017 the Council of the European Union adopted its first common list of tax havens motivated, among others, by Panama papers and Paradise papers leaks (Remeur, 2018). The definition used to establish the list described the following criteria: "lack of effective exchange of relevant information with other governments on their taxpayers,

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[3] Definition according to:"Illicit Financial Flows (IFFs)." *World Bank*, www.worldbank.org/en/topic/financialsector/brief/illicit-financial-flows-iffs.

[4] Definition according to: "Base Erosion and Profit Shifting - OECD." *Base Erosion and Profit Shifting - OECD BEPS*, www.oecd.org/tax/beps/.

[5] Definition according to: "Glossary of Tax Terms." *OECD*, www.oecd.org/ctp/glossaryoftaxterms.htm.

minimal or no disclosure on financial dealings and ownership of assets, no or minimal taxation on income and assets of non-residents, tax advantages to non-resident individuals, generally not applying accepted minimum standards of corporate governance and accountability". Applying these criteria resulted in 17 jurisdictions on the "Black list" (non-cooperative list) and 47 jurisdictions on the "Grey list" (watch list). Since the release date, 5th of December 2017, the list was changed several times. The last update was implemented on 17th of May 2019 with 12 jurisdictions on "Black list" and 36 on "Grey list".

Cobham, Jansky & Meinzer (2015) argue that the lack of a clear and approved definition of tax havens causes systematic weakness in academic research. As an alternative to many different lists of tax havens, they introduced the Financial Secrecy Index (FSI) describing the countries' intensity of being a tax haven. When comparing results from two or more studies about a similar topic but based on a different definition of a tax haven, the results may be practically incomparable. Using the FSI instead of pure dummy variable describing whether a country is present on a tax havens list brings reasonable advantages. Since the definitions of tax havens consider more than low tax rates, the formula of FSI includes the following attributes: key financial indicators (taken together resulted in secrecy score with 0 considered as perfect transparency and 100 as the opposite, in fact, the score varies between 32.4 – Sweden and 88 – Samoa) and global scale of the jurisdiction (data about the trade in international financial services, in percentage of the total). The key financial indicators are in the cubic form and global scale weight is to the power of one third since there is significantly more variation.

The discussion about the tax havens in the academic literature was opened by Hines and Rice (1994) before the CBCR was imposed in any country. They examined the trends and tools in tax avoidance of US companies from the 1980s and set the list of countries considered as tax havens. They set the definition of the tax havens as locations with the following four attributes: (i) low corporate or personal tax rates; (ii) legislation that supports banking and business secrecy; (iii) advanced communications facilities; and (iv) self-promotion as an offshore financial centre.

The authors used direct investments abroad reported to the US Department of Commerce. The results suggest that 1% increase in tax rate reduces the reported profit by 3 %. Such analysis has several drawbacks; the tax rate is the same average of the year for all affiliates, not precisely the tax rate implied to the marginal dollar of earnings transferred. Also, the sample suffers from the selection bias since only the countries with

more than a few companies were used, due to confidentiality and many more, unobserved effects. The results of their other regression suggest that with 1% reduction in tax rate the use of labour and capital by US investors increases by 3 % and as the tax rate increases there is a significant curvature (captured by the tax rate squared). They conclude that the maximizing-revenue tax rate for a tax haven jurisdiction is between 5 and 8 percent.

There is substantial research focusing on tax avoidance in the financial market. These studies serve as an inspiration as well since international banks must publish very similar data as I use in my thesis. In one of the recent studies, Overesch and Wolff (2017) proposed the hypothesis that the banks which experienced the implementation of the CBCR duties should face the increase of the effective tax levels, moreover the banks operating in the tax havens. Their results suggest that multinational banks' effective tax rate increased by 3.7 % without being present in European tax havens relative to non-multinational banks not obliged to publish the reports, using as the control group. Study of 36 multinational banks based in EU by Bouvatier, Capelle-Blancard, and Delatte (2017) yields results that in terms of GDP countries listed as "tax havens" (using Hines Jr and Rice's list of tax havens from 1994) cover 2 % of the sample, but 29 % of total in terms of profit. Further analysis of data from 2015 using gravity equations revealed that the average effect of being a "tax haven" is 2.5 times higher activity compared to non-havens.

Recently, Jansky (2018) took advantage of mandatorily published Country-By-Country Reporting (CBCR) data in the financial market and introduced a detailed study of a wide data set consisting of 4118 observations from 46 banks during the period 2013 – 2017. The research employs several different approaches to analyse the misalignment of banks' profits. Firstly, the author used the regression of the profit on the number of employees by country describing the economic activity and introduces the formula for excess or missing profit (profit to be shifted from or to the country within a company). The results suggest there is a strong correlation between profit and number of employees with a slight time trend. The correlations range from 0.64 to 0.77 for country-bank-level and from 0.87 to 0.92 for country-level data. The second analysis measures misalignment between profits and employees in all four years. At the top of the list, there is Luxembourg (with an average 1100% misalignment in the number of employees and 230% in turnover), followed by Ireland and Hong Kong in terms of misalignment for employees and profit.

Dowd, Landefeld and Moore (2017) analysed the profit shifting behaviour using the data set of US tax returns over the period 2002 – 2012. They focused on the US multinational companies, motivated by LuxLeaks - widespread reporting. In their regression, they used the logarithm form of profit as the dependent variable and tangible capital assets (to describe the capital effect) and the wage bill (to describe the labour impact) as the independent variables – both in logarithm form to measure elasticity. Other independent variables were 1-tax rate and, the tax rate squared, GDP per capita, and a number of inhabitants in the squared form as their relationship is expected to be non-linear.

Their results are very similar despite using different types of tax rates. The results suggest that as the tax rate increases, the profit increases as well at a decreasing rate. They also found a positive impact of capital and wages (both in log form). For GDP per capita and population squared significant estimates suggest, that as the GDP per capita increases, the profit increases non-linearly and gets more intensive for higher GDP per capita. The population increase results in the profit increase and the effect slightly decreases. The estimated tax rate effect implies that if countries behaving like tax havens would increase their tax rates, they would lose more profit (in percentage), compared to countries with higher tax rates.

In the investigation of European multinational banks Fatica & Gregori (2018) used CBCR data for financial years 2014 – 2016 (which allowed them to use the fixed effects model and control for potential unobservable effects) and found that there is a negative correlation between profits reported in a country and its corporate tax rate. Using the method of simulation, they discovered that shifted profit in tax havens is approximately 38 % of true profits and about 7 % when selected non-havens are considered. Their data suggest that on average the profit per employee in non-tax havens countries is 40 thousand euros, while in tax havens the profit per employee is 220 thousand euro. In their model, they included labour force (number of employees), capital (consolidated value of total assets), tax indicators in the country (effective tax rate or corporate income tax) and two indicators of governance quality, and a variable for the unobserved heterogeneity. In the second analysis, they decided to focus on the semi-elasticity of all countries with available observations. The results suggest that the semi-elasticity of profits to a 1 percentage point increase in the effective tax rate in selected non-havens equals 1.94 and 4.22 for tax havens (meaning that in tax havens the profit is more likely to be shifted due to effective

tax rate increase or decrease). This research is relevant because the data set used is similar to the data set used in the thesis.

In addition to the summary of legislative implementations in Chapter 3 Legislation Summary and NGOs in terms of Extractive Industries Transparency of the thesis, Cobham, Gray and Murphy (2017) discuss the idea of a global database of payments to governments by multinational companies, which could have been used by researchers, journalists or investors. Tax Justice Network (TJN) was established in 2003 (as the initial stage of CBCR imposing) and by 2013 tax issues were one of the leading global policy agendas. This was one of the reasons OECD was given a mandate to change international tax rules, technically very close to the original TJN proposal, but politically very far. In other words, the data were not available to the public, apart from the TJN idea, but tax authorities in a multinational headquarters were able to exchange the data under certain conditions. Therefore, they proposed a plan to collect a global database, which would combine the relevant and already existing data from OpenCorporates, Open Ownership, the Open Contracting Partnership and OpenOil. The described database may thus serve as an insight into the global economy organisation, how the largest economic players on the planet can be understood and managed.

Thus, the civil society proposals for CBCR data can be covered in areas: the identity of the company, its activity in each country, intra-group transactions to understand company's behaviour patterns and the key financial data – profits/losses and taxes paid. The OECD standards for reporting from 2013 covers all these aspects but not in enough detail. The information can still be valuable for researchers, especially the intra-group transfers section where only "total capital employed split between committed capital and retained reserves" is published.

Hoopes, Robinson and Slemrod (2018) consider a possible counter-argument for publishing CBCR reasoning with the negative reaction of investors and customers along with only a small increase in tax payments.

Possible reasoning for this phenomenon, described in Australia after disclosure of firm-level data by Australian Taxation Office in 2017, is that private companies were most likely to avoid the disclosure and in total their tax payments increased, apart from the opposite approach and results of public companies, which influenced customers' and investors' point of view.

With respect to the topic of the thesis, it is important to define companies in extractive industries, in order to fully understand the possible imperfections to be improved. According to the definition stated by Sigam & Garcia (2012) extractive industries involve activities leading to the extraction of raw materials from the Earth, mainly oil, metals, minerals and aggregates. After the development stage of the company in an extractive industry (stage of searching the resources and setting the place for extraction) the production period lasts 15-25 years. When commercial exploitation ends, the rehabilitation of the area starts – it involves the removal of buildings and equipment, the restoration of the area in the environmental perspective, as well as re-vegetation. For the host country, it is not only profitable in terms of taxes and royalties but also in the terms of economic externalities, as it resulted with the economic impact of the oil and gas industry in the US amounted to 1.3 % of the total employment.

Environmental impact tends to leave a strong environmental impact along the entire value chain, but the larger the oil field or mine, the greater the impact. Applied on gas and oil extracting companies for example flaring of excess gas, deforestation from on-site operations, oil leakages and accidents can be highly pollutant and can affect the natural life of the area, resulting pollution of land and water and hence the performance of other economic activities like fishing, tourism or agricultural growing of plants for long term. In the mining sector, the major problem is usually erosion of landscape and water pollution. Governments' challenge is to minimize and manage the negative impact caused by extractive companies, it is also an opportunity for non-governmental organisations and researchers to participate.

In contrast with previous arguments, with a different approach, there were several reasons described by Le Billon (2011) why it is important to care about transparency especially in the extractive industry. Extractive companies are associated with high-level discretionary political control, blurring of public and personal interests (preferably senior management or politically exalted persons may benefit from corruption) and very limited competition, which makes a comparison to other companies or sectors impossible. Le Billon also defines the three main types of illicit financial flows resulted from the risks: corruption (bribes paid by companies), illegal exploitation (undeclared corporate revenues from illegal resource exploitation) and tax evasion (smuggling of resources) and several cases of these practises have already been listed, which is the main reason why is the issue of transparency debated, as such.

There were examined several ways how companies in oil and gas extraction avoid paying royalties and not only to governments, for example as Lustgarten (2019) described in his paper. According to the UN, as the royalties are usually paid as a percentage of the revenues, companies decrease their revenues by deducting their expenses for transporting and processing or in other cases companies sell the extracted resources to other companies owned by the same company at lower prices. [6]

The effectiveness of the Extractive Industries Transparency International (EITI, included in Chapter Legislation Summary & NGOs in terms of Extractive Industries Transparency) was detailed examined by Sovacool, B. K., Walter, G., Van de Graaf, T., & Andrews, N. (2016). They established in total 13 different hypotheses with one precise research question: "Does the EITI membership make any difference?". They searched for any signs of better economic activity of these countries that cooperate with the EITI and the effect of candidacy, compliancy and full membership in the EITI. The study must deal with a few complications related to the fact that countries cooperate with the EITI on a voluntary basis, such as the selection bias, which eventually diminished by using the other OPEC countries as a control group. The results suggest that, even though there is a positive development of regulatory quality, foreign direct investments, and GDP per capita in the EITI member countries, there is no significant impact of the EITI membership or candidacy on the governance or economic development.

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[6] *Proposed Guidance on Fiscal Take in the Extractive Industries*. (2016), https://www.un.org/esa/ffd/wp-content/uploads/2016/12/13STM_CRP21_fiscal-take.pdf

3 Legislation Summary & NGOs in terms of Extractive Industries Transparency

Nowadays, there are different legislative implementations and approaches to the transparency issue both differed across the world and the industry.

In European union, among banks, investment companies and multinational companies with profits exceeding 750,000 EUR per year, there were legislative requirements exposed for firms in extractive industries. Under transparency requirements for listed and large non-listed companies (Directive 2004/109/EC) and accounting rules (Directive 2013/34/EC) that are economically active in the oil, gas, mining or logging industries have specific obligations. All payments to governments must be reported country-by-country and by specific projects. Payments that must be reported:

- Production entitlements
- Taxes on income, production or profits
- Royalties
- Dividends
- Signature, discovery and production bonuses
- Licence fees, rental fees, and other considerations for licences and/or concessions
- Payments for infrastructure improvements

To compare multinational European banks according to Art.89 of CRD IV must publish the following information by country:

- Name, activities and geographical location of all affiliates
- Turnover
- The average number of employees
- Profit or loss before tax
- Corporate taxes paid
- Public subsidies received

In the USA the situation is not clear, yet. In 2010 the US Congress passed the Dodd-Frank Wall Street Reform and Consumer Protection Act, and Section 1504, included in the Act, efforts to improve the transparency and accountability of oil, gas and mining companies listed on the US stock exchange and engaged in commercial development. Practically under that Act, these companies must publish their payments

including taxes, royalties, production entitlements and dividends, among others on country-by-country and project-by-project basis. In 2016 the Securities and Exchange Commission adopted the final rules, how to implement of the Section 1504, starting on fiscal years ending on or after September 30th, 2018. However, in 2017 President Donald Trump signed into law to repeal the SEC's rule and ban the enforcement of Section 1504[7]. The USA joined the EITI in 2014 and left in 2017, and the last report is from the year 2015 (EITI web site).

Canada adopted an obligation to report payments to governments known as the Extractive Sector Transparency Measures Act (ESTMA) and came into force in June 2015. The report must be public and is applied to all companies in extractive industries that are listed on a stock exchange in Canada, or company that applies at least 2 of the following rules: exceeding 20 million CAD in assets, exceeding 40 million CAD in revenue and employs at least 250 employees on average in financial year and must contain payments (such as taxes, other than consumption taxes and personal income taxes, royalties, fees, production entitlements, bonuses, dividends, infrastructure improvements payments)[8].

Not only by legislative steps can governments increase the transparency in the extractive sector. Countries can participate in the organisation of the Extractive Industries Transparency Initiative. The EITI's agenda according to its web site[9] is guided by the belief that a country's natural resources belong to its inhabitants, the initiative set a global standard to support and raise the open and accountable management of oil, gas and mineral resources. It requires the data disclosure along the value chain from the extraction, public benefits and how revenues are collected from the company by governments. In the year 2019, there are 51 implementing countries, who want to improve the management of their natural resources, the data are uploaded online for free for research. The participation of the resource-rich country is not only government's and organisation's decision, as for example very oil-rich country Azerbaijan left the Initiative

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[7] Justicia en las Américas. "Transparency in the Extractive Industry – The United States: from Hero to Zero?" *Justicia En Las Américas*, 19 Mar. 2018, https://dplfblog.com/2017/04/18/transparency-in-the-extractive-industry-the-united-states-from-hero-to-zero/

[8] Legislative Services Branch. "Consolidated Federal Laws of Canada, Extractive Sector Transparency Measures Act." *Extractive Sector Transparency Measures Act*, 2019, https://laws-lois.justice.gc.ca/eng/acts/E-22.7/page-1.html

[9] "Who We Are." *Extractive Industries Transparency Initiative*, https://eiti.org/who-we-are

after the suspension of its membership by the EITI, because of the concerns about civil rights in the country, claims Reuters[10].

According to the United Nations Development Programme (UNDP)[11], the mineral, oil and gas resources bring opportunities for countries in order to achieve development. However, with extraction comes risks, such as volatile economic growth, violent conflicts, corruption, environmental degradation, human rights violations and gender-based violence. UNDP supports over 50 countries globally to maximize their economic and social benefits, claiming that their aim is "to ensure that natural wealth is used to improve people's lives." For example, UNDP provides help to improve the sustainability and productivity of smaller mining in Africa, the Caribbean and Pacific countries. Along with UNDP also The World Bank[12] helps countries to manage their extractive industries wealth to fairly contribute to economic growth and poverty reduction. There are strategic focus areas where the WB works: "effective governance, increasing transparency and promoting inclusive growth while ensuring local community needs are met and the environment protected". The WB works with the governments to improve their fiscal regimes and among others to improve their tax administration and revenue transparency.

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[10] "Azerbaijan Leaves Transparency Group after Membership Suspended." *Reuters*, 11 Mar. 2017, www.reuters.com/article/us-azerbaijan-eiti/azerbaijan-leaves-transparency-group-after-membership-suspended-idUSKBN16I007.

[11] "Extractive Industries." *UNDP*,www.undp.org/content/undp/en/home/2030-agenda-for-sustainable-development/planet/environment-and-natural-capital/extractive-industries.html.

[12] "Overview." *World Bank*, www.worldbank.org/en/topic/extractiveindustries/overview#1.

4 Data set

Due to scarce data availability, I decided to collect and use data mandatorily published by firms in extractive industries according to the EU directive and the Canadian ESTMA directive demanding a proper country-by-country reporting (CBCR). There is limited research using such data for firms in extractive industries, possibly because the published information is not as detailed as information reported by banks, which include final profits, number of employees, taxes paid and much more. The CBCR data published by companies in extractive industries contain only the paid amounts grouped by types of payment and by countries, where the payments were paid. Another possible reason, why there is only limited research using the CBCR data, is that they are published separately by each company and it would be considerably time-consuming to collect these data from individual websites.

I managed to assemble manually the CBCR data for 25 multinational companies in the years 2016 and 2017, which resulted in 488 entries across 98 countries. When I nearly exhausted the potential sources, Natural Resources Governance Institute uploaded a brand new CBCR dataset called *Payments to Governments on Entity Level* to the website of the World Bank.[13] The new dataset includes 733 extractive companies and provides much more insight regarding taxes and other payments to governments. I compared these data with a sample of the manually collected data and since no substantial differences were found, I decided to use the superior dataset thereafter.

The new dataset consists of more than 17 thousand rows, each row represents one payment from a company in extractive industries to a specific governmental office during the specified year. The following types of payment are present: taxes (without further specification), bonuses, fees, payments for infrastructure improvements, royalties, dividends, production entitlements, payment type without specification and other. The time horizon spans from 2014 to 2018, but due to very limited entries in 2014 and 2018, I decided to use data from the period 2015 - 2017 for further analysis. In addition, I decided to eliminate entries with the negative amount paid in the econometric analyses (inspired by Jansky, 2018 and Bouvatier, Capelle-Blancard and Delatte, 2017). In order to receive more feedback from the data set, two data subsets were chosen. The first data subset, where the entries are sums of all types of payment from one company to a certain

[13] The data available at: https://databox.worldbank.org/en/dataset/ei-payments-to-governments

country, is an unbalanced panel consisting of 733 companies, 152 countries, 3 years (2015, 2016, 2017), which constitutes 3255 entries worth 516 billion USD. The second data subset contains only the tax payments of companies (ignoring other types of payment), which results in an unbalanced panel of 561 companies, 139 countries, 3 years (2015, 2016, 2017), which constitutes 2294 entries worth 296 billion USD.

Next, I examined the sum of all payments (all types and all companies) to governments of individual countries during the years 2015 - 2017. The Russian Federation is the leading country with payments of 161.9 billion USD, which corresponds to 54 billion per year. This finding can be explained by the fact that the Russian Federation is the largest country in the world, which implies a high possibility of containing resource-rich areas. The two other leading countries are Norway and Australia, the former being the European leading country in oil extraction and the latter being the sixth largest country in the world (hence, similar implications as for the Russian Federation). Another possible reason for Australia to be in the top ranks is the fact that it was colonised in the 19th century, which implies no extraction in the previous periods and more resources available for the current and recent extraction processes.

Then, a list of the largest companies in terms of the total payments to all governments was constructed. I identified 12 companies associated with the amount higher than 10 billion USD over the period 2015 - 2017. The top three companies with the greatest payments (Rosneft, Royal Dutch Shell Public Limited Company and BP Public Limited Company) were further inspected and their brief introduction follows. Rosneft is a Russian oil extracting company owned by the Russian government (50 %) and by companies BP, CEFC China Energy Company Limited, Moscow Exchange, Glencore Xstrata and Qatar Investment Authority. The company operates in Russia, in the Arctic Ocean and has “Foreign projects” at every continent, except Australia. The second largest company is the Royal Dutch Shell. This Dutch and British company operates in more than 70 countries, has approximately 82 thousand employees and in 2018 it produced 3.7 million barrels of oil equivalent per day. The third biggest company in the data set is BP, a UK and US registered company. Nowadays, the company operates in 78 countries and has 73 thousand employees.

The essential independent variable for the econometric analyses is the corporate tax rate, which I compiled from the website *tradingeconomics.com* and cross-checked with the *Corporate Tax Rates Table* established by the company KPMG. Data for other

independent variables (GDP per capita, land area, population and GDP) were downloaded from the WB database as it was the most complete and detailed source.

To describe the countries in the data set I used the Development Indicators introduced by the WB as labels. These countries are ordered by the gross national product and divided into 4 income groups: low income, lower middle income, upper middle income and high income. The "High income" group is the most represented income group with 51 countries. The representation falls as the income indicator decreases and, according to the WB, only 24 countries are classified as "Low income" countries.

In order to assess the countries' dependence on the payments collected from extractive companies, I examined the ratio of these payments to the GDP of respective countries (both numbers summed across the 2015 - 2017 period). By far the leading country is Azerbaijan with a ratio of 19 % followed by Congo and Angola both at 8 %. This ratio is influenced by several factors. For example, Azerbaijan is an oil-rich country labelled as "Upper middle income" country. Hence, it can be assumed that the payments from extractive industries are significantly improving the country's GNP, but it can also be a sign of a well-set tax rate and an effective tax and other payments collection.

See Table 1 below with descriptive statistics of payments used for econometric regression and corporate income tax in the data set.

	Sum of all types of payments by countries	Sum of tax payments only by countries	All types of payments by companies	Tax payments only by companies	Corporate income tax
Mean	1 303 484 972	872 241 558	159 208 756	128 801 362	25.23 %
Standard deviation	5 172 702 034	4 404 330 932	1 083 426 025	937 591 177	8.97 %
Minimum	8 000	23	63	23	0 %
Q1	4 561 225	6 086 046	599 553	716 927	20 %
Q3	291 635 550	509 187 932	31 764 000	26 952 567	30 %
Maximum	62 889 614 296	54 406 570 221	30 916 731 092	23 117 026 918	83.7 %
Observations	396	340	3 255	2 309	396

Table 1

4.1 Other sources of the governmental natural resources revenues

In this chapter, I introduce data from different sources describing the same phenomenon – rents or revenues of countries from natural resources. The mandatorily published CBCR data describe how much did the firms pay to the governments each year in all payments related to extracting natural resources. If all companies in extractive industries published these reports, the sum of their payments would represent the total revenues from natural resources in a country and a year. However, the legislation was not

imposed on every company in the world. The CBCR data are demanded from companies operating in countries where such reporting is mandatory and from companies with revenues above a certain threshold. For the purpose of this comparison analysis, I added the payments with negative balance back as it is needed to compare the amounts precisely. There are several data sources describing rents or revenues.

To introduce the first one, it is the report "Total natural resources rents in % of GDP"[14] from the WB. The variable is described as the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents and forest rents. The data are available for 264 countries, starting from the year 1970 and ending with the year 2017, with more than 10 thousand entries in total. The drawback of comparing these data is in the definition of natural resources rents because the forest rents are not included in the mandatory CBCR data. Extracting wood from a forest is different from other types of extracting as it is possible to regrow a forest and extract it repeatedly. The data set contains almost all countries in the period 2015 - 2017.

Another drawback of the data set is that the variable *total rents* is only an estimate, calculated in the following way[15]:

$$u_t = \sum_{i=t}^{t+T-1} \frac{\overline{R_t}}{(1+r)^{i-t}}$$

where $\underline{R_t}$ is lagged, a five-year moving average of rents in years *t* (the current year) to year *t-4*, *r* is the discount rate (assumed to be 4 %) and *T* is the lifetime of the resource. Rents are calculated as revenue minus production costs, including the normal rate of return. Since the prices are relatively easy to measure, the production costs are kept in secret by firms.

The similar framework is described in the data set „Government Revenue Dataset"[16] (GRD) published by United Nations University, as the variable "Total Resource Revenue" as the percentage of the GDP. The dataset is a combination of OECD Revenue Statistics, OECD Latin American Tax Statistics, IMF Government Finance Statistics, IMG Article IV Staff Reports and CEPALSTAT Revenue Statics in Latin America. On the one hand, the dataset is precise, but on the other hand, it suffers from

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[14] Data available at:
https://datacatalog.worldbank.org/total-natural-resources-rents-gdp-2
[15] According to "The Changing Wealth of Future":
https://openknowledge.worldbank.org/bitstream/handle/10986/29001/9781464810466.pdf, page 101
[16] The data set available at: https://www.wider.unu.edu/project/government-revenue-dataset

incompleteness. There is no information for the year 2017, there are several countries missing in the dataset (such as Greenland, Faroe Islands, New Caledonia or Monaco) and there are lots of countries for which the information about resources rent is not available, the data only contains 143 entries for both years 2015 and 2016 (even though my original dataset counts 152 countries). Thus, is it possible to use the reported data from the companies as the estimation country's natural resources revenues?

5 Methodology

5.1 Comparison of the data set

5.1.1 Comparison of CBCR data and the WB data

In order to compare the data available from CBCR with the data that the WB claims to be Natural resources rents by countries, I used an intuitive method. As the WB natural resources rent data are presented in the percentage of the GDP, I multiplied the WB percentage estimate with the GDP.

$$natural\ resources\ rents_{i,t} = GDP_{i,t} * natural\ resources\ rents\ in\ \%\ of\ GDP_{i,t}$$

The resulted amount is the amount in USD describing the sum of all payments collected from the extractive industries by the government. I expect the CBCR data to be just a segment from the WB estimate, as the CBCR data do not cover all of the companies in the extractive industries. Comparison of the resulted natural resources rents in USD describes the following formula:

$$\alpha_{i,t} = \frac{sum\ of\ all\ payments\ reported_{i,t}}{natural\ resources\ rents_{i,t}}$$

5.1.2 Comparison of CBCR data and GRD

In comparison with the GRD, I decided to follow the same approach as in the previous chapter. From the definition, the GRD data represent the income of the country from natural resources extraction expressed as the percentage of the GDP. Even though, the GRD data are built on WEO point of view to GDP definition and data in the dataset the GDP variable is not complete for all countries from my original dataset. Therefore, I decided to use the GDP variable from the WB for further calculation. Since I know the percentage of GDP representing the natural resources rents and the values of GDP with the formula:

$$natural\ resources\ rents\ _{i,t} = GDP\ _{i,t} * natural\ resources\ rents\ in\ \%\ of\ GDP\ _{i,t}$$

The value of natural resources rents in USD I compared with the CBCR value representing the sum of all types of payments from all companies in country and year, in

the meaning: How much of the CBCR data are contained in the GRD, as the value β, the formula below describes the calculation:

$$\beta_{i,t} = \frac{sum\ of\ all\ payments\ reported_{i,t}}{natural\ resources\ rents_{i,t}}$$

Expecting that, as the CBCR data are not mandatory for all companies and in countries, the amounts per GRD data exceed the CBCR data.

5.2 Herfindahl-Hirschman Index

Since the dataset is very new and holding unobserved information, I decided to analyse the data also using the Herfindahl-Hirschman Index[17] (HHI) to determine the market concentration of companies contributing to payments to governments per country. The HHI is used for determining the market competitiveness, the lower the index is, the more is the market competitive, there are more companies with smaller and almost same market shares. In theory as the index approaching zero, the market is experiencing the perfect competition. It represents the sum of market shares squared, in this case, I use the share of contribution by one company to all payments to governments in the country in a specific year.

$$HHI = \sum s_i^2$$

where s_i represents a company's market share in the country. I decided to calculate the index for all countries only for the year where I have the most complete data (years 2016-2017), otherwise, the further comparison would be misleading.

[17] Widespread economic term, in the thesis used according to definition: Hayes, Adam. "Why the Herfindahl-Hirschman Index (HHI) Matters.", Investopedia, 29 Apr. 2019, www.investopedia.com/terms/h/hhi.asp.

5.3 Panel data regression of all payments by companies

To analyse the panel data described in Chapter 4, I decided to follow Overesch & Wolff (2017) and other researchers, as Dharmapala (2014) described in a general model for estimating the elasticity of profit reported in a country in each year:

$$log\left(profit\ of\ the\ company_{i,t}\right) = \beta_1 tax\ incentive_{i,t} + \beta_2 log\ (capital)_{\ i,t} + \beta_3 log\ (labour)_{\ i,t} + X_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t}$$

where *i* signalizes an affiliate, i.e. country where the multinational company operates, *t* represents the year, $X_{i,t}$ corresponds to the matrix describing the additional affiliate-level controls in years, and μ_i, δ_t represent affiliate fixed effects (controlling for unobserved characteristics of the affiliate *i* that do not change over time) and year fixed effects (controlling for unobserved common changes in the profitability of all affiliates in a given year), respectively. The tax incentive in this model means the tax incentive for profit shifting to and from the affiliate *i* in year *t.*

Even though that Dharmapala (2014) does not specify it, I understand this model, in the same way as the two-way fixed effects model, described by Imai and In Song (2019) as:

$$Y_{i,t} = \alpha_i + \gamma_t + \beta X_{i,t} + \epsilon_{i,t}$$

where α_i and γ_t represent functions of unobserved effects as the country/affiliate changes and time changes, respectively. In fact, the model has the same results as the regular fixed effects regression when a dummy variable for every year, except one, is added. Their model assumes the absence of spillover and carry-over effects – outcome of one unit is not affected by other unit or the treatment status of any unit from the previous periods. In the empirical section of the paper, they use the cluster-robust standard errors that allow for autocorrelation and heteroskedasticity.

As the reports with payments to governments published by companies in extractive industries differ from the reports of banks and financial institutions, the dependent variable *profit of the company in the affiliate i and the year t* is missing. I decided to substitute it with the variable *amount paid by the company to the government in the affiliate i and the year t*. Apart from such model measuring the semi-elasticity, I decided to add a model with the dependent variable in units as well instead of using only the logarithm form. The main reason for this addition is that my dependent variable is

different from the *profit* variable used in their models and that it can reveal more insight. Unfortunately, this dependent variable misses the connections between specific payments from one company.

The last dependent variable, therefore, is the *percentage of company's payments in the affiliate i and the year t out of its payments in all affiliates* as the dependent variable, because it tells us what portion from all payments to governments is paid to a specific government and reveals possible profit shifting between the company's affiliates. The model is the only one connecting the payments from one company and could more precisely describe the profit shifting phenomenon. This model inspects whether the portion of the company's payments in a specific affiliate depends on the corporate income tax rate in the respective country.

For the variable *tax incentive,* I chose the corporate income tax rate collected from the website Tradingeconomics.com, as described in Chapter 4. Since there were several missing observations, I filled the remaining observations by hand from available online sources. I am aware of the potential drawback, that companies do not face only the corporate income tax but also pay other types of taxes, fees, royalties, etc. The specific payments depend on the country's policy, but such information is not possible to collect for such a wide data set. I further include two macroeconomic variables to describe under which conditions companies pay to the governments.

The first macroeconomic independent variable is the *land area* of a country, where the payments were reported. The country's land area corresponds to the probability of being a resource-rich country as, generally, small countries have fewer opportunities to extract natural resources. During the studied period, the variable *land area* changed slightly for some countries, which was probably caused by remeasurement or adjustment. Hence, when using the fixed effects model, this variable is not excluded from the results table due to its demeaning. In my opinion, it is more reasonable to include land area than the number of inhabitants as, for example, Dowd, Landefeld and Moore (2017) did. Using the number of inhabitants does not correspond to the natural resources' opportunities. However, in the sake of robustness check, I employed the variable *inhabitants* in the econometric analysis as well to compare the results.

As the second macroeconomic independent variable, I decided to use *GDP per capita* to find its impact on the amount paid by the firm in the country. Here it is also needed to be aware of the fact that there might not be actual causation since developing countries might have more natural resources, because they started later with its extraction,

leading to smaller amounts paid by extractive companies in developed countries with large GDP per capita.

This approach is combined with the approach of the analyses by Dowd, Landefeld and Moore (2017), which is further described in Chapter 2. They plotted a graph of the *log(profit)* variable on the vertical axis and the *tax rate* variable on the horizontal axis and constructed the regression lines by groups of neighbour point. They found out that as the tax rate is increasing the slope of the trend line increases as well. Hence, they added the tax incentive variable (in their case they used the variable *1 – tax rate*) squared to the model, which yielded significant results. I decided to use a similar approach but kept the simple percentage value of corporate income tax as the tax incentive variable and added its squared form.

As Dharmapala (2014) describes in similar research to this thesis, he used the fixed effects model, but to be sure that it is the best way to analyse the data I included several additional tests. Initially, I estimated the fixed effects model together with the random effects and pooled OLS models. Then, I ran the F-test to eliminate the pooled OLS model. It turned out that there are significant unobserved effects which pooled OLS does not cover. Next, I ran the Hausman test to evaluate whether to use the random effects or fixed effects model. Since the null hypothesis was rejected in favour of the alternative hypothesis, the random effects would be inconsistent. The overall feature of the fixed effects model is that by demeaning the data it controls for the omitted (time invariant) variable bias. For all these reasons, I concluded that the fixed effects model is the most suitable for the used data set. The final models are stated as follows:

Model 1.1

$$sum\ of\ all\ payments_{i,t} = \beta_1 taxrate_{i,t} + \beta_2 tax\ rate^2 + \beta_3 GDP\ per\ capita + \beta_4 area + \mu_i + \delta_t + \varepsilon_{i,t}$$

Model 1.2

$$\log(sum\ of\ all\ payments_{i,t}) = \beta_1 taxrate_{i,t} + \beta_2 tax\ rate^2 + \beta_3 GDP\ per\ capita + \beta_4 area + \mu_i + \delta_t + \varepsilon_{i,t}$$

Model 1.3

$$payment\ \%_{i,t} = \beta_1 taxrate_{i,t} + \beta_2 tax\ rate^2 + \beta_3 GDP\ per\ capita + \beta_4 area + \mu_i + \delta_t + \varepsilon_{i,t}$$

See Table 2 below, with the descriptive statistics of the data set used, more precisely described in Chapter 4. The first statistic called *Company* signalizes only the label for every company in the data set (in total there are 733 companies included). The

second variable *payments* is in USD, *tax rate* is in % instead of being written in the decimal form, and the variable *area* uses 1 000 km squared as its unit, in order to intensify the estimates for easier interpretation.

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Company	3,255	348.638	220.416	1	148	563.5	733
Y_payment	3,255	159,208,756.000	1,083,592,488.000	63	599,776	31,762,850	30,916,731,092
X_taxrate	3,255	26.263	6.441	0	22.5	30	84
X_GDPpc	3,255	9,809.193	24,807.080	281.181	281.181	14,398.360	168,010.900
Y_taxpayment	3,255	91,367,847.000	791,962,176.000	0	0	12,079,152.0	23,117,026,918
X_taxrate2	3,255	731.209	353.139	0	506.2	900	7,006
Y_payment_%	3,255	0.402	0.442	0.00000	0.008	1.000	1.000
X_area	3,255	3,657.946	4,315.553	0.002	306.190	9,093.510	16,376.870

Table 2

As it is possible to extract the tax payments separately for another regression, I decided to complement the dependent variable (the sum of all types of payments) with tax payments only. This dependent variable is used in **Models 2.1, 2.2, and 2.3**, which follow the models described above with the choice of the independent variables. For the estimation purposes, I did not consider entries for which tax payment is not reported. Instead of making these observations equal to zero, I decided to delete the missing observations, as it is unlikely, that there was no tax payment from a company in the extractive sector. The data set was reduced to 2 309 observations for 522 companies, described in Table 3 below:

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Y_taxpayment	2,309	128,801,361.000	937,794,272.000	23	720,000	26,905,134	23,117,026,918
X_taxrate	2,309	26.097	6.379	0	22	30	84
X_taxrate2	2,309	721.709	361.554	0	484	900	7,006
X_GDPpc	2,309	9,625.509	24,392.190	281.181	281.181	14,398.360	168,010.900
X_area	2,309	3,916.718	4,456.244	0.002	310.070	9,093.510	16,376.870
Y_tax_percentage	2,309	0.433	0.444	0.00000	0.013	1.000	1.000

Table 3

More significant results can be expected when using the *tax payments* as the dependent variable because the tax rate should influence directly only the tax payments.

5.4 Panel data regression of the sum of all payments by countries

In order to use the advantage of the panel data structure, I decided to analyse the data in terms of all payments paid in the country by all companies together. This measures how the independent variables explain the total amount collected by the government from multinational companies in extractive industries.

I constructed the model using the same independent variables as I have already described in the previous sections. To make the model the best possible, I filled the missing observation by hand one by one, using the information searched online. See Table 4 below for the descriptive statistics of the data set, which I use for this regression. The variable *total* represents the sum of all types of payments reported in a country and the statistic *tax total* considers only tax payments. Again, the variable *tax rate* is already in percents and for *Area,* I use km squared as the unit of measurement, as the model's estimates allow me, in order to be understandable. In total the data set contains 151 countries for 1 – 3 years, depending on the reporting.

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
taxtotal	340	872,241,558	4,410,822,212	23	6,089,010	289,336,686	54,406,570,221
total	396	1,303,484,972	5,179,245,619	8,000	4,642,208	507,043,795	62,889,614,296
taxrate	396	25.226	8.986	0	20	30	84
taxrate2	396	716.906	593.6	0	400	900	7,006
GDPpercap	396	15,299.300	21,129.53	281.181	1,919.273	17,369.81	168,010.900
Area	396	913,117.6	2,169,400	2	70,637.5	770,880	16,376,870

Table 4

From Table 4, it is evident, that there are 56 countries in years, where only total payments were reported, and the "taxes" part of payments is missing.

Since there are 4 possible dependent variables – *total, log(total), tax total, log(tax total)*, I constructed a separate model for each of them and included all of the independent variables as before (labelled as **Models 3.1, 3.2, 3.3. and 3.4**, respectively). Furthermore, I ran the same tests as before to choose the most suitable estimation method of these panel data. Based on the tests, I decided to use the fixed effects model again. Since the time horizon is rather short, I acknowledge that time demeaning removes the entries with data for only one of the three years. This applies to Gambia, Georgia, Burundi and 9 other countries, which are excluded from the analysis for this reason.

5.5 OLS analysis of the payments by years

To fully examine the unique data set I decided to add the OLS regressions to cross-sectional data by years to find if the effect changed in time and to utilize the e straightforward interpretation of the OLS estimation. The results are then compared with the results of the previous panel data estimations in order to see any similarities or differences.

I decided to proceed with the same theoretical baseline as in the previous sections, which means using the dependent variable *company's payments to the governments*. To observe the elasticity of the payments, I employed these variables in the logarithm form as well. As the OLS regression is not capable of keeping the information which payments belong to which company, these dependent variables do not carry the information about the possible profit (and tax payments) misalignment. Therefore, I have also decided to include the third version of the dependent variable *percentage portion of all payments by the company to one government from its payments to all governments.* I decided to keep the *corporate income tax rate* as a tax incentive variable as the main independent variable. In order to find its non-linear effect, I also included the tax rate squared.

To include other factors that can influence the amount paid by a company to a government, I included the *GDP per capita* and the *land area* of the country. The variable GDP per capita signalizes the development of the country from the economic perspective and the land area may describe the possibility of occurrence of natural resources. The final models are constructed as follows:

Model 4.1

$$payment = \beta_0 + \beta_1 tax\ rate + \beta_2 tax\ rate^2 + \beta_3 GDP\ per\ capita + \beta_4 land\ area + \varepsilon$$

Model 4.2

$$\log(payment) = \beta_0 + \beta_1 tax\ rate + \beta_2 tax\ rate^2 + \beta_3 GDP\ per\ capita + \beta_4 land\ area + \varepsilon$$

Model 4.3

$$(payment\ \%) = \beta_0 + \beta_1 tax\ rate + \beta_2 tax\ rate^2 + \beta_3 GDP\ per\ capita + \beta_4 land\ area + \varepsilon$$

I estimate all version of the model for every year (2015, 2016 and 2017) separately. The drawback of the OLS estimation apart from the fixed effects model is that the omitted variable bias can occur in the estimation. The natural problem which can occur in the regression can be the selection bias. As I only analyse the reports mandatorily published by companies with profits or turnovers above the certain threshold, I do not have the possibility to consider also the smaller companies. I cannot distinguish whether all companies which operate multinational and therefore have the opportunity to shift the profit to convenient affiliates, fulfil the criteria for the mandatory country-by-country reporting.

See Tables 5 – 7 in this chapter below for the descriptive statistics of the data sets used. I would like to point out the standard deviation in Table 6: 2016 for *Y_payment* as it is lower compared to the other years. More significant results can be expected from the model applied to the year 2016 and using *Y_payment* as the dependent variable. Similarly, to the HHI calculated before but on the company's level, *Y_payment_%* with value 1 corresponds to company operating only in one country. There is very few of them in the year 2015 and approximately 25 % of the sample in both years 2016 and 2017.

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Y_payment	523	297,371,163.000	1,591,221,267.000	192	793,163.5	68,921,224	29,034,000,000
Y_payment_%	523	0.239	0.380	0.00000	0.002	0.269	1.000
X_taxrate	523	24.918	6.702	8	20	30	46
X_taxrate2	523	665.742	327.095	56	400	900	2,070
X_GDPpc	523	13,267.000	31,482.240	281.181	281.181	16,809.650	168,010.900
X_area	523	2,724.632	4,263.578	0.320	241.930	2,699.700	16,376.870

Table 5: 2015

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Y_payment	1,356	115,375,797.000	797,576,339.000	450	516,447.2	26,402,664.0	22,640,799,698
Y_payment_%	1,356	0.440	0.445	0	0.01	1	1
X_taxrate	1,356	26.473	6.342	0	22.5	30	84
X_taxrate2	1,356	740.981	357.794	0	506.2	900	7,006
X_GDPpc	1,356	9,287.483	23,699.500	281.181	281.181	12,654.350	168,010.900
X_area	1,356	3,818.068	4,312.276	0.002	316.017	9,093.510	16,376.870

Table 6: 2016

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Y_payment	1,376	149,890,846.000	1,086,913,878.000	63	589,922	29,416,698.0	30,916,731,092
Y_payment_%	1,376	0.427	0.446	0	0.01	1	1
X_taxrate	1,376	26.567	6.377	0	24	30	84
X_taxrate2	1,376	746.462	355.521	0	576	900	7,006
X_GDPpc	1,376	9,009.051	22,828.230	281.181	281.181	14,398.360	168,010.900
X_area	1,376	3,854.891	4,295.673	0.002	309.500	9,093.510	16,376.870

Table 7: 2017

6 Results

6.1 Comparison of the data set

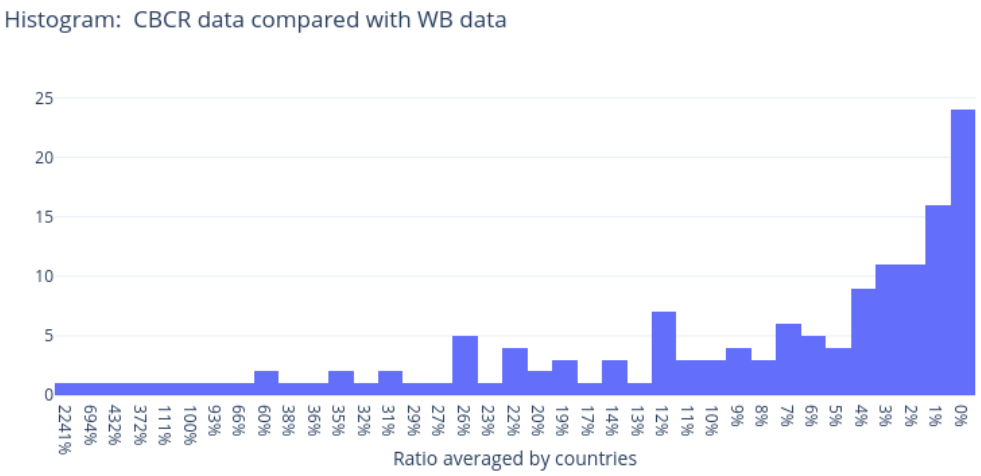
6.1.1 CBCR and WB data compared

When divided the CBCR data by the WB estimate in USD, the ratio describes how much of the WB data do CBCR data represent. There are 52 occasions in the CBCR dataset where no report was published for a country in a year and the WB estimated a non-zero revenue from natural resources rents, which signalizes that the CBCR data set is incomplete. On the other hand, there are results for 21 countries in the years, where the WB estimate is unavailable. Totally, I obtained 435 results for countries in the years, covering 145 countries. The average ratio resulted to be 37 %, which implies that the WB data set covers payments which CBCR data do not - payments from smaller companies or companies in the forest extraction industry.

In order to compare the results, I averaged the results of countries across all the years 2015 - 2017. There are 5 countries with greater ratio than 100% - Lebanon (2241 %), Iceland (694 %), Singapore (432 %), Mauritius (372 %), and Azerbaijan (111 %). The results for Cyprus correspond precisely to 100 %, meaning that the reports cover all estimated rents from natural resources. The majority (114 out of 145) of countries from all different income groups have the ratio below 20 %. See Table 8 with the descriptive statistics of the averaged results and its graphical interpretation.

CBCR data compared with WB data
Min. : 0.000006
1st Qu.: 0.012568
Median : 0.048590
Mean : 0.368251
3rd Qu.: 0.141417
Max. :22.408686

Table 8



6.1.2 CBCR and GRD data compared

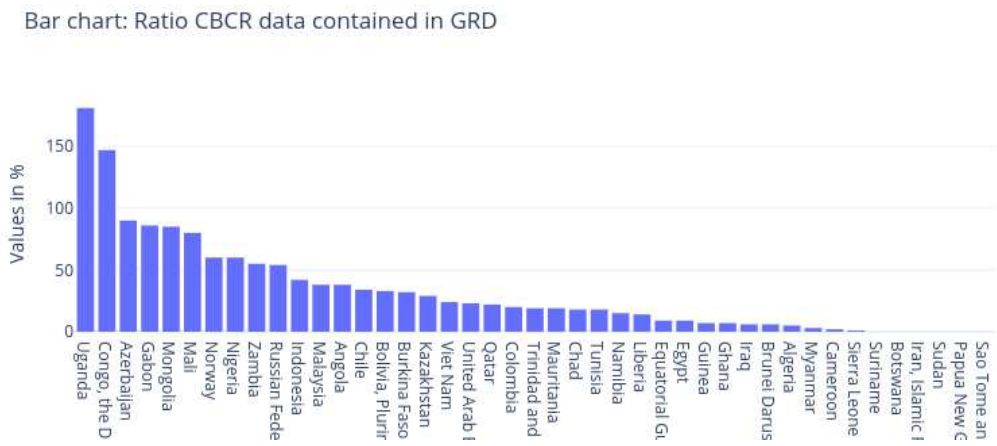
For this analysis, I have decided to proceed in the same way as in the analysis before (6.1.1). As the GRD data are limited in terms of quantity (there are only data until 2016) of the entries for the *total natural resources %* variable there are only 71 results of comparison for countries in years. Further descriptive statistics of the results are presented in Table 9 below.

Only 4 out of the 71 results exceed 100 % – Uganda for years 2015 and 2016 with results 187 % and 176 %, respectively, The Democratic Republic of Congo with 147 % and Mongolia with 135 %. All these countries are labelled as low-income countries except Mongolia, which belongs in the lower-middle-income group. The results over 100 % correspond to the fact, that there were more payments reported by companies then reported by governments. There are 28 countries/years (almost 40 % of the sample) with the result below or equal to 10 %, meaning that there were only low payments reported by companies compared to reported revenues of governments. This pattern can signalize a small share of the companies obliged to publish the CBCR in the developing countries.

For comparing countries with each other (43 countries), I calculated the average of all results by countries. There are only 2 countries with the result exceeding 100 % - Uganda and The Democratic Republic of Congo, both low-income countries, and 16 countries (i.e. 37 % of the dataset) with the result lower than 10 %. The descriptive statistics, as well as graphical interpretation of the results, follows.

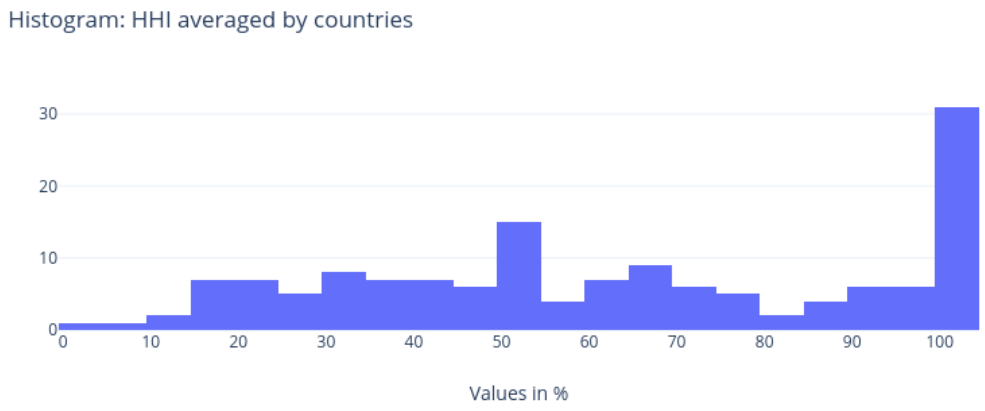
Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Ratio CBCR/GRD average for countries	43	0.323	0.393	0.000	0.058	0.403	1.815

Table 9

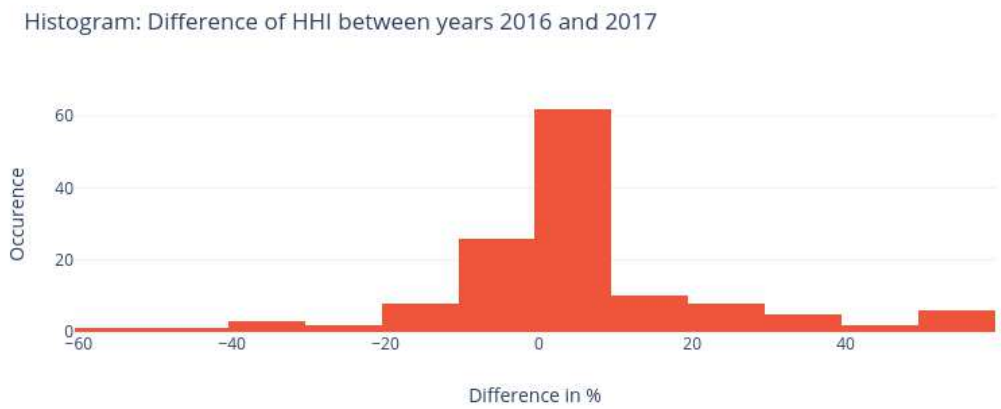


6.2 Herfindahl-Hirschman Index

The results for countries in years (280 results in total) vary from 3 % to 100 %, from very competitive markets with many firms and small market shares to monopolized markets where only one firm operates. The top 5 lowest values of HHI by country/years were found Canada (2016, 2017), United States (2016, 2017) and Peru (2016), with values from 3 % to 11 %. There are 65 countries in years (23 % of the results) with the full 100% index.



In order to compare the results by years, I found 12 countries where there is information for counting HHI reported only in one of the years, mostly relatively small or developing countries, such as Bangladesh, Yemen or Hong Kong, with intuitively low probability of data availability or high probability of no extracting company operating on the market. These countries were excluded from the comparison since I do not have further information to confirm the reason for missing observations. As the average of the HHI for the year 2016 is 58 % and for the year 2017 it is 62 %, I would not conclude any significant difference in competitiveness of the natural resources market worldwide. The following plots present the results by years.



In the histogram above, we can see that the HHI value did not change in most of the countries between 2016 and 2017.

To compare the countries, I decided to average the results by countries. The lowest values of HHI were found for Canada, United States, Colombia, Egypt and Peru, with rates 3 %, 9 %, 14 %, 14 % and 15 %, respectively. Canada can be considered as the outlier in that area of interest, possibly because Canada is the second largest country in

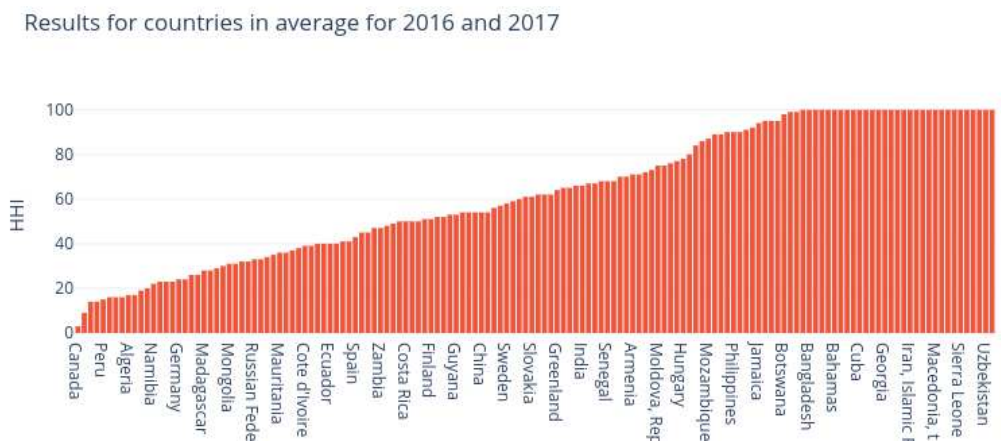
the world, rich in natural resources and having imposed the obligation ESTMA for companies to publish types and location of all payments to governments.

See Table 10 below where the descriptive statistics of the vector of results are shown:

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
HHI average for countries	146	0.625	0.290	0.030	0.388	0.945	1.000

Table 10

There are 30 countries associated with the full 100 %, meaning that there is only one firm (with 100% market share) in the country based on the payments to the governments reported. Please see the plot of the HHI results by countries below.



Note: Results in ascending order

When analysing the result using the income groups of countries, there is no consistent pattern between the country's income and the HHI. As displayed below in the plot, there is no difference in average HHI by income groups except the "low income" group, which has approximately 15% - 20% larger HHI then other groups. There is more tendency for natural resources markets to be monopolized in "low income" countries. I can guess that the market is either not mature, corrupted, not democratic, the government has set significant barriers to entry or the government intends to have only a few extracting companies in their country for a manageable reason. The results can also reflect the data published because the obligation to publish the reports is mainly for companies operating in Europe or Canada, which increase the number of observations belonging to these national markets. Since the data are not available for further analysis, I cannot make any conclusions.

As another aspect to view the results is its comparison with the total payments reported and collected by the governments. I establish the correlation coefficient which describes how much is HHI per country correlated with the total amount paid in the country. The resulted -21.25 % proposes that there is fairly weak but negative correlation implying that if the HHI increases; the total amount paid in the country is likely to decrease. As the market is more competitive, the market can get greater in terms of its profitability. Also, less competitive markets may suffer from profit underestimation in order to avoid taxes and other payments to governments. This phenomenon could be improved if the information from other countries were published and comparable.

6.3 Panel data regression of all payments by companies

As the first step after fitting my data in the model, I ran the Durbin-Watson test for detecting the autocorrelation and Breusch-Pagan test for detecting the heteroskedasticity. Both tests appeared to be positive, hence all models suffered from heteroskedasticity and autocorrelation of the idiosyncratic errors. To account for them, I decided to use cluster-robust standard errors. The results with the corrected robust standard errors are in Table 11.

	Dependent variable:		
	Y_payment_percentage	Y_payment	log(Y_payment)
	(1.1)	(1.2)	(1.3)
X_taxrate	0.001	32,482,848.000	0.033
	(0.002)	(54,093,178.000)	(0.032)
X_taxrate2	−0.00003	−527,209.800	−0.001
	(0.00005)	(984,654.000)	(0.001)
X_GDPpc	0.00000	169.883	−0.00000
	(0.00000)	(748.684)	(0.00001)
X_area	0.002	20,817,273.000	0.011
	(0.001)	(20,268,906.000)	(0.021)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 11

Let me first interpret model 1.1 using *payment percentage* as the dependent variable, even though the results are not significant. This model can identify if companies shift their profits to another affiliate in order to pay less (by reporting their profits in countries with lower tax rates). The tax rate effect differs across heaviness of the tax rate imposed. The effect is positive in the range of tax rates from 0% to 33.33% (where more than 75 % of all the observations belong), with the peak in 16.67 % of tax rate with the most intensive positive effect of 0.008 (or 0.8 %). After reaching the tax rate of 33.33 % the impact becomes negative and for 100% taxation the effect falls to -0.2. Since there is no such country with a tax rate of 100 % and the 3rd quartile of the corporate income tax is 30 % (see Chapter 4), the estimated effects for these extreme values are not as relevant. For instance, the interpretation for a tax rate in the neighbourhood of 16.67 % is the following: if the tax rate increases by 1 percentage point (from 16.5 % to 17.5 %), the fraction of all company's payments increases in the country increases by 0.8 percentage points.

When considering the model 1.2 the company's connection between particular payments is broken and only payments as such are analysed. The effect of the tax rate is very similar to the previous model by its shape. The effect is positive for the tax rate from 0 % to 61.6 % and then becomes negative. As the dependent variable corresponds to payments in USD and not to percentage part in the range between 0 % and 100 %, the effect changes its units as well. The impact of the tax rate is the most intensive in the neighbourhood of 30.8 % tax rate and reaches 500 300 000. Such estimate would be interpreted as 500 300 000 USD increase in payments of a company to a single

government if the tax rate increased by one percentage point (for example from 30 % to 31 %). However, the effect gets smaller for other values of the tax rate and the estimates are not significant at any relevant levels.

The last model 1.3 describing the semi-elasticity of the payments reported does not take into account any connection between payments of one company across different countries. The tax rate effect still holds the same shape of a parabola with the negative quadratic term and a positive linear term. The total effect of the tax rate is positive from 0 % to 33 %. Between these values is the peak (16.5 %) with the highest effect magnitude of 0.272, meaning that as the tax rate increases by 1 percentage point (from 16 % to 17 %), the estimated payment in the country increases by 27.2 %, keeping in mind, that this is the most extreme effect among the positive effects. From the description of the data set used, the highest tax rate imposed is 84 % and its estimated effect would be -4.284. Hence, the effect of the tax rate ranges from -4.284 to 0.272. As a robustness check the land area was also replaced by the population of the countries. For the comparison of the estimates from Table 11 with their alternatives using the independent variable *inhabitants* instead of the land area see Table A1 in the Appendix. The alternative variable *inhabitants* did not bring any significant differences for estimates of the tax rate's effects, as well as its significance. I suppose that there is a significant correlation between the population size and land area of the country, therefore I do not construct the model with both variables.

	Dependent variable:		
	Y_tax_percentage	Y_taxpayment	log(Y_taxpayment)
	(2.1)	(2.2)	(2.3)
X_taxrate	−0.003	19,721,047.000	0.003
	(0.003)	(23,995,657.000)	(0.028)
X_taxrate2	0.00005	−271,218.800	0.0001
	(0.0001)	(437,772.600)	(0.001)
X_GDPpc	−0.00000	−59.297	0.00000
	(0.00000)	(634.995)	(0.00000)
X_area	0.006	15,506,830.000	−0.005
	(0.006)	(23,672,297.000)	(0.072)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 12

The same approach I have chosen for analysing the tax payments only. In Table 12 are shown results with the cluster-robust standard errors in the brackets, corrected for heteroskedasticity and autocorrelation of the idiosyncratic disturbances. As mentioned before, there are fewer observations for tax payments only, which might partly cause the insignificance of the results, even though the natural expectation were different.

Let me start with the interpretation of the results of model 2.1. The tax rate affects the percentage of all the company's tax payments which the company reported negatively between 0 % and 60 %. The most negative impact is in the neighbourhood of the point 30 % of the tax rate, with the value of -0.045. For tax rate's value greater than 60 % the effect becomes positive and is progressively increasing. For instance, the mean value of the tax rates in the data set (26.3 %) corresponds to an estimated effect of -0.044, which can be interpreted as: if the tax rate increases by 1 percentage point (from 26 % to 27 %), the percentage of all tax payments of the company paid in the specific country decreases by 4.4 percentage points.

The second model (2.2) describing the effects on the payments but without any connection with other payments of the company, but it is needed to bear in mind the fact that the individual tax payments are summed up on the company level. The tax rate affects the tax payments positively (on average) between 0 % and 72.71 %, which includes almost all observations of the data set. The highest effect ($3.6 * 10^8$) is associated with the tax rate 36.4 %, otherwise, the effect is closer to zero.

The interpretation of the last model (2.3) follows: the impact of the tax rate is only positive (except 0 %, where the impact is essentially zero) and increasing with the higher tax rates. For example, the effect associated with the tax rate 30 % is 18 %, meaning that as the tax rate increases by 1 percentage point (from 30 % to 31 %) the expected tax payment increases approximately by 18 % (multiplying the payment associated with 30 % by 1.18).

6.4 Panel data regression of the sum of all payments by countries

Using the Breusch-Pagan test for heteroskedasticity and Durbin-Watson test for autocorrelation were detected both problems. To correct the estimates, I decided to use the cluster-robust standard errors. Table 13 presents the results.

	Dependent variable:			
	log(total)	total	log(taxtotal)	taxtotal
	(3.1)	(3.2)	(3.3)	(3.4)
taxrate	−0.689***	15,576,842.000	−0.397***	9,858,313.000
	(0.131)	(74,254,589.000)	(0.150)	(63,226,708.000)
taxrate2	0.012***	741,585.800	0.009**	853,147.700
	(0.002)	(1,334,817.000)	(0.004)	(1,504,380.000)
GDPpercap	0.00003***	13,176.460	0.00003***	11,379.150
	(0.00001)	(13,512.040)	(0.00001)	(11,941.660)
Area	0.0001***	526,473.800***	0.0001***	280,399.700***
	(0.00002)	(7,825.016)	(0.00002)	(6,944.262)
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 13

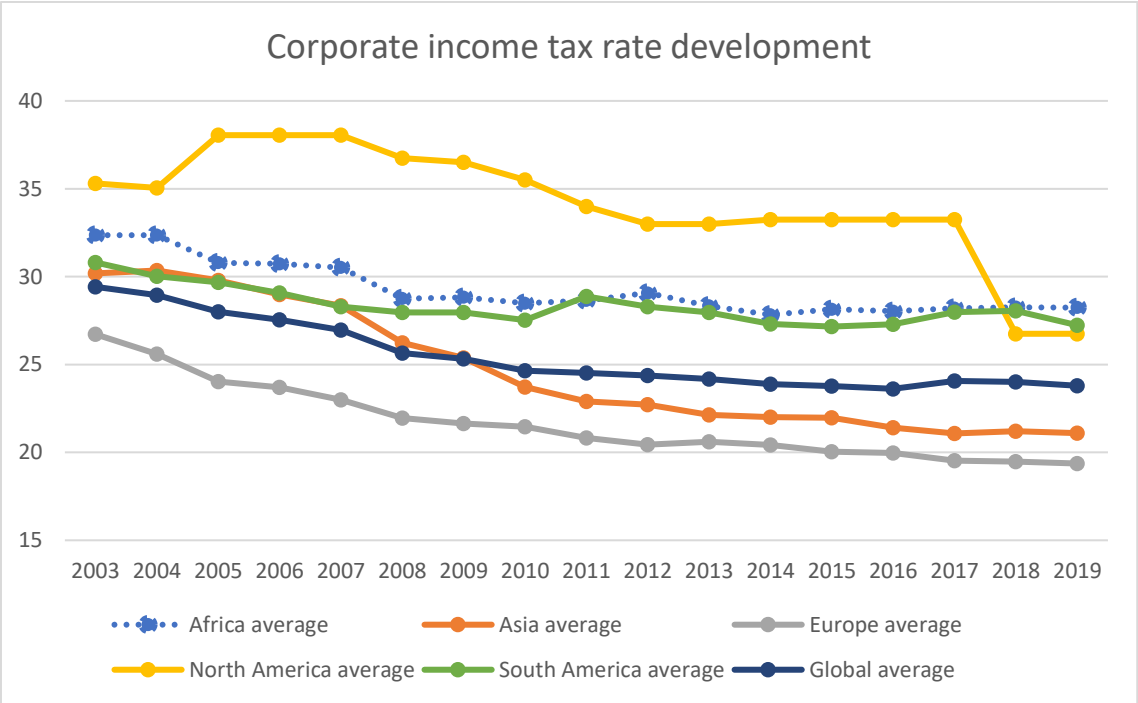
First, I interpret the results of model 3.1. Keeping the unobserved effect for all countries the same, the tax rate effect compiled from the linear and quadratic terms, is negative for the tax rates in the range between 0 % and 57.4 %, with the most negative effect in the neighbourhood of the point 28.7 % (effect of -9.9). As there are very few observations with the tax rate over 57,4 %, I can conclude that the tax effect is mostly negative. The interpretation is: as the tax rate increases by 1 percentage point (from 28 % to 29 %), the sum of all reported payments in the country decreases by 989 %. Such an effect would turn the sum of payments to a negative value, which makes no sense. Hence, we can conclude that although the estimates are significant, the model is not specified correctly (a most likely wrong form of the dependent variable). The estimates in the level-level models 3.2 and 3.4 are not significant for any independent variable except the variable *area*, which is not the main effect of interest.

The elasticity model 3.3 is significant in all independent variables. The negative parabola describes the impact of the tax rate on the major part of the tax rates observations on the logarithmically transformed sum of only tax-type-payments reported. I can conclude that firms obliged to publish the country-by-country reporting describing their payments to governments react negatively on higher values of the corporate income tax. They can either shift their profit to countries with lower corporate income tax or limit their operations in countries with higher tax rates. As there are no data describing how much is extracted in specific locations, no further conclusions can be made.

In order to carry out the robustness check as it was done in the previous chapter, I replaced the land area by the population size (see Table A2 in the Appendix). As the *inhabitants* variable is not significant in any semi-elasticity model and does not change

the estimates of the tax rate significantly, only the model with the *area* variable is included.

Less developed (low or lower-middle-income) countries, which are mostly African countries rich in resources, would benefit from the proper tax collection the most. The results of the regression suggest that if the corporate income tax rate is lowered, the expected collected payments from the companies in extractive industries is about to increase. The plot below depicts the development of the corporate income tax rate (averages of the continents) during the last 15 years. Globally, the corporate tax rate is steadily decreasing over the studied period. Apparently, the African average corporate income tax rate is one of the highest in the last few years. This observation suggests that there is an opportunity to decrease the corporate income tax by African governments in order to maximize the collected payments.



Note: Author, using the Corporate Tax Rates Table by KPMG

6.5 OLS analysis of the payments by years

To interpret the results and their significance precisely, I decided to run the Breusch-Pagan test for heteroskedasticity of the residuals, which resulted in very small p-values rejecting the null hypothesis: "Residuals are homoskedastic." To correct for the heteroskedasticity I decided to use the robust standard errors, for the models chosen. As the data describing the companies are very limited, there is no better way how to deal with the data.

As depicted in Table 14 below, the linear estimates of the tax rate impact in model 4.1 for the years 2016 and 2017 are significant at the 90% level. The combined effect of linear and quadratic variables is negative between 0 % and 84.85 % for the year 2016 and between 0 % and 89 % for the year 2017. As the maximum value of the tax rate in the data set is 84 %, the effects are negative for all observations. The peak values of the parabolas are 0.79 billion and -1.1 billion, for years 2016 and 2017 respectively. As the estimations of the constants are also significant in these models, with increasing tax rate the payments paid decrease by subtracting from the initial value - constant.

The tax rate estimations in the model 4.1 (see Table 14 below) for the year 2015 are rather not significant at all, as the corrected standard errors associated the tax rate exceed the estimations. The insignificance may occur due to fewer observations reported in the year 2015 or companies deciding and behaving individually.

	Dependent variable:		
	payment		
	(2015)	(2016)	(2017)
X_taxrate	311,702.600	−37,046,167.000*	−49,368,551.000*
	(24,822,437.000)	(19,845,231.000)	(26,142,831.000)
X_taxrate2	−466,343.300	436,573.100	550,694.900
	(468,285.500)	(339,532.100)	(432,738.900)
X_GDPpc	−4,977.155*	−2,466.385	−4,841.359
	(2,655.298)	(2,106.265)	(3,208.292)
X_area	66,681.840	27,457.720	45,215.240
	(45,640.810)	(18,713.080)	(28,121.250)
Constant	491,680,555.000	727,575,726.000**	1,002,401,980.000**
	(359,683,734.000)	(291,487,598.000)	(404,057,756.000)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 14

Tables 15 and 16 show the results when alternating the dependent variable with *log(payment)* and *percentage payment.* In Table 15, where semi-elasticity of the payments is estimated, the results approve the estimates from Table 14, but very insignificantly. The model 4.3 in Table 16 do not provide any significant estimates of the tax rate effect on the percentage part od payments paid in the specific country, hence it is probably not a correctly chosen dependent variable for this model.

	Dependent variable:		
	log(payment)		
	(2015)	(2016)	(2017)
X_taxrate	0.003	−0.111	−0.095
	(0.121)	(0.075)	(0.070)
X_taxrate2	−0.001	0.001	0.001
	(0.002)	(0.001)	(0.001)
X_GDPpc	−0.00001	−0.00001*	−0.00001***
	(0.00001)	(0.00000)	(0.00000)
X_area	0.0001**	0.0001***	0.0001***
	(0.00003)	(0.00002)	(0.00002)
Constant	16.467***	17.365***	17.163***
	(1.437)	(0.929)	(0.902)
Note:		*p<0.1; **p<0.05; ***p<0.01	

Table 15

	Dependent variable:		
	payment_percentage		
	(2015)	(2016)	(2017)
X_taxrate	−0.0004	0.003	0.002
	(0.019)	(0.021)	(0.021)
X_taxrate2	−0.0001	−0.0001	−0.00003
	(0.0004)	(0.0004)	(0.0004)
X_GDPpc	−0.00000	−0.00000	−0.00000
	(0.00000)	(0.00000)	(0.00000)
X_area	0.00003***	0.00004***	0.00004***
	(0.00000)	(0.00000)	(0.00000)
Constant	0.243	0.272	0.259
	(0.212)	(0.242)	(0.233)
Note:		*p<0.1; **p<0.05; ***p<0.01	

Table 16

With respect to the results of the panel data analysis describing the same phenomenon, which deals with omitted variable bias and resulting with insignificant estimates, I can conclude that the OLS estimates are most likely biased, probably due to omitting important variables in the model.

7 Conclusion

The thesis utilizes newly published data set following the transparency trends of obligatory publishing of the country-by-country reports by companies in extractive industries. The directive is imposed on multinational and profitable companies but demands to report only information about the types of payments and countries where the payments were paid. It was very challenging to find suitable independent variables (in terms of correctness and completeness) to include in the econometric models and to choose the most appropriate estimation method. I followed the previous research using data published by banks and financial institutions by taking payments summed on company's affiliates level.

This panel data regression did not yield any significant estimates, possibly due to unobservable missing information, such as variables describing the economic activity of the individual companies (for example labour or capital inputs, and profits by countries). Trying a different approach and running the OLS estimation for cross-sectional data for the separate years 2015, 2016 and 2017 did not yield any significant results which could contradict the outcomes from the panel data analysis.

Eventually, summing the reported payments together by countries brought significant results, which may lead to a recommendation: what is the ideal corporate tax rate imposed on the companies in the extractive industries to maximize the governments' income. For 394 observations from 396, the tax rate's impact on the elasticity of all types of payments summed is negative and parabolically decreasing till the tax rate 28.708 %, where it is the most negative. The 1% increase in the tax rate (from 28 % to 29%) is associated with more than 900% decrease of the payments reported. Since the negative payments were not included in the regression, the effect is not reasonable to be correct. This leads to a conclusion, that the model is most likely specified incorrectly. However, very similar and significant results were obtained with the sum of only the tax payments paid as the independent variable.

The Herfindahl-Hirschman index describing the competitiveness of the extractive industries national markets resulted in 30 countries with only 1 operating company in the years 2016 and 2017 on the national market, according to the obtained evidence. The most competitive markets in terms of companies reporting their payments to governments result to be in Canada and the USA. The comparison of the newly obtained data set with the estimated or reported natural resources rents which already existed before did not find

any correlation or similarity between the different sources. The discrepancy suggests the differences in defining the extractive industries and the lack of companies obliged to publish the payments to governments reports.

Since the data set is still being updated, I would suggest repeating the estimations with the more observations included, to see if there are any changes caused by country-by-country reporting obligations. Also, as the transparency is a highly discussed topic among numerous organisations, these mandatory reports might be imposed further on smaller companies (exceeding a lower profit threshold than today) and might be extended in terms of the information included. This thesis may also serve as the baseline for further research, as the data set was not examined by other researchers yet.

8 List of the literature

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Appendix

Re-estimation with the number of inhabitants instead of the land area as the independent variable

	Dependent variable:		
	Y_payment_percentage	Y_payment	log(Y_payment)
	(1)	(2)	(3)
X_taxrate	0.001	32,534,644.000	0.033
	(0.002)	(54,107,046.000)	(0.032)
X_taxrate2	−0.00003	−530,476.000	−0.001
	(0.00005)	(985,458.700)	(0.001)
X_GDPpc	0.00000	−505.223	−0.00000
	(0.00000)	(787.648)	(0.00001)
X_inhabitants	0.000*	1.394	−0.00000*
	(0.000)	(3.167)	(0.00000)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table A1

	Dependent variable:			
	log(total)	total	log(taxtotal)	taxtotal
	(1)	(2)	(3)	(4)
taxrate	−0.692***	7,329,640.000	−0.401***	7,024,799.000
	(0.129)	(72,011,490.000)	(0.150)	(64,055,475.000)
taxrate2	0.012***	940,049.700	0.009**	921,745.900
	(0.002)	(1,336,325.000)	(0.004)	(1,560,771.000)
GDPpercap	0.00003***	9,183.657	0.00003***	9,205.838
	(0.00001)	(10,056.780)	(0.00001)	(9,939.472)
Inhabitants	0.00000	105.448*	0.00000	58.248
	(0.00000)	(56.652)	(0.00000)	(50.545)
Note:				*p<0.1; **p<0.05; ***p<0.01

Table A2