Is There any Resource Curse in Education and Health Sector?

A Subnational Analysis of Resource Curse Dynamics at the Indonesian District Level

A Research Paper presented by:
Dina Pramudianti
(Indonesia)

In partial fulfilment of the requirements for obtaining the degree of:
Master of Arts in Development Studies

Student Number:
574180dp

Major:
Economics of Development

Members of the Examining Committee:
Dr. Elissaios Papyrakis
Dr. Matthias Rieger

The Hague, The Netherlands
November 2021

Disclaimer:

This document represents part of the author's study programme while at the Institute of Social Studies. The views stated therein are those of the author and not necessarily those of the Institute.

Inquiries:

Postal address:

Institute of Social Studies

P.O. Box 29776

2502 LT The Hague

The Netherlands

Location:

Kortenaerkade 12

2518 AX The Hague

The Netherlands

Telephone: +31 70 426 0460

Fax: +31 70 426 0799

CONTENTS

List of Tables

List of Figures

Acknowledgements

Foremost, I would like to thank my supervisor, Elissaios Papyrakis, and my second reader Matthias Rieger for their patience, motivation, help, support, and immense knowledge during the process of this research paper.

I would like to express my gratitude and love to my best supporting system, my husband, Hendro Hastowo and my daughter Haura Abia who always help and support me to pursue my dream.

My sincere also goes to all Indonesian Double Degree students, Major ECD students, My Indonesian family in Den Haag, especially Indah, Nina, Wening, Dince, Edwin, and Vania. Thank you for always taking care of me. My peer discussant Bangun Canggih, my consultation team, Mas Indra, Renosa, Mas Rizki, Mas Ardhi and all of PPIE UI Students, thank you for your times and efforts to help me to finish my RP.

Last but not least, I thank my family in Magelang and Wonogiri for their prayer and blessing that always support me even in a difficult situation. I hope I can present my master degree, especially for my father that always dreamed of it.

Abstract

Whether natural resource has positive or negative effect on social development indicator has been a long-standing debate between economists. Existing studies shows the mixed results with their own justification. I contribute to this topic by examining the effect of natural resource dependence on some health and education outcomes utilizing a large sample of Indonesian district's data from 2007-2017.

The empirical result indicates that there is positive and significant correlation between the mining rent per capita and the net enrolment ratio of senior secondary school, health expenditure and the percentage of birth attended by a skilled health labor. Even though the result is less robust, the mining rent per capita also has positive correlation with literacy rate, immunization rate and life expectancy (old method). The correlation between the share of people employed in mining and quarrying sector and the literacy rate are positive and significant. The government revenue dependences also almost do not have a robust correlation with education and health outcomes, except for negative correlation between oil revenue and life expectancy 2010-2017. Overall, I can conclude that the resource dependence in Indonesia mostly support education and health outcomes.

The possible transmission channel on how natural resource dependence may affect education and health outcomes come from income, inequality and government institutional quality proxy. However, there is possibility of other transmission channel that is a little difficult to measure in district level due to the unavailability of the data such as, pollution and child labor. Extension of my study can take those variables into account and scrutinize more on the possibility of other transmission channel mechanisms.

Relevance to Development Studies

The paper will contribute to the literature on development studies since it attempts to analyse the impact of natural resources in a broader view than economic growth. There have been numerous studies come out with varied results of whether resource abundance is good or bad for the economic growth of a country. However, the study focussing on the impact of natural resource dependence on health and education sector is still lack in quantity. Thus, this paper will contribute more to development study by providing within country analysis of the effect of natural resource to education and health outcomes.

Keywords

Natural resource dependence, education outcomes, health outcome, resource curse, resource blessing, Indonesia, Dutch Disease, Transmission Channel

CHAPTER 1
INTRODUCTION

1.1 Background of the Study

There has been a long-standing debate among economists whether natural resource is a blessing or a curse for nations. In the early studies, it is believed that natural resource was beneficial for development because it can be a source of potential income for both government and citizens (Nurske, 1953; Rostow, 1959). Citizen can use income from natural resource to improve their wellbeing including health and education. Similarly, government can use the revenue form natural resource to provide a better infrastructure dan human capital accumulation. Therefore, the natural resource abundance may lead to enhanced economic growth, employment, poverty alleviation, infrastructure improvement, encouragement of related industry, and technology transfer (Karl, 2004).

However, many studies afterwards state that resource rich countries tend to have slower economic growth compared to resource poor countries (Auty, 1994; Sachs and Warner, 1995; Dietz et. al, 2007; Ross, 2001). Several intermediate channels do so, such as lessen the competitiveness of the manufacturing sector (Dutch disease), increasing rent-seeking behavior, lowering the quality of economic policies, and weakening the demand for schooling (Gylfason, 2001).

The term Dutch disease refers to the condition that happened in the North part of the Netherland when there was a discovery of natural gas reserves followed by the commodity price boom that drove up the exchange rate reducing the competitiveness of the manufacturing and other exports (Auty, 1994). While manufacturing sector is believed to create more positive externalities (learning by doing) to support the economy. For this reason, Sachs and Warner (1995) argue that too much focus on developing natural resource sector may lead to high unemployment and less investment in health and education because of the nature of this sector that require capital intensive.

The low hanging fruit revenue from natural resources makes the government face resilient problems such as rent seeking and corruption that distort government policies' effectiveness (Brunnschweiler, 2008). Furthermore, the government may become overconfident with their resource rent revenue and neglect the importance of human capital development (Gylfason, 2001). On contrary, a resource-poor country become more mindful with their economic policy due to its marginal position (Auty, 1994:12).

On the one hand, especially at the household level, natural resource abundances can increase household income; therefore, households can afford better education and

health facilities (Mejia, 2020). On the other hand, the easiness to make an income from natural resources can negatively affect the household through various channels. Child labor is an example mechanism that may hinder educational attainment in countries where the mining activities are still being conducted traditionally. There is a tendency for the parent to send their children to work at an early age than to go to school (Santos, 2014). The fact that some mining sectors do not require highly skilled labor makes this condition even worse; therefore, the opportunity cost of studying will increase, forcing children to leave school for work (Ahlerup et al., 2019; Mejia, 2020). The gold price boom in Burkina Faso in the early 2000, is an example that the gold mining may increase the child labor (Zabsorne et al, 2018). Also, for health, the mining activities may cause pollution that may endanger public health and the environment. A literature study conducted by Stephens and Ahern (2001) points out that in long term, mining workers have a high risk of some health problems such as cancers and respiratory problems such as silicosis, asbestosis and pneumoconiosis. Moreover, most literatures address that mining sector has adverse effects on community health.

To date, many studies have been conducted to examine the effect of the natural resource abundance on a national economy that shows the varied result. The results depend on the variables chosen, the analysis period, and the econometric techniques (Murshed, 2018). Some studies point out that the economic growth in many well-endowed countries is underperformed compared to the less well-endowed countries (Sachs and Warner, 1995; Gylfason, 2001; Papyrakis and Gerlagh, 2004; Rosser, 2004). However, other studies show that resources can be a blessing, like Botswana, Malaysia, and Saudi Arabia that can maintain their economic growth (Auty and Gelb, 2001; Auty 2001; Murshed, 2018).

Further development of the study about natural resources tried to generate insight on the transmission channel from natural resource dependence to failure of economic growth. Gylvason (2001) points out that the inverse relationship between natural resource and economic growth due to the crowding out human capital investment. Later, Papyrakis and Gerlagh (2004) also mention about schooling transmission channel that may outweigh the positive effect of natural resources to economic growth.

A study conducted by Weber-Fahr et al. (2002) points out that natural resources may increase household income and provide more welfare to the population. In addition, some sub-national studies show that regions with higher natural resources endowment have higher school attainment (Ahlerup et al., 2017; Mejia, 2020; Kim and Lin, 2017).

On the other hand, other studies point out that some well-endowed countries have a slower progress in improving their social indicators of development. For example, in sub-Saharan Africa, some resource rich countries, like Nigeria, is failed to improve its human capital accumulation. The resource abundance may decrease unemployment but involve

more child labor and lower educational attainment (Zabsonre et al., 20018, Santos, 2018, Ahlerup et al., 2019). Children sometimes are forced to work at such early age and leave their schools. Hence, their educational attainment is also low. Another study conducted by Gylfason in 2008 mentions that public spending on education and health care in resource-rich countries is significantly lower than in resource-poor countries because of the poor political institution prone to rent-seeking behavior.

However, Saviola and Sen (2020) argue that nations endowed by an abundant natural resource can end up with significantly different achievements in terms of poverty, inequality, health, and education. The mixed results mainly depend on the political economy mechanism that drives the developmental consequences.

Even though there are many studies related to a natural resource and human development indicator, to my knowledge, there are few studies conducted at the district level, especially in Indonesia. Studies in Indonesia mainly assess the effect of natural resources on Gross Regional Domestic Product (GRDP) with various resource dependence proxies in each district. However, the results are also mixed. Within-country study of Indonesia, Cust and Rusli (2016) also Hilmawan and Clark (2019) found a resource blessing that the natural resource improves GRDP. Still, Komarulzaman and Alisjahbana (2006) found a resource curse on GRDP growth. This contradictory finding is likely happened due to the different resource dependence measures that may prone to the endogeneity problem.

While for social development, a study conducted by Edwards (2016) shows that there is a negative effect of natural resource dependence on the education and health sector in Indonesia. He examines the impact of the natural resources dependence on school enrolment rate, exam test score, the birth attended by a skilled health worker, and average household health and education expenditure. However, his study only focuses on single year data, 2009. In my opinion, a study about the effect of natural resource dependence should be conducted in a longer time frame to provide a better explanation about the result and prevent any anomalies. Besides, a single-year analysis makes the study is prone to omitted variable bias.

Therefore, I conduct a study to examine the effect of natural resource dependence on social development indicators focussing on health and education outcomes at the district level for a longer time frame (2007-2017).This study will provide insights about the impact of district's resource dependence on their education and health outcomes. Besides, it will be relevant for the policymaker in Indonesia to improve their human development policies.

For the proxy of education, I employ monthly per capita household education expenditure, net enrolment rate of secondary school, literacy rate of the population age 15 and over, and the average of years of education in each district. While the proxy of health outcome is represented by the monthly per capita household health expenditure, birth

attended by skilled health worker, immunization coverage for children under 5 years old and the average of life expectancy.

The resource dependence proxy, I use the share of the mining and quarrying sector in GRDP (mineral rents per capita), the share of people employed in mining and quarrying sector (employment dependence), government revenue dependence from oil (per capita), government revenue dependence from gas (per capita), also government revenue dependence from oil and gas (per capita). Those data are taken from the Human Development Index Survey and National Labor Survey (Sakernas) conducted by Statistics Indonesia (BPS), Ministry of Finance of The Republic of Indonesia, also from The Indonesian Database for Policy and Economic Research (INDODAPOER), The World Bank. I apply quantitative panel data analysis on the district (Kabupaten/Kota) level.

1.2 Research Problem

Indonesia is the most prosperous natural resource country in Southeast Asia. But not every district does have similar natural resources; some are richer than others. Therefore, the percentage of mining and quarrying sector in each district's GRDP also varies. Indonesia has more than 500 districts that can be a proper object to be scrutinized. Moreover, despite endowed with rich natural resources, Indonesia can maintain its economic growth. Therefore, in the cross-country level study, Indonesia is considered a country with resource blessing, not resource curse. But how about at the district level, are Indonesia districts still have an excellent performance in maintaining their social development indicator? Therefore, I am motivated to observe the relationship between the natural resource dependence on health and education outcome at the district level in Indonesia.

1.3 Significance of the Study

The paper will contribute to the literature on development studies since it attempts to analyse the impact of natural resources in a broader view than economic growth. There have been numerous studies come out with varied results of whether resource abundance is good or bad for the economic growth of a country. However, the study focussing on the impact of natural resource dependence on health and education sector is still lack in quantity. Moreover, study of Indonesia offers a large and reliable cross-section data. Besides, the within-country analysis, that I choose, is believed to provide better control for unobserved heterogeneity in national factors affecting health and education outcomes compared to the cross-country analysis. Thus, the result of this paper might be more beneficial for local policymakers in Indonesia to direct the program not only focus on economic growth but also other social aspects.

1.4 Research Objective

This research paper aims to find the effect of natural resource dependence on the health and education outcomes at the district level of Indonesia and the possible channels. For Indonesia, the subnational level study mainly examined the effect of natural resources on economic growth. Moreover, to the best of my knowledge, there has been no study examining the impact of natural resource dependence on health and education outcomes for a comparatively long-run perspective at the district level in Indonesia.

1.5 Research Questions

As indicated in the research objective above, the research questions in this paper are:

Main research question:

- What is the effect of various natural resource dependence indicators on district education and health level in Indonesia?

Additional question:

- What are the possible transmission channels?

1.6 Limitations

The availability of the data is my main concern during this study. Unlike the provincial level data, some data, such as the corruption level representing the institutional quality, is not available at the district level. Therefore, I choose another variable (the opinion from the Indonesian Audit Board for the district's financial statement) to be an alternative proxy. There are also several new districts because of territorial separation (proliferation) that have not much historical data. Therefore, I merged the new districts with their parents' districts for the analysis purpose and to increase the data reliability.

My second concern in this study is the difficulty to address externalities and spill over from the nearby resource-rich district. The higher education and health level in one district may be caused by the availability of more prominent education and health facilities in the nearby districts. It is impossible to observe each district's distinct characteristic and nearby districts because of the vast number of the districts. Therefore, I include the government revenue sharing from oil ad gas as an alternative proxy of resource dependence. The reason for doing so is, in Indonesia, the mining revenue are shared not only for the production districts but also for the nearby districts. Hopefully, it can capture the spill over effect of the mining activity to the nearby district.

Some studies measure the effect of resource dependence on different gender. However, in this study, I cannot divide the effect of the natural resource dependence for different gender since the unavailability of data. Again, the Indonesian district level data is more limited compared to provincial level.

1.7 Organisation of the Research

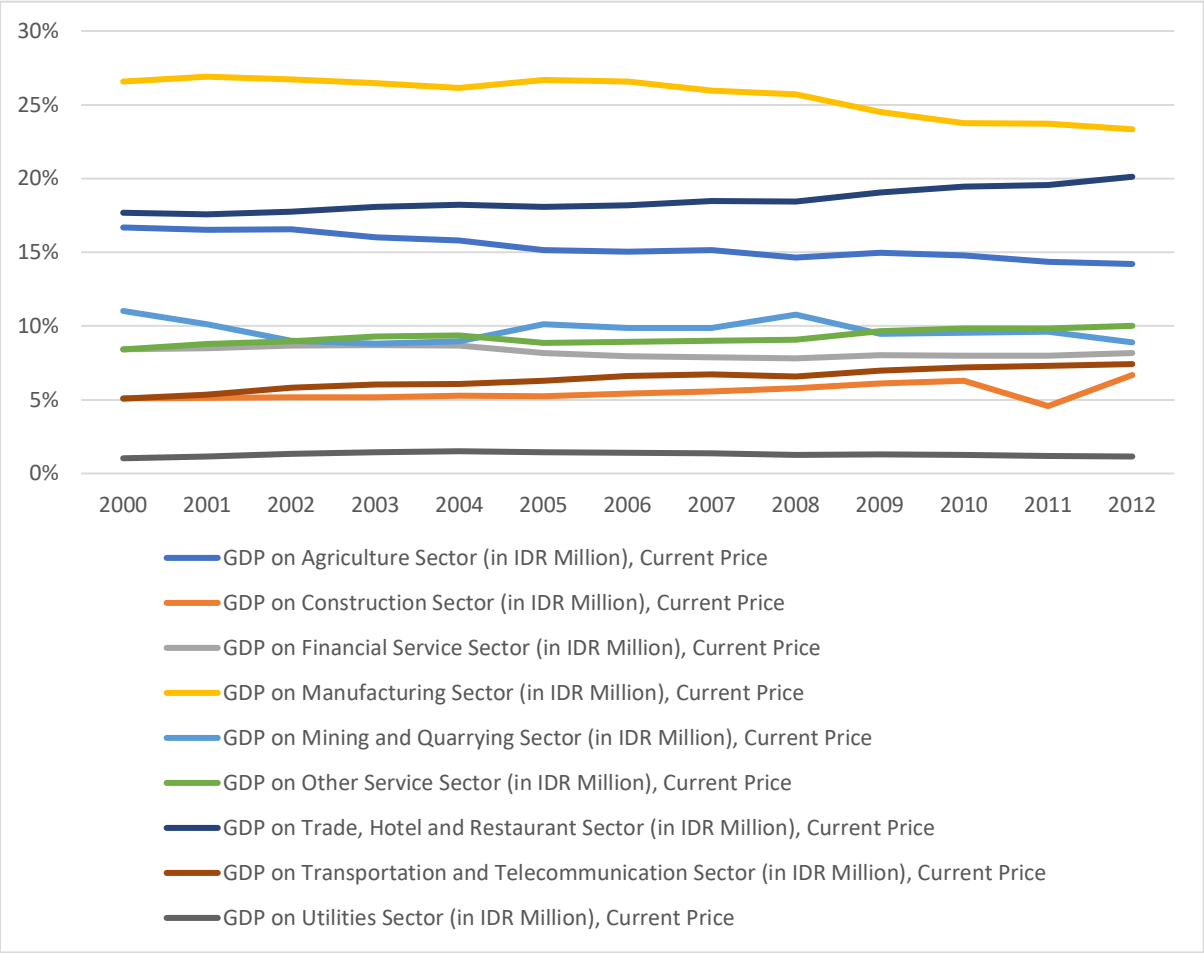
This research paper is structured as below. The first chapter provides an introduction and background of the research. In the second chapter, I explain overview of Indonesian condition. The third one present the literature reviews used as the baseline of the paper. In addition, the fourth one describes the methodology implemented in the paper. The fifth chapter portrays the result and the analysis of the paper. Last, it offers the conclusion of this study.

CHAPTER 2
OVERVIEW OF INDONESIAN CONDITION

2.1 Natural Resource in Indonesia

Indonesia is richly endowed with natural resources. Indonesian export of steam coal, refined tin, and nickel ore is the biggest in the world, besides the exports of gold, bauxite, lead, zinc, and cooper also play a significant role in the world (Dutu, 2015: 7). From 2000 until 2017, approximately 9% of Indonesian GDP comes from the mining and quarrying sector.

Figure 1. Share of Each Sector in Indonesian GDP



Source: Indonesia Data for Policy and Economic Research (INDODAPOER), The World Bank.

Indonesian mining exploration started during Dutch colonialism. In 1602, the Dutch government established the VOC; besides selling spices, they also started trading in mining products. In 1652 the scientists from Europe came to investigate various aspects of natural potential in Indonesia. The first gold mining appeared in 1669 in Salido, West Sumatra, during the tenure of Commandeur Jacob Joriszoon Pit by employing slaves from Nias.

After the VOC went bankrupt due to corruption, the Dutch government took over all the control previously owned by the VOC after dissolving it in 1799. During that time, the industrial revolution began in Europe, marked by the invention of the steam engine, which increased the need for mining goods.

In 1850 the Dutch East Indies government formed the "Dienst van het Mijnwezen" (Mijnwezenn-Mining Service) based in Batavia to optimize geological and mining investigations further. Its primary responsibilities include mining and quarrying management, tax authorities, supervision and management of mines containing mineral materials, also implementation of exploration and exploitation.

In 1852 the first mining regulation (Mijnreglement) was made by the Dutch government. This regulation regulates the granting of mining rights to private parties, Dutch citizens, but is limited to areas outside Java. Since then, many Dutch companies have obtained permits to operate mines in Indonesia, including in Belitung Island (1852), Ombilin (1891), Bengkulu (1895), Simau (1910), Salida (1914), Lebong Simpang (1921) and Tambang Sawah (1923), Belimbing and Gunung Arum (1935), Bulangsi (1936), Meulaboh (1941). In 1922, this Mijnwezen institution changed its name to Dienst van den Mijnbouw.

During the Japanese colonial period (1942-1945), Mijnbouw, with all its facilities and documents, was taken over by Japan, and Japan changed its name to Chisitsu Chosasho. However, the Chisitsu Chosasho office could not do much because of the lack of expertise and budget.

On August 17, 1945, the Proclamation of Indonesian Independence ushered in enormous changes in all fields, including the mining sector. On September 28, 1945, the Chisitsu Chosasho office was taken by force and converted to "Poesat Djawatan Mining and Geology." Mining in the era of President Ir. Soekarno did not rapidly develop because he was anti-imperialism-capitalism.

During the New Order era under President Suharto, Indonesia rejoined the International Monetary Fund (IMF) and the International Bank for Reconstruction and Development. With the assistance of IMF economists, the New-Order-Government issued laws concerning Foreign Investment, Basic Forestry Provisions, and Basic Mining Law. On

April 5, 1967, a contract of work (Kontrak Kerja sama) was signed between Freeport Sulfur Company (FCS) and the Indonesian government. In the period 1967-1972, there was US$ 2,488.4 million foreign investment entering Indonesia (excluding banking).

Investment in the mining sector was the largest, at US$ 953.7 million or as much as 38% of the overall percentage of foreign capital inflows into Indonesia, in the early 1980s such as Rio Tinto, Newmont Gold Company, Newcrest Mining Ltd, Broken Hill Proprietary Company, and Inco Ltd began operating in strategic mining areas.

Nowadays, Indonesia is considered one of the largest mining producers in the world. In 2018, Indonesia was the world's largest producer of nickel, the 6th largest producer of bauxite, 10th for cooper, 2nd for tin, 9th for gold, 15th for silver, 6th for feldspar, 14th for Kaolin, 7th for Zircon, 4th for steam coal, 12th for cooking coal, 11th for natural gas. The total mining production can be shown in the table below.

Table 1. Total Mining Production in Indonesia

Mining Items	**Mining Production**		
	2017	2018	2019
Oil (Barrels)	2.923.738.000	281.826.610	273.494.800
Gas (MMscf)	2.781.154	2.833.784	2.647.986
Coal (Tonnes)	461.087.221	557.983.706	616.154.054
Bauxite (Tonnes)	1.294.236	5.693.640	16.592.187
Gold (Kgs)	100.514	132.734	108.977
Iron sand (Tonnes)	1.955.926	6.988.688	2.507.786
Tin Concentrate (Ton Metrics)	71.531	82.809	86.947
Copper Concentrate (Ton Metrics)	2.253.461	2.309.262	1.697.725
Nickel Ore (Tonnes)	20.920.251	38.329.146	60.948.143

Source: Statistics Indonesia (https://www.bps.go.id/indicator/10/508/1/produksi-barang-tambang-mineral.html and https://www.bps.go.id/statictable/2009/06/15/1092/produksi-minyak-bumi-dan-gas-alam-1996-2019.html accessed on 3 March 2021)

Besides, each province in Indonesia has different resource endowments. Oil can be found in most of Indonesian area, with majority in Sumatera, Java, Kalimantan, Maluku and Papua, while gas can be found in Kalimantan, Sumatera, Java, Papua dan Kepulauan Riau. The detail of the mining products in each province can be seen on the table below.

Table 2. Indonesian Province and Its Mining Product

No.	Province	Mining Product

1	Nanggroe Aceh Darussalam	Silver, natural gas, petroleum, gold, silver and coal
2	Sumatera Utara	Petroleum, manganese and natural gas
3	Sumatera Barat	Coal, sulfur and manganese
4	Riau	Platinum, tin, bauxite, manganese, granite and natural gas
5	Kepulauan Riau	Petroleum, tin and bauxite
6	Jambi	Sulfur, gold, coal and copper
7	Bengkulu	Coal, silver, platinum, manganese and gold
8	Sumatera Selatan	Coal, natural gas and petroleum
9	Kepulauan Bangka Belitung	Bauxite and tin
10	Lampung	Iron ore, granite, limestone, natural gas and gold
11	Banten	Petroleum and steel
12	DKIJakarta	-
13	Jawa Barat	Limestone, marble, gold, silver, manganese, sulfur, iron ore, coal and gypsum
14	Jawa Tengah	Phosphate, iron ore, sulphur, manganese, copper, sulphur, gypsum, and iron sands
15	Jawa Timur	Phosphate, petroleum, marble, natural gas, limestone
16	DI Yogyakarta	Silver, manganese and granite
17	Bali	sandstone
18	Nusa Tenggara Barat	Gypsum, gold, silver, manganese and lead
19	Nusa Tenggara Timur	Manganese and limestone
20	Kalimantan Barat	Diamonds, bauxite, aluminium, nickel, coal, iron ore, gold and silver
21	Kalimantan Selatan	Coal, iron ore, manganese, gold, silver and diamonds
22	Kalimantan Tengah	Diamond and petroleum
23	Kalimantan Timur	Coal, petroleum, gold, silver, natural gas, iron ore, diamonds and tin
24	Kalimantan Utara	Petroleum, natural gas, bronze, nickel, sulfur, gypsum, sulfur and copperbel
25	Gorontalo	Gold, silver, copper, granite and limestone
26	Sulawesi Barat	Lead, gypsum, petroleum, gold, iron ore, nickel, copper and coal
27	Sulawesi Selatan	Coal, gypsum, nickel, silver, copper, lead, petroleum, gypsum, sulfur, and marble
28	Sulawesi Tenggara	Petroleum, nickel and limestone
29	Sulawesi Tengah	Iron ore, gold, nickel and copper
30	Sulawesi Utara	Silver, gypsum, gold, natural gas, iron ore, petroleum, nickel, manganese, gold, copper and bronze
31	Maluku	Petroleum, nickel, manganese, gold and copper
32	Maluku Utara	Petroleum, copper and nickel
33	Papua	Coal, gold, aluminium, petroleum, nickel, marble and copper

34	Papua Barat	Coal, gold, aluminium, petroleum, nickel, marble and copper

Source: https://www.kompas.com/skola/read/2021/01/31/170917169/daftar-barang-tambang-di-seluruh-provinsi-di-indonesia-dan-kegunaannya accessed on 4 March 2021

Because of the different level of natural resource endowments, the contribution of mining and quarrying sector to GRDP in each district within province also different. As an example, in Papua province, the share of mining and quarrying sector in the Asmat district GRDP is nearly 0% but for Mimika district (within the same province) the share is 99,31%. Moreover, for this province the average share of mining and quarrying sector in each district GRDP is around 9,07%; with standard deviation equals to 23,16%. For this reason, I choose district level in my analysis instead of province level to capture more variation of the resource dependence. To obtain a clearer insight on how the shares of mining and quarrying sector in district's GRDP within each province, we can see in the table below.

Table 3. The Maximum, Minimum, and Average of the Share of Mining and Quarrying Sector in District's GRDP for Each Province Year 2017

Province	Maximum		Minimum		Average	Std. Dev
	%GRDP	District Name	%GRDP	District Name		
Papua, Prop.	99,31%	Mimika, Kab.	0,01%	Asmat, Kab.	9,07%	23,16%
Kepulauan Riau, Prop.	97,45%	Kepulauan Anambas, Kab.	0,03%	Tanjung Pinang, Kota	22,05%	37,42%
Kalimantan Timur, Prop.	97,03%	Pasir, Kab.	0,05%	Balikpapan, Kota	43,70%	39,23%
Sumatera Selatan, Prop.	77,09%	Musi Banyuasin, Kab.	0,01%	Palembang, Kota	20,27%	25,32%
Riau, Prop.	72,33%	Rokan Hilir, Kab.	0,03%	Pekanbaru, Kota	20,80%	26,88%
Sulawesi Selatan, Prop.	70,92%	Luwu Timur, Kab.	0,00%	Makassar, Kota	8,17%	14,53%
Kalimantan Selatan, Prop.	70,77%	Balangan, Kab.	0,00%	Banjarmasin, Kota	23,52%	23,25%
Kalimantan Utara, Prop.	68,30%	Nunukan, Kab.	6,74%	Tarakan, Kota	44,13%	27,26%
Kalimantan Tengah, Prop.	65,69%	Murung Raya, Kab.	0,82%	Pulang Pisau, Kab.	19,72%	22,07%
Jambi, Prop.	62,00%	Tanjung Jabung Timur, Kab.	1,81%	Kerinci, Kab.	20,75%	19,86%
Sulawesi Tenggara, Prop.	54,61%	Kolaka Timur, Kab.	2,92%	Kendari City	24,44%	16,08%
Jawa Timur, Prop.	48,78%	Bojonegoro, Kab.	0,00%	Probolinggo, Kota	6,21%	10,05%
Papua Barat, Prop.	43,99%	Teluk Bintuni, Kab.	1,44%	Kaimana, Kab.	11,45%	15,33%
Maluku Utara, Prop.	35,82%	Halmahera Timur, Kab.	0,08%	Kepulauan Tidore, Kota	12,72%	15,51%
Sulawesi Tengah, Prop.	35,33%	Morowali Utara, Kab.	1,27%	Banggai Kepulauan, Kab.	11,18%	12,39%
Maluku, Prop.	33,77%	Seram Bagian Timur, Kab.	0,43%	Ambon, Kota	5,43%	11,48%
Kepulauan Bangka-Belitung, Prop.	33,66%	Bangka Selatan, Kab.	0,00%	Pangkal Pinang, Kota	18,02%	10,86%
Lampung, Prop.	31,59%	Lampung Timur, Kab.	0,00%	Metro, Kota	6,96%	8,97%
Jawa Tengah, Prop.	31,22%	Blora, Kab.	0,00%	Magelang, Kota	3,84%	5,40%
Kalimantan Barat, Prop.	23,90%	Kayong Utara, Kab.	0,00%	Pontianak, Kota	7,88%	6,60%
Nanggroe Aceh Darussalam, Prop.	18,43%	Aceh Utara, Kab.	0,00%	Banda Aceh, Kota	4,26%	4,63%
Sumatera Barat, Prop.	18,23%	Sijunjung, Kab.	0,00%	Bukittinggi, Kota	5,80%	5,12%
Bengkulu, Prop.	17,58%	Bengkulu Tengah, Kab.	0,22%	Bengkulu, Kota	5,59%	5,06%
Sulawesi Utara, Prop.	14,46%	Bolaang Mongondow Selatan, Kab.	0,10%	Manado, Kota	7,51%	5,67%

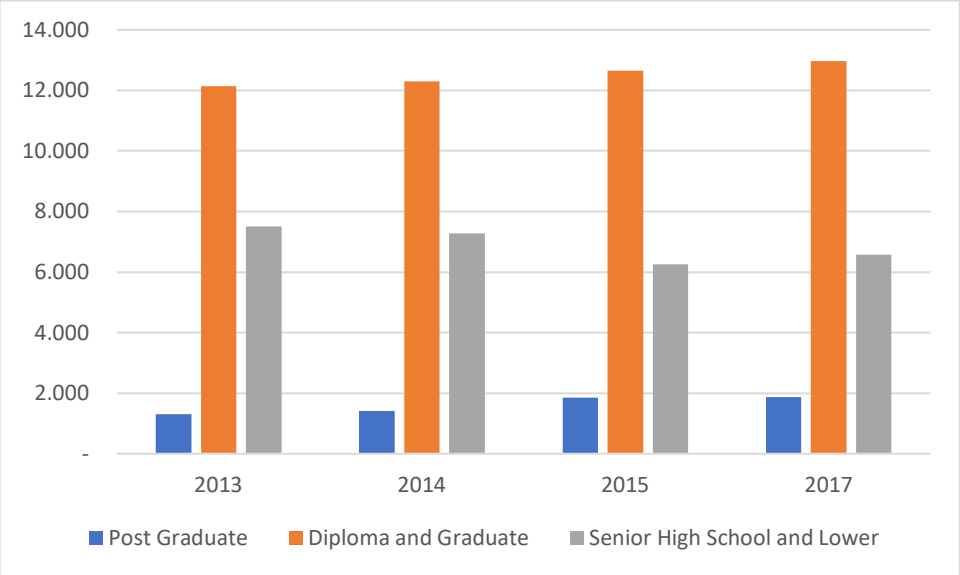
Sumatera Utara, Prop.	13,18%	Langkat, Kab.	0,00%	Medan, Kota	2,11%	3,47%
Banten, Prop.	12,88%	Pandeglang, Kab.	0,00%	Tangerang, Kota	3,65%	5,72%
Jawa Barat, Prop.	12,81%	Subang, Kab.	0,00%	Bekasi, Kota	1,91%	3,27%
Nusa Tenggara Barat, Prop.	8,01%	Lombok Timur, Kab.	0,01%	Mataram, Kota	4,16%	2,92%
Bali, Prop.	5,20%	Klungkung, Kab.	0,00%	Denpasar, Kota	2,25%	1,77%
Nusa Tenggara Timur, Prop.	4,86%	Manggarai Timur, Kab.	0,15%	Kupang, Kota	2,13%	1,10%
Sulawesi Barat, Prop.	3,91%	Mamuju Tengah, Kab.	1,41%	Mamuju Utara, Kab.	2,98%	0,96%
Gorontalo, Prop.	2,53%	Gorontalo Utara, Kab.	0,43%	Gorontalo, Kota	1,34%	0,95%
DI Yogyakarta, Prop.	1,89%	Kulon Progo, Kab.	0,00%	Yogyakarta, Kota	0,96%	0,79%
DKI Jakarta, Prop.	0,00%	Jakarta Barat, Kota	0,00%	Jakarta Utara, Kota	0,00%	0,00%

Source: Indonesia Data for Policy and Economic Research (INDODAPOER) and Statistics Indonesia

2.2 Labor Intensity in Indonesian Mining Industry

In Indonesian mining industry, especially oil and gas mining, do not always require high skills and formal educations. Data from Statistic Indonesia shows that in 2017, around 31% of people work in oil and gas mining are senior secondary school or lower graduates. Figure 2 below depicts the composition of the labor based on their education level.

Figure 2. Number of Workers in Oil and Gas Companies by Education Level



Source: Statistics Indonesia

As an example, in Kepulauan Bangka Belitung, one of the biggest tin producers in Indonesia, Sohidin (2018) mentions that in 2018, there are more than 8,84% child labor. From that figure, 23,5% of them mainly worked in mining sector, as the small sized mining industry there does not require a highly skilled labor, depicted by the fact that 60% of the child labor are equal or lower than elementary school graduates (Sohidin, 2018). Similarly, in Kutai Barat District, estimated around 4.529 children involved in child labor in the

informal/traditional gold mining (pertambangan rakyat), either voluntarily or forcefully (International Labour Office, 2004).

2.3 Decentralisation and Natural Resource Revenue Sharing in Indonesia

Indonesia started its decentralization in 1999 by issuing Law number 22/1999, enabling each district to retrieve more revenue sharing from natural resource exploration in their area. However, the complete decentralization had only begun in 2005. Nowadays, Indonesia has 416 districts and 98 municipalities (514 in total).

The revenue sharing from natural resources is regulated under Law 33/2004, which replaces Law 25/1999. Revenue Sharing Fund is a fund from national budget revenues allocated to regions based on a certain percentage to finance regional needs in implementing decentralization. The revenue sharing fund is assigned based on two principles. First, the principle of by origin, in which regions producing state revenues get a larger share (percentage) and other areas of one province get a share (percentage) based on equity. Second, the revenue sharing fund distribution is carried out based on the actual principle. The amount of the revenue sharing is distributed to regions, producing regions, and non-producing regions. The revenue sharing also considers surrounding regencies/cities affected by externalities from the business processes.

The revenue sharing for oil is divided into 84.5% for the Central Government and 15.5% for the Regional Government. The 15,5% of the Regional Government share then distributed as follow, 3% is distributed to the province concerned, 6% is for producing districts, 6% is for other districts within the province and the remaining 0.5% is for education budget.

Meanwhile, natural gas is divided into 69.5% for the Central Government and 30.5% for the Regional Government. The 30.5% from the regional government is distributed as follow 6% for the province, 12% for the producing districts, 12% is distributed to other districts within the Province concerned and the remaining 0.5% is allocated to increase the basic education budget. The remain 0,5% part from oil and gas revenue sharing the is divided as follow: for the province 0,1%, for the producing district 0,2% and for others district within the province 0,2%.

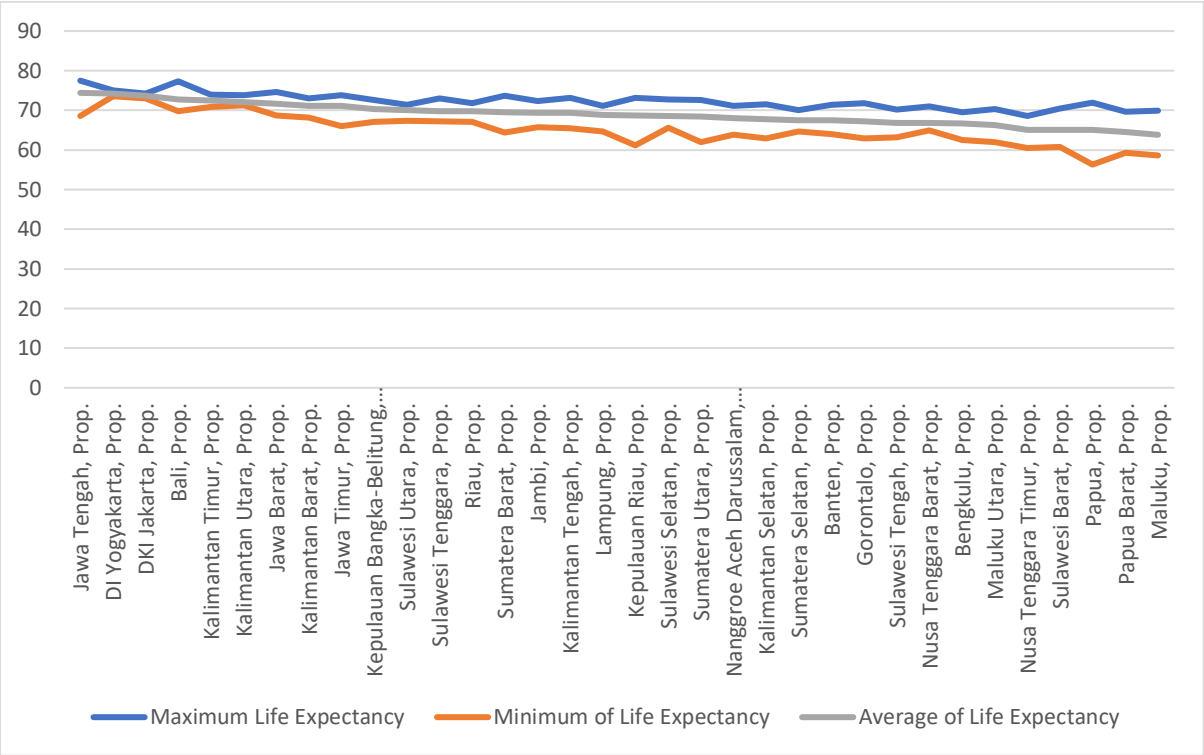
There are five types of Revenue Sharing Funds distributed to regions, namely 1) Oil and Gas, 2) General/Mineral and Coal Mining, 3) Geothermal Business, 4) Forestry and 5) Fisheries Revenue Sharing. The five types of revenue sharing are divided based on the types of natural resources with various percentages. The Directorate General of Fiscal Balance calculates revenue sharing allocations based on data and information obtained from

the Ministry of Energy and Mineral Resources, the Ministry of Environment and Forestry, the Ministry of Marine Affairs and Fisheries, the Directorate General of Budget, and other related units. However, not all of the data of the revenue sharing are publicly available.

2.4 Overview of Indonesian Health and Education Condition

On state level, Indonesian life expectancy is 71,28 years. However, the condition in district level is various. Jawa Tengah (Central Java) has the highest average of life expectancy for 74,42 years, while Maluku has the lowest figure by 63,83 years. The detail for each province can be seen on the Figure below.

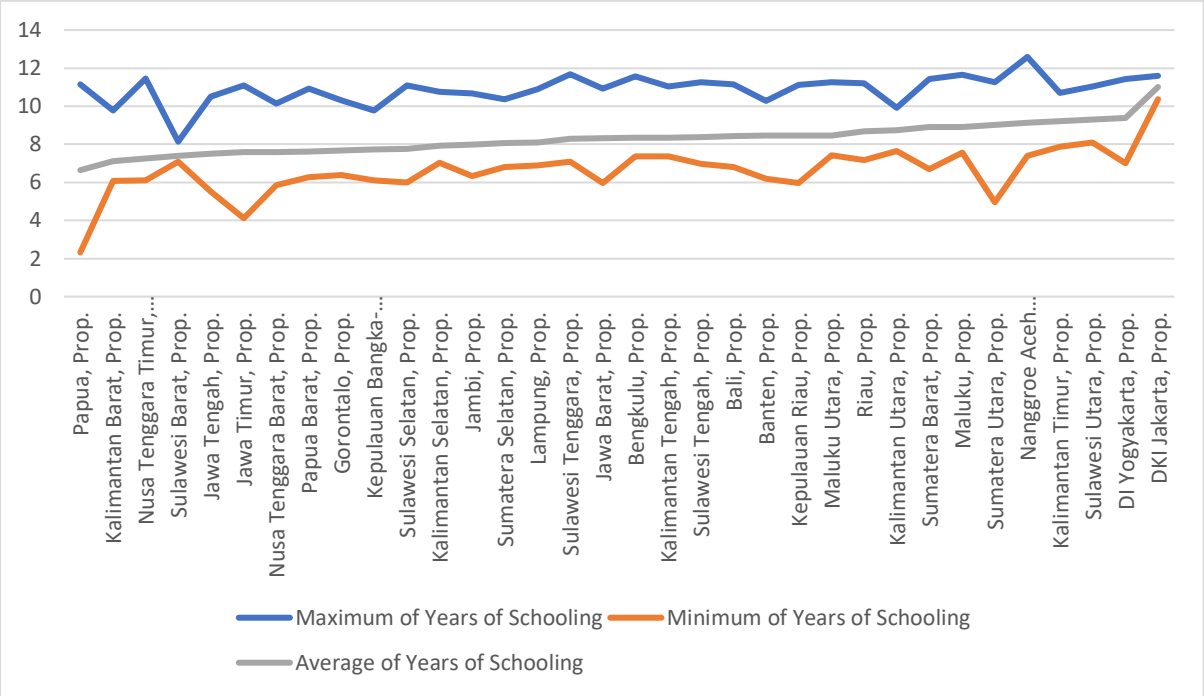
Figure 3. Indonesian Life Expectancy Per Province Year 2017



Source: Indonesia Data for Policy and Economic Research (INDODAPOER) and Statistics Indonesia

For the education outcome, the year of schooling in Indonesian level in 2017 is 8,28 years. It is expected that on average Indonesian people can pursue their education until their early bachelor's degree. However, some districts in Papua Province only have year of schooling below 7 years.

Figure 4. Indonesian Year of Schooling Per Province Year 2017



Source: Indonesia Data for Policy and Economic Research (INDODAPOER) and Statistics Indonesia

CHAPTER 3
LITERATURE REVIEW

3.1 Conceptual Framework

3.1.1 The Natural Resource and Economic Growth

Many countries are gifted by a vast amount of natural reserve that can be exploited to generate revenue. The income from resource booms may increase consumption and investment to improve the welfare of the citizen. Rostow (1960) points out the importance of natural resources in economic development to bring the traditional economy to precondition for take-of. Some countries such as Germany, UK, and the US have been successfully managed their natural abundance to boost their industry and technology (Sachs and Warner, 1995). Indeed, the ability of natural resources to foster development depends on the state's capabilities to raise its income, manage public spending effectively, develop efficient bureaucracies (Savioa and Sen, 2020:1). In this case, the elite behaviours and the type of the political institution play an essential role that determine whether the abundance of natural resource become curse or blessing.

However, many studies also show that natural resource abundance has a negative association with economic prosperity (Gylfason, 2001; Atkinson and Hamilton, 2003; Papyrakis and Gerlagh, 2004; Rosser, 2004). These studies reveal that the resource abundance hinder the economic growth confirming the resource curse hypothesis by Sachs and Warner (1995). Several channels are responsible for the failed growth in resource-rich economies, namely: Dutch Disease, rent-seeking, overconfidence, and neglect of education (Gylfason, 2001).

The explanation "Dutch Disease" effect can be found in the Findlay and Lundahl (1994) model. This model simplifies the economy into three sectors, the tradable natural resources sector, the tradable manufacturing sector, and the non-traded sector. When there is a resource price boom, the production will focus on the natural resources sector because it provides higher revenue than export other goods. It happens with OPEC countries during the oil boom when their export decline as oil prices hikes in 1998 while the world export ratio increases (Gylfason, 2001). The massive export of natural resources causes currency appreciation. It makes import goods relatively cheaper (and exports more expensive); therefore, the domestic need of manufacturing goods can be simply fulfilled from import. Consequently, the capital and labor previously used for tradable manufacturing are now shifted to non-traded goods production, resulting in the contraction of the manufacturing sector and expanding the non-traded sector (Sachs and Warner, 1995: 6). That condition

may cause a resource reallocation effect and lead to premature and permanent deindustrialization unless the policymaker maintains competitiveness and fosters domestic industrialization (Murshed, 2018).

Resource rents from natural resources may affect the quality of the political institution that may affect the economy (Bhattacharyya & Hodler, 2014). If a resource boom in a country leads to rent-seeking and corruption behavior, it may lead to destructive effects such as lower growth rate and hindering productive investment (Murshed, 2018; 31). Similarly, according to Atkinson and Hamilton (2003), a natural resource abundance can be harmful to development if weak institutions enable resource profits to be spent on government consumption rather than investment, particularly in countries with a low level of real saving.

An extreme rent-seeking behavior may arise in resource-abundant economies (Sachs and Warner, 1995: 4). Hence, a particular group may find an opportunity to corrupt from the resources revenues and the royalties. This practice will only benefit a particular part of society at the cost of others. The greed to achieve more from the rent-seeking activities may threaten economic growth. It limits the availability of productive capital for production that endangers economic efficiency and social equity (Gylfason, 2001). Mavrotas et al. (2011) mention the 'rentier effect' as an effect of the resource price boom that increases the possibility of rent-seeking behavior. In a less democratic country, the higher resource rent leads to more corruption, and that the effect is significantly more substantial in less democratic countries (Arezki and Gylfason, 2013).

Overconfidence of the government with a false sense of a high and stable income from the natural resource also can be a severe problem. The government may lose sight of managing its sustainable economic growth (Gylfason, 2001). Murshed (2018: 31) also points out that high dependence on natural resources makes a country prone to resource rent volatilities as commodities' global prices constantly fluctuate, and harm the economic growth.

Concerning the overconfident government, there are also possibilities that the government neglects the importance of human capital development because they have already been satisfied with the natural resource revenue. The children's education may be overlooked. This phenomenon can be seen in the OPEC countries with less education spending than the world average (Gylfason, 2001). While, Papyrakis and Gerlagh (2003) find that the demand for schooling is one of the transmission channels that natural resource dependence may affect economic growth.

Notwithstanding the theory of resource course, other studies show that natural resources can be a blessing to a country. Alexeev and Conrad 2009 point out that the

abundance of oil reserve has a positive correlation with per capita GDP. Moreover, Ouoba (2016) also finds that resource dependence (the share of total natural resource rents in the GDP) has a positive impact on GDP. However, there are also researcher who find that the natural resource dependence does not have a significant effect on economic growth (Brunnschweiler and Bulte 2008, Mehlum et al., 2006).

Due to many contradictive findings about the effect of natural resource on economic growth, scholars try to find the explanations why that difference happens. Brunschweiler and Bulte (2008) argue that some resource measures suffer from endogeneity problem.

3.1.2 Linking Natural Resource to Health and Education

Linked with the previous theory, economic growth can be an essential mechanism for the natural resource to impact health and education. The resource rent generated by the government provides an additional source to finance public spending on health and education that may affect human capital accumulation (Mejia, 2020). However, if the government has a strong dependence on resource rent, there will not be much fiscal space in the national budget; therefore, the government may less prioritize the long-term health and education outcome (Savioa and Sen, 2020).

Gylfason (2001) divided measures on education into three categories: input, outcome, and participation. Public expenditure on education is considered input on education. Many cross-country studies point out that resource-rich countries have lower public spending on health and education (Gylfason, 2001; Stijns, 2006). In his research, Gylfason (2001) shows that many resource-rich countries spend only around 1% of their GNP for public education expenditure (Haiti, Indonesia, Myanmar, Nigeria, and Sudan). This study concludes that the abundance of natural resources negatively correlates with public expenditure on education. However, Gylfason also emphasizes that public expenditure cannot be used as a perfect measure to assess the government's commitment to education since some countries spend more on private education than the public one.

The second mechanism that natural resources may affect health and education is through household income. The abundance of natural resources can provide more employment because it does not need highly skilled labor (Savioa and Sen, 2020). Households may easily generate income from this sector that can be used to improve their health and education level. However, the natural resource sector can be a double-edge sword because of low-skilled employment and a high wage during the price boom. Increasing the possibility that children at a young age may leave school to work in this sector. In this case, the educational attainment and years of schooling can be relatively low

because there is a lower expected return to skill, education, and knowledge (Edwards, 2016).

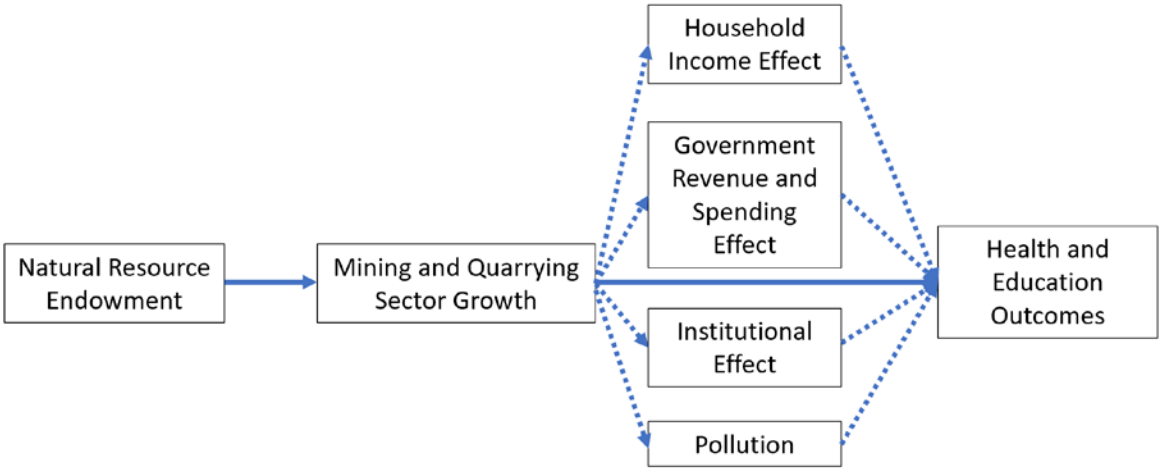
Gylfason (2001) also observe the effect of natural resources on female's school years. This variable is part of the educational outcome. The study concludes that natural resource abundance harms girl's years of schooling. Still from the same research, Gylfason (2001) points out that the secondary-school enrolment also decreases in the rich-resource countries. This study also proves that public expenditure on education (input), secondary-school enrolment rate (participation), and expected years of schooling (outcome) have a positive correlation with economic growth.

The quality of the institution also has a responsibility on the education and health outcome. Low-quality institutions with corruption and inefficiency may lead to systemic health and education failure (Edwards, 2016). Karl (2004: 666) also mentions that ineffective and inefficient governance in resource-rich countries tends to lack the corporate cohesiveness and authority necessary to exercise effective public policy. Also, politicians tend to direct the public spending to finance megaprojects that can easily corrupt, such as infrastructure and defence projects, rather than to fund health and education expenditure (Karl, 2004: 667). Ecuador is an example that spends 20,3% of its budget on the military compared to the average of 12,5% for other developing countries (Karl, 2004: 668). On the other hand, if the government can manage their public spending effectively, revenue rent from natural resources can be a potential source to improve the education and health outcome. Botswana, with their policy to Increase taxation relying on natural resource exports, is an example of country that considered success in financing their public spending to increase their health outcome (Elovainio and Evans, 2013).

The following mechanism affecting health is pollution from large-scale mining (Edwards, 2016; Goltz and Barnwal, 2019; Savioa and Sen, 2020). Areas surrounding mining area usually have a terrible level of environmental degradation. Acting as a massive source of money, foreign currency, and employment, mining in developing countries tends to be poorly regulated (Goltz and Barnwal, 2019). Furthermore, Goltz and Barnwal (2019) examine the effect of mining on anemia and stunting as an effect of exposure to lead and other heavy metals in 44 developing countries. This study finds that the economic benefit from mining is at the cost of serious health problems for the citizen.

Figure 5: The Conceptual Framework How Natural Resource Endowment

May Affect Health and Education Outcomes



3.2 Empirical Evidence

3.2.1 Cross-country analysis of the effect of natural resource on education and health outcomes

The first study about the link between natural resources and education and health is conducted cross-country. Similar to studies about economic growth, studies about the impact of natural resource abundance on human development indicators also show mixed results.

Some economists point out a resource curse in the education and health sector (Gylfason 2001, Papyrakis and Gerlagh 2004; Karl 2004; Wadho 2014; Edwards 2016). Gylfason (2001) examines the nexus between natural resource abundance and human capital accumulation by conducting cross-country analysis on public spending on education, the expected year of schooling for girls, and the secondary-school enrolment rate. Those three variables have a negative correlation with the share of natural capital in national wealth. He finds that natural capital crowd out the human capital. A nation with too much dependence on natural capital may stunt its economic growth through four mechanisms: (a) the Dutch Disease, (b) rent-seeking behavior, (c) overconfidence, and (d) neglect of education.

Another study conducted by Papyrakis and Gerlagh (2004) also demonstrate how natural resource abundance may affect economic growth. They point out that, first, the rent-seeking behaviour resulting from the resource rent has an indirect effect on worsening economic growth. Second, the impact of the natural resource boom to prevent the manufacturing sector from growing will reduce the profitable investment in the manufacturing industry. Third, natural resource hinders economic growth by limiting the economy's degree

of openness and worsening its term of trade. Fourth, through the schooling transmission channel, the natural resource boom makes education to provide skilled labor less critical.

Moreover, countries with high dependence on oil are characterized by rent-seeking behavior and inefficient governance. Karl (2004) mentions that those countries usually have high poverty rates, inadequate health care, low life expectancy, high malnutrition rate, and poor educational outcome. The boom-bust cycle of commodity prices leads to a significant decrease in per capita income when the price plummets. In addition, oil-dependence countries also have a lower health and education expenditure and outcome compared to oil-poor countries. Karl (2004) also emphasizes that natural resource abundance is closely related to civil war and conflict.

However, other study shows counterintuitive argument, natural resource indeed a blessing for a country in their education and health sector (Cotet and tsui 2013). Based on data from 157 mining countries, Cotet and Tsui find that oil abundance positively correlates with long-run economic growth. Oil-rich countries have lower infant mortality and higher life expectancy. The most significant improvement experienced by non-democratic oil-rich countries. These findings contradict other studies that point out the importance of political institutions to escape from the resource curse.

Furthermore, the result of the study about the correlation between natural resources and health and education outcome does not stop on curse or blessing, but there is a possibility for the mixed result (Stijn 2006; Brunnschweiler and Bulte 2008; Blanco and Grier, 2012; Kim and Lin 2017). Stijn (2006) conducted a study to utilize cross-country data and measure the correlation between some resource abundance indicators and some health and education outcomes. The proxy of health is measured by life expectancy at birth. In contrast, the proxy of education is represented by average years of schooling, net secondary enrolment rate, adult literacy rate, and public expenditure on education. However, this study shows mixed results depending on the choice of indicators and sample restriction.

Similarly, Blanco and Grier (2012) measure the relationship between total primary commodity export to GDP and human and physical capital. They find that resource dependence has no significant direct effect on physical and human capital. However, petroleum export dependence affects physical capital positively but human capital negatively both in the short and long run. In addition, agricultural export hurts physical capital, and in the long run, it also harms human capital.

Kim and Lin (2017) observe 55 developing and developed countries find that natural resource dependence improves education quality and declines health quality. Besides, agricultural export decreases education and health, but non-agricultural export promote both.

Gradstein and Ishak (2020) employ data from 16 African countries from 1990 to 2016 and point out that the effect of income shocks resulting from oil price fluctuation has different effect on educational attainment and other derived outcome depending on age and gender. The income shock has positive impact on educational attainment if happens in early childhood for both genders. However, the effect will diminish and become negative when it happens in adolescence, with a higher decrease for female.

Davis (1995), using data from 91 developing economies, tests whether mineral endowments have negatively contributed to the historical long run growth and development. He finds that there was 'development blessing' from the rich mineral endowed countries. In the long run, mineral rich countries have a better human capital investment than mineral poor countries as a group.

3.2.2 Within-country analysis of the effect of natural resource on education and health outcomes

The within-country analysis is believed to provide better control for unobserved heterogeneity in national factors affecting growth. Therefore, in developing the resource curse study in human development indicators, some economists shift their observation into within-country phenomena. Similar to cross-country analysis, the result on within-country analysis also shows contradictory conclusions.

In sub-national analysis, Edwards (2016) highlights that natural resource dependence negatively affects health and education in Indonesia. He chooses average household health expenditure and the percentage of birth attended by a skilled health worker as proxies to measure health outcomes. While for education outcome, he utilizes the secondary-school enrolment rate, average examination test score, and average household education expenditure. This result is consistent with his cross-country study in the same paper.

However, across within-country studies, more studies show mixed results (Fenske and Zurimendi, 2017; Zabsorne et al., 2018; Goltz and Barnwal, 2019; Mejia, 2020). Study using data from Niger Delta, the Southern part of Nigeria, shows that higher oil price leads to more income for the citizen (Fenske and Zurimendi, 2017). Besides, it promotes greater level of education, having a skilled occupation, later marriage, a higher rate of working women and increase relative BMI. However, it negatively affects body height, fertility, and investment in children's health such as vaccination.

Zabsorneet al. (2018) study the within-country effect of gold mining in Burkina Faso. They deduce that gold mining increases the living standard, reduces poverty gaps and increases household expenditure. Nevertheless, gold mining has a negative effect on local

inequality and child labor. In addition, mineral mining in developing countries may provide economic benefits but negatively affect health, such as anemia and stunting due to heavy metal contamination (Goltz and Barnwal, 2019).

In Columbia, gold mining increases government revenue and expenditure, increases enrolment in primary school, reduces the dropout rate. However, it also reduces standardized test scores, reduces college enrolment rates, and increases crime (Mejia, 2020).

3.3 Natural Resource Study in Indonesia

Even though not much, there are several published Indonesian natural resource sub-national studies. The first study is conducted by Komarulzaman and Alisjahbana (2006) examining the relationship between resource abundance and the impact on economic development at district level from 2001 to 2004. For the resource abundance proxy, they use government revenue sharing from mining, forestry, oil and gas. They conclude that the total resource rent has no significant impact on economic growth. But when they separate the rent, mining rent shows the incidence of resource curse but not for forestry, oil and gas.

Further investigation conducted by Cust and Rusli (2016) using district government revenue dependence from oil and gas from 1999-2009, finds the positive correlation between resource dependence and economic activity. They also highlight about the spillover effect, from direct spill over and through fiscal spillover on district's economic activity. Similarly, Hilmawan and Clark (2019), using Indonesian district level data from 2006-2015, argue that the resource dependences (mining share in GRDP, government revenue dependence from mining, oil and gas) have positive correlations with real per capita income.

However, to the best of my knowledge, the only natural resource study that gauge the effect of natural resource dependence on education and health outcomes in Indonesia was conducted by Edward (2016). In his natural resource cross country study, he complement it with within country evidence from Indonesia for a single year analysis 2009. He studies the effect of natural resource dependence on district's education and health outcomes. The resource dependence variable used is mining and quarrying share of total GRDP, while for dependence variables are senior secondary enrolment ratio, average exam score, birth attended by skilled health labor, and average household education and health expenditure. He finds that the resource dependence has significantly negative impact all of the education and health outcomes. Also, it has positive correlation with district poverty rate. This result is in line with the resource curse theory.

CHAPTER 4
METHODOLOGY

4.1 Data

4.1.1 Object of the Study

I use Indonesian district's data from 2007 (due to the data availability of the new decentralized districts) until 2017 (the latest available data). Currently, Indonesia has 514 districts with various dependence on mining and quarrying sector. The percentage of mining and quarrying sector in 2017 GRDP ranges from 0,24% to 46,31% with various outcomes on its education and health quality. Most of the districts' data are publicly available in INDODAPOER, Ministry of Finance and Statistics Indonesia's website. Those facts make Indonesia become a reliable object of study about the impact of the natural resource dependence on education and health outcomes.

4.1.2 Education Outcome

As mentioned in the previous chapter, Gylfason (2001) divided measures on education into three categories: input, outcome, and participation. I do not employ the public expenditure on education since there is a mandatory 20% of district budget to be spent on education (Law 20/2003); therefore, I prefer to choose the more measurable outcome of the government policies related to education. The education indicators for this study are measured by:

a. The monthly per capita household education expenditure

   This variable is relevant to the study conducted by Edwards (2016). He categorizes this variable together with the monthly per capita household health expenditure as household capital investment. The prediction is as income generated from natural resources increases, the household investment in education will follow. This variable is considered input on education. The monthly per capita household education expenditure data are taken from INDODAPOER, sourced from National Social Economic Survey (SUSENAS) published by Statistics Indonesia. However, there is obstacle in using this data, since in 2008 the data is not available from Susenas. Due to that reason, I leave the data empty for 2008.

b. Net enrolment ratio of senior secondary school

   This variable means the proportion of the population in senior secondary level age group who are still in school to the population in that age group. This variable is

quite popular to measure the educational impact of natural resource abundance (Gylfason, 2001; Stijn, 2006; Brueckner and Gradstein, 2016; Edwards, 2016). I choose this variable because in Indonesia there is a compulsory 9-year education; citizen must enrol at least until junior secondary school and government provide some subsidies for education until that level. Therefore, in Indonesia, the consideration to enrol in senior secondary school has been done after taking into account the opportunity cost of schooling. As mentioned before, In some districts, many mining activities still being conducted traditionally, that does not require skilled labor. Such mining activities may employ a vast amount of child labor, and their wages are considered an opportunity cost for enrolling in senior secondary school.

I consider the net enrolment ratio of senior secondary school variable as participation in education. The net enrolment ratio of senior secondary school data is taken from INDODAPOER, sourced from National Social Economic Survey (SUSENAS) published by Statistics Indonesia.

c. Literacy rate of the population age 15 and over

Statistics Indonesia defines this variable as the proportion of the population aged 15 years and over who have the ability to read and write simple sentences in Latin letters, Arabic letters, and other letters (such as Javanese letters, kanji, etc.) to the population aged 15 years and over.

Literacy rate is a common variable used to measure the education outcome (Davis, 1995; Stijn, 2006; Emery et al., 2012; Brueckner and Gradstein, 2016). Moreover, Stijn (2006) employs the adult literacy rate variable in his study because it provides information about median skill level compared to other average indicators. Brueckner and Gradstein (2016) also use this variable to measure the effect of oil shock on the schooling. The literacy rate here is more to assess the quality of the education since the education expenditure and enrolment ratio only capture the quantity outcome. There is a possibility that the natural resource boom may affect the quality of human capital. This variable is considered outcome on education. The Literacy rate of the population age 15 and over are taken from INDODAPOER, sourced from National Social Economic Survey (SUSENAS) published by Statistics Indonesia.

d. The average years of schooling in each district

The average years of schooling in each district is defined as the number of years spent in formal education by the population. However, since 2010 the data published by statistics Indonesia is “Expected Years of Schooling” which means the length of schooling (in years) that is expected to be experienced by children at a certain age in the future (Statistics Indonesia, 2014: 10). Therefore, I divided my

analysis about year of schooling into 2 parts, first from 2007-2009 (old method) and 2010-2017 (new method). This indicator can be used to determine the condition of education system development at various levels in Indonesia.

I emphasize the years of schooling based on the study conducted by Gylfason (2001), Stijn (2006), Emery et al. (2012); Fenske and Zurimendi (2017); Kim and Lin (2017) Zabsorne et al. (2018); and Gradstein and Ishak (2020). This indicator is the most direct and preferred indicator to measure human capital accumulation (Stijn, 2006). In addition, Gylfason (2001) mention that the lower average of years of schooling (mainly for female) is an intermediate channel that resource abundance may hinder economic development. Moreover, Emery et al. (2012) pointed out the resource boom may change the timing of schooling but not reduce the total accumulation of human capital; therefore, years of schooling can be a better proxy to measure human capital accumulation in the long run. This variable is considered outcome on education. The average of years of schooling in each district is taken from Human Development Index Survey published by Statistics Indonesia.

4.1.3 Health Outcome

Similar with public expenditure on education, there is also a mandatory minimum of 10% of the district budget to be spent on health (Law 36/2009); therefore, this variable will not be a prominent indicator to measure the effect of resource dependence on district's health outcome. In this study, the health proxies are measured by:

a. The monthly per capita household health expenditure

   Similar to the education expenditure, this variable is in line with the study conducted by Edwars (2016). The prediction is that if the income generated from natural resources increases, then the household investment in health will also increase, improving the human capital. If I should analogic this variable with Gylfasion (2001) classification of the variable measure (input, participation, and outcome), then I consider this expenditure as an input proxy. The monthly per capita household health expenditure data are taken from INDODAPOER, sourced from National Social Economic Survey (SUSENAS) published by Statistics Indonesia. Also similar with the education expenditure, the health expenditure is not available for year 2008.

b. Birth attended by a skilled health worker (in % of total birth).

Statistics Indonesia[1] defines this variable as the ratio between the number of ever-married women aged 15-49 years who have given birth to a live child in the last two years and whose last delivery was assisted by a trained health worker (having midwifery competence) with the number of ever-married women aged 15-49 years who have given birth. Trained health workers who have midwifery competence is person such as obstetricians, general practitioners, and midwives who have midwifery clinical skills according to standards.

This variable can be classified as participation of health proxy. Fenske and Zurimendi (2017) use this variable to measure the maternal health for mother living in mining area in Niger Delta region. This variable is also used by Edwards (2016) in his study as a proxy to replace the child mortality ratio because it is a rare event in Indonesia, roughly 40 deaths out of 1000 births based on the survey data. The source data of the birth attended by a skilled health worker is National Social Economic Survey (SUSENAS), published by Statistics Indonesia.

c. Immunization coverage for children under 5 years old

This indicator tells the ability of parent to provide immunization for their children. I personally choose this data for complementary support to measure the participation of health. The source data of the birth attended by a skilled health worker is National Social Economic Survey (SUSENAS), published by Statistics Indonesia.

d. Life expectancy

Life expectancy (Angka Angka Harapan Hidup /AHH) is defined as the estimated average number of years a person can expect to live. However, after 2010, the data published by Statistic Indonesia is Life Expectancy at birth which means “the average years of life that will still be lived by someone who has managed to reach age x, in a given year, in a mortality situation prevailing in his community” (Statistics Indonesia, 2014: 9). Therefore, I also divide my analysis about life expectancy into 2 parts, first from 2007-2009 (old method) and 2010-2017 (new method).

Mining activity can provide an additional income to improve someone/public health. However, there is also a potential side effect of mining, pollution. It can cause many health problems that may decrease life expectancy. Many studies employ life expectancy or life expectancy at birth (as a component of Human Development Index) to measure the health outcome (Davis, 1995; Stijn, 2006; Cotet and Tsui, 2013; Savioa and Sen, 2020).

[1] https://www.bps.go.id/subject/30/kesehatan.html accessed on 7 June 2021

Cotet and Tsui (2013) employ this variable in their cross-country analysis, to measure the health improvement before and after oil discovery. Moreover, Savioa and Sen (2020) also use life expectancy at birth to measure the relationship between natural resources and development. Therefore, I also use life expectancy as a proxy to measure the health outcome to measure whether the mining activity affect life expectancy in positive or negative way. This variable can be classified as an outcome of the health proxy. Each district's life expectancy data are taken from Human Development Index Survey published by Statistics Indonesia.

4.1.4 Resource Dependence

In this study I choose five indicators as the proxies of resource dependence.

a. Mining Rent (Per Capita)

In line with Indonesian natural resources studies conducted by Edwards (2016) also Hilmawan and Clark (2019), I choose mining and quarrying's share of total GRDP for each district as the proxy of resource dependence. Here, the mining rent means the share of GDP on Mining and Quarrying Sector on total GRDP times by GRDP per capita. The data of mining and quarrying's share of total GRDP for each district are taken from the INDODAPOER published by the World Bank, sourced from Statistics Indonesia (Badan Pusat Statistik/BPS).

Statistics Indonesia[2] defines mining as "the activity of extracting valuable and economically valuable mineral deposits from the earth's crust, both mechanically and manually, on the earth's surface, below the earth's surface and below the water surface. The results of this activity include oil and natural gas, coal, iron sand, tin ore, nickel ore, bauxite ore, copper ore, gold ore, silver and manganese ore". While quarrying is defined as "an activity that includes taking all kinds of minerals. Excavated goods are chemical elements, minerals and all kinds of rocks which are natural deposits (excluding metals, coal, oil and gas and radioactive materials). These minerals are usually used as raw materials or auxiliary materials for the industrial and construction sectors. The results of excavation activities include mountain rock, river stone, limestone, coral, gravel, marble, sand, silica sand, quartz sand, kaolin, clay and others."

b. Share of people employed in mining and quarrying sector (employment dependence)

This variable represents the share of people employed in mining and quarrying sector per total employment in each district. This variable may capture the

[2] https://www.bps.go.id/subject/10/pertambangan.html accessed on 1 November 2021

resource dependence in district's labor market. The source of this data is Indonesian Labor Survey (SAKERNAS) - Statistics Indonesia. However, the district's data for 2016 is not complete due to the Indonesian Labor Survey in 2016 is only representative up to the province level.

c. Government revenue dependences from Oil (Per Capita)

Following the empirical strategy conducted by Cust and Rusli (2016) and Hilmawan and Clark (2019), I also employ the share of revenue from oil in district's government budget as a resource dependence variable.

The revenue sharing for oil is divided into 84.5% for the Central Government and 15.5% for the Regional Government. The 15,5% of the Regional Government share then distributed as follow, 3% is distributed to the province concerned, 6% is for producing districts, 6% is for other districts within the province and the remaining 0.5% is for education budget.

Here, I multiply the share of oil revenue in government's budget with the total district's budget per capita to get the variable of oil revenue per capita. The data of the revenue sharing from oil is taken from Ministry of Finance of the Republic of Indonesia. While the data of government budget was taken from Directorate General of Financial Management Ministry of Finance [3].

d. Government revenue dependences from Gas (Per Capita)

This variable is also similar with variable used by Hilmawan and Clark (2019). Here, I use the gas revenue per capita. The revenue sharing from natural gas is divided into 69.5% for the Central Government and 30.5% for the Regional Government. The 30.5% from the regional government is distributed as follow 6% for the province, 12% for the producing districts, 12% is distributed to other districts within the Province concerned and the remaining 0.5% is allocated to increase the basic education budget. The data to construct this variable is also taken from Directorate General of Financial Management Ministry of Finance[4].

e. Government revenue dependences from Oil and Gas (Per Capita)

This variable is the sum of the two previous variables. The data to construct this variable is also taken from Directorate General of Financial Management Ministry of Finance[5].

4.2 Estimation Strategy

The specification of my model is:

[3] http://www.djpk.kemenkeu.go.id/?p=5412 accessed on 30 September 2021
[4] ibid
[5] ibid

$$\left(y_{i,t}\right) = \alpha + \beta_1 RD_{i,t} + \beta_2 X_{i,t} + \delta_t + \varepsilon_{it}$$

$\left(y_{i,t}\right)$ is general education or health outcomes in district i and year t. The education outcome is represented by: (a) the natural logarithm of the monthly per capita household education expenditure (lneducex), (b) net enrolment ratio of senior secondary school (enrolrate), (c) literacy rate of the population age 15 and over (litrate), and (d) the average years of schooling in each district (yearschool). Whereas the health outcome is measured by: (a) the natural logarithm of the monthly per capita household health expenditure (lnhealthex), (b) birth attended by a skilled health worker (birthskill), (c) immunization coverage for children under 5 years old (immunization), and (d) life expectancy (lifeex). $RD_{i,t}$ is the five proxies of resource dependence as above mentioned. $X_{i,t}$ is control variables. δ_t is year dummy to control for events experienced by all districts at a point in time, for example business cycle fluctuation, price booms, and economic crises. ε_{it} is the error term, assumed to be independently and identically distributed (iid).

I include some control variables include specific characteristic for each district i.e., population, poverty rate and governance-related institutional indicators. Due to the unavailability data of corruption in district level, I try to use alternative control that represent the government institutional quality. This state accountability variable represents the opinion from audit result conducted by Indonesia Audit Board (BPK) for district's financial statement and accountability. Cockx and Francken (2014) and Edwards (2016) also use the similar variable for their study.

BPK opinion is a professional statement regarding the fairness of the financial information presented in the district's financial statements based on several criteria, namely:

- conformity with government accounting standards;
- adequacy of disclosures;
- compliance with laws and regulations; and
- effectiveness of the internal control system.[6]

For the financial audit, the BPK has four opinion ranks. The highest rank is an "unqualified opinion" which implies that they may have reasonable guarantees that financial statements are free from material misstatements. The second best is "qualified opinion"; the third is "adverse", and the last is "disclaimer" opinion. The lower level of the opinion means that the financial statement prone to misstatements and errors. Therefore, in this study, I give the value of 1 if the opinion is unqualified, and 0 for other opinions.

[6] https://www.bpk.go.id/news/ragam-opini-bpk accessed on 10 November 2021

CHAPTER 5
RESULT AND ANALYSIS

Using the model that has been mentioned in previous chapter, I use the Indonesian district level data from 2007 to 2017. I obtain most of the data from Indonesia Data for Policy and Economic Research (INDODAPOER) published by the World Bank. Unfortunately, not all of the data are complete for my observation years (2007-2017). Therefore, I manually fill the missing data from the province's statistical yearbook published by Statistic Indonesia (BPS). The data for health and education expenditure for 2008 is not available from Susenas; hence, I left it empty.

In the first phase, there are 5.654 observation. However, in Indonesia, there are some new districts as a result of the proliferation program starting from 1999 to 2014, resulting the unavailability data of those new districts during my observed period. Following the estimation strategy conducted by Hilmawan and Clark (2019), I choose to merge child districts with the parent districts to increase the reliability data. Moreover, there are also some obstacles, that there are some districts that have the product from mining and quarrying sector is higher than their GRDP. I have confirmed the data from INDODAPOER and from Statistic Indonesia and other relevant sources, but the data still do not make sense. For this reason, unfortunately, I must drop five districts' data i.e., Adm. Kepulauan Seribu, Bengkalis, Kutai Kartanegara, Kutai Timur and Sumbawa Barat.

The next problem with the data comes from the measurement for life expectancy and year of schooling. In 2010, the government decided to replace their measurement with the new method. Therefore, for those two proxies, I will analyse separately, using the data from old method (2007-2009) and new method (2010-2017). Finally, the summary of the data after cleansing can be seen in the table 4.

Table 4. Descriptive Statistics for the Observation Districts

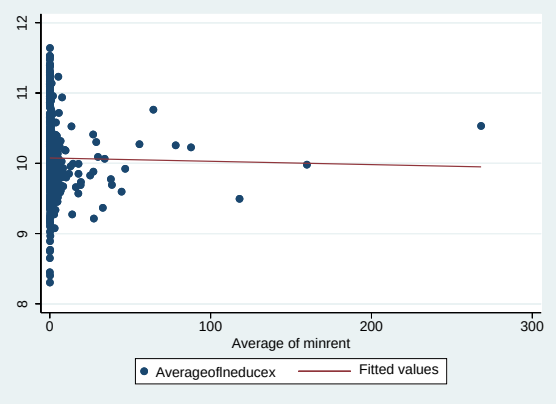
5.1. Scatterplot Illustration Resource Dependence and Education and Health Outcomes

5.1.1. Resource Dependence vs. Education Outcomes

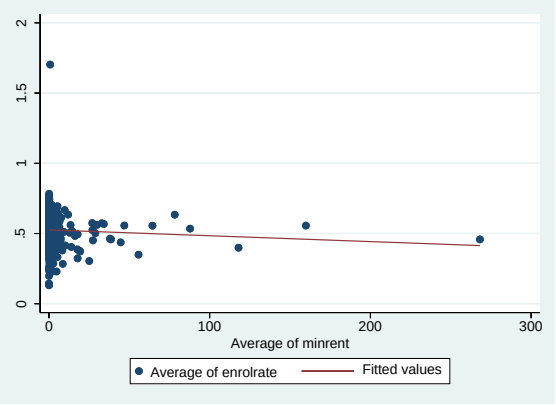
Using scatterplot to draw simple correlation, we can see the correlation between each district's averaged resource dependence and the average education outcome for the observation period.

At a glance, the scatterplot in Figure 5 shows that there are negative correlations between the average of mining rents per capita and all of the education outcomes. A significant negative correlation happens between the average of mining rents per capita and average year of schooling for 2007-2009 (old method).

Figure 5. Scatterplot Correlation Between Mining Rents Per Capita and Education Outcomes

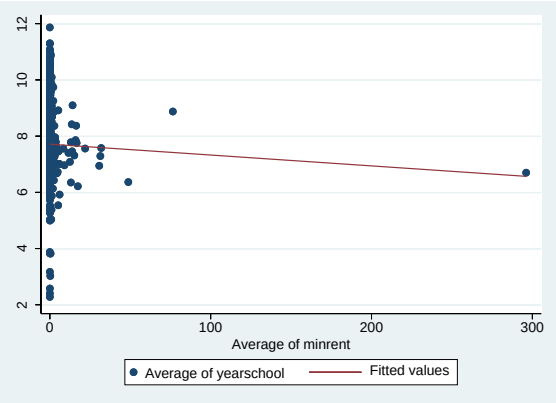


Mining rents per capita vs. education expenditure (Average)

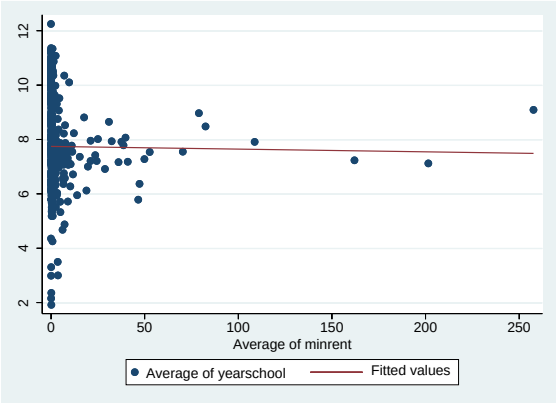


Mining rents per capita vs. Net Enrollment Rate: Senior

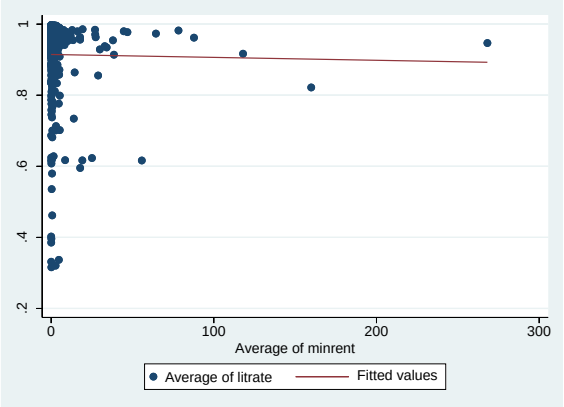
Secondary (Average)



Mining rents per capita vs. year of schooling 2007-2009 (Average)



Mining rents per capita vs. year of schooling 2010-2017 (Average)

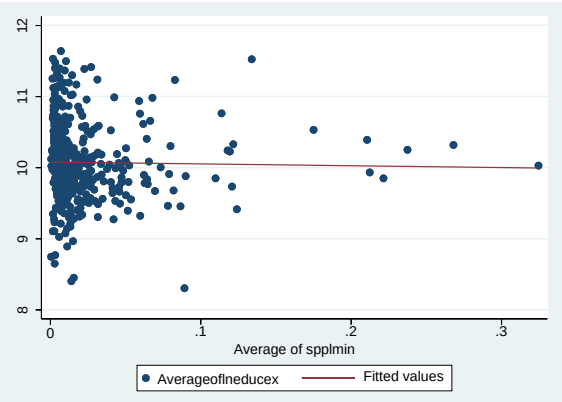


Mining rents per capita vs. Literacy Rate (Average)

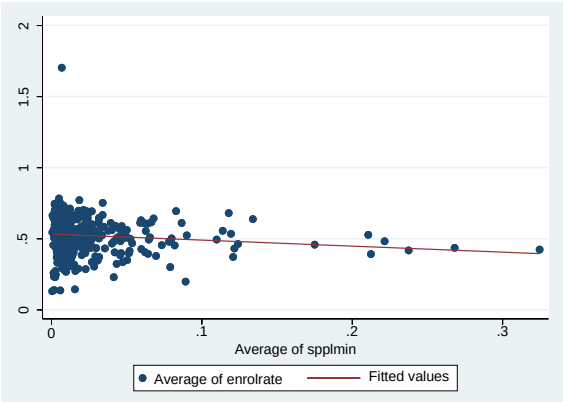
Source: Own construction using Stata Program

Similarly, on Figure 6, the scatterplot between the share of people employed in mining and quarrying sector (employment dependence) and the education outcomes also illustrates a negative correlation, except for literacy rate.

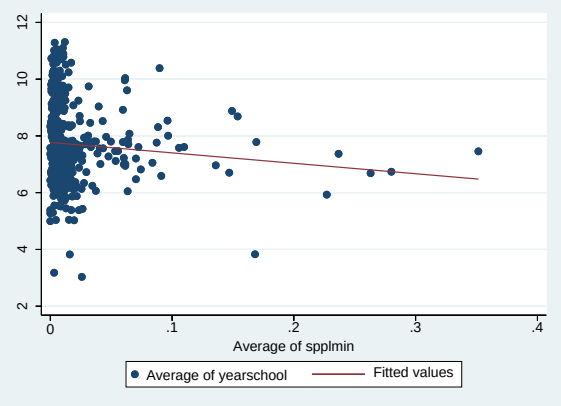
Figure 6. Scatterplot Correlation Between the Share of People Employed in Mining and Quarrying Sector and Education Outcomes



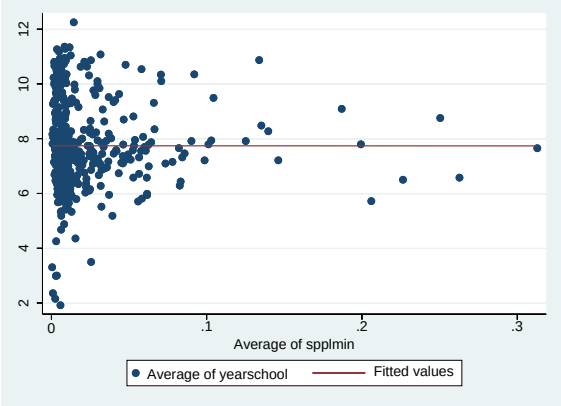
Employment Dependence vs. education expenditure (Average)



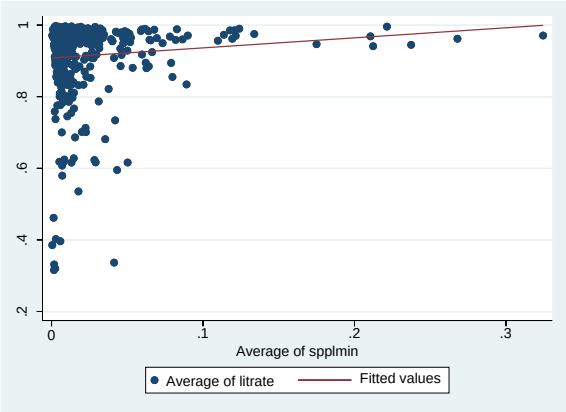
Employment Dependence vs. Net Enrollment Rate: Senior Secondary (Average)



Employment Dependence vs. year of schooling 2007-2009 (Average)



Employment Dependence vs. year of schooling 2010-2017 (Average)

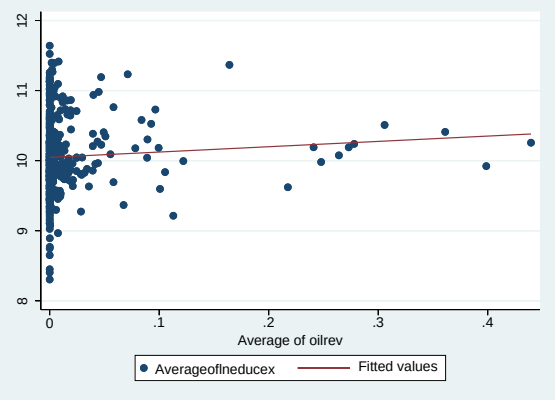


Employment Dependence vs. Literacy Rate (Average)

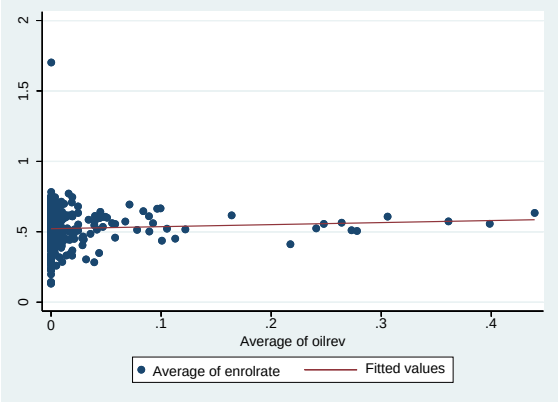
Source: Own construction using Stata Program

In contrast, the scatterplots correlation between the average of government's revenue dependence from oil per capita and all education outcomes shows a positive correlation. Roughly, this can be interpreted as an increase in education outcome as a result of an increase of the government revenue dependence from oil.

Figure 7. Scatterplot Correlation Between Government Revenue Dependence from Oil Per Capita and Education Outcomes

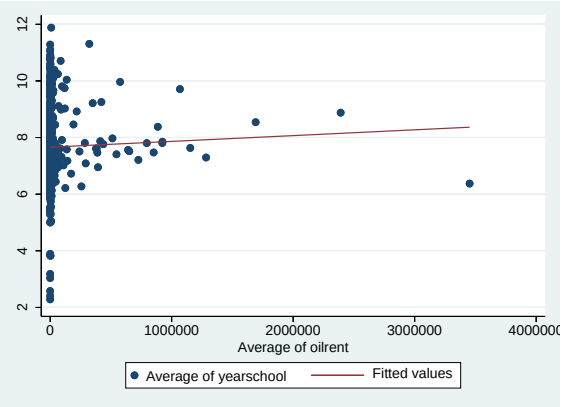


Oil revenue per capita vs. education expenditure (Average)

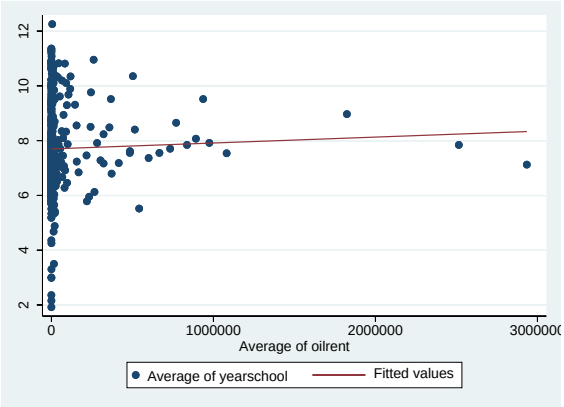


Oil revenue per capita vs. Net Enrollment Rate: Senior

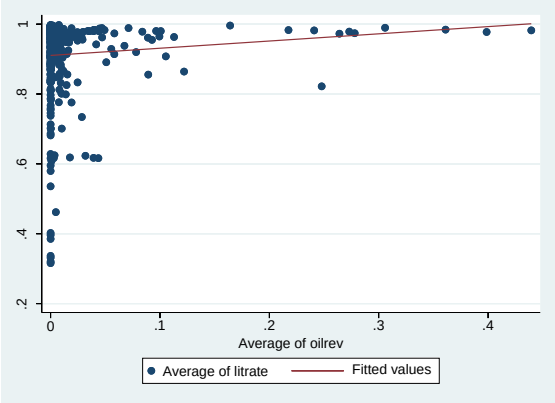
Secondary (Average)



Oil revenue per capita vs. year of schooling 2007-2009 (Average)



Oil revenue per capita vs. year of schooling 2010-2017 (Average)

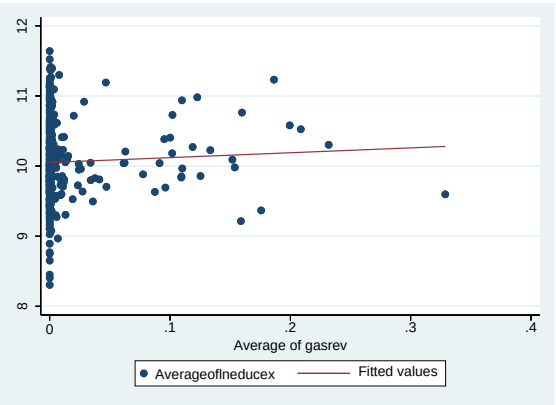


Oil revenue per capita vs. Literacy Rate (Average)

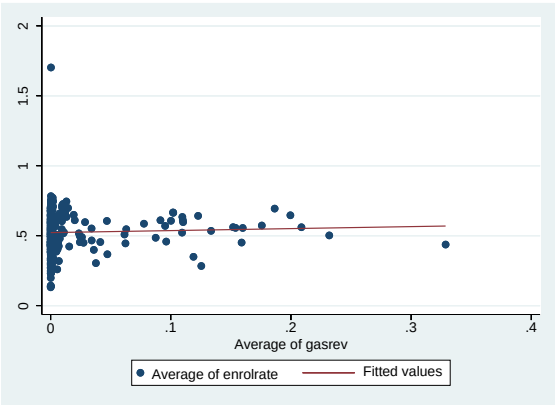
Source: Own construction using Stata Program

It also appears that here is also a positive correlation between government revenue dependence from gas per capita and education outcomes as shown in Figure 7 below.

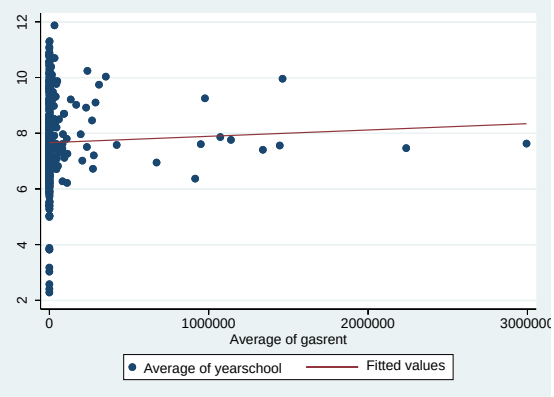
Figure 8. Scatterplot Correlation Between Government Revenue Dependence from Gas Per Capita and Education Outcomes



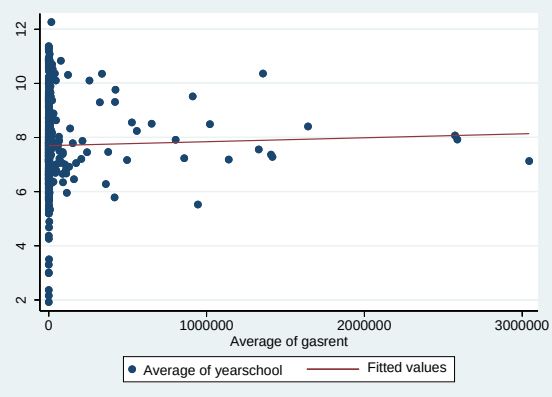
Gas revenue per capita vs. education expenditure (Average)



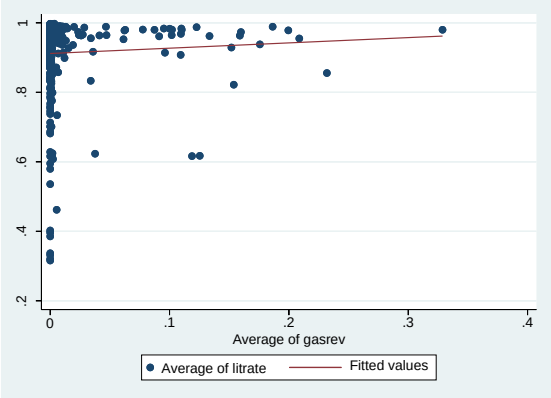
Gas revenue per capita vs. Net Enrollment Rate: Senior Secondary (Average)



Gas revenue per capita vs. year of schooling 2007-2009 (Average)



Gas revenue per capita vs. year of schooling 2010-2017 (Average)

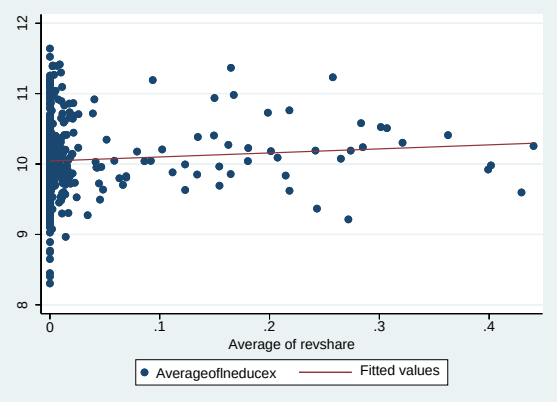


Gas revenue per capita vs. Literacy Rate (Average)

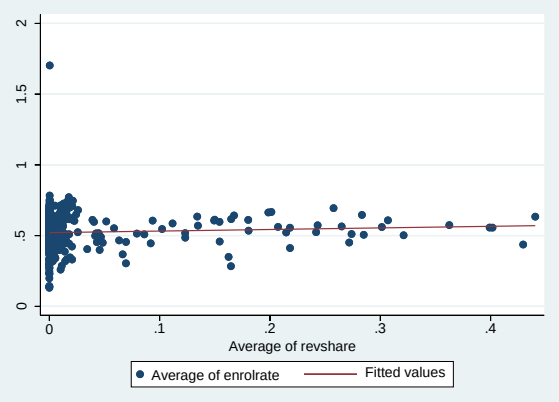
Source: Own construction using Stata Program

Lastly, Figure 8 also demonstrates the positive impact of the government revenue dependences from oil and gas per capita and education outcomes.

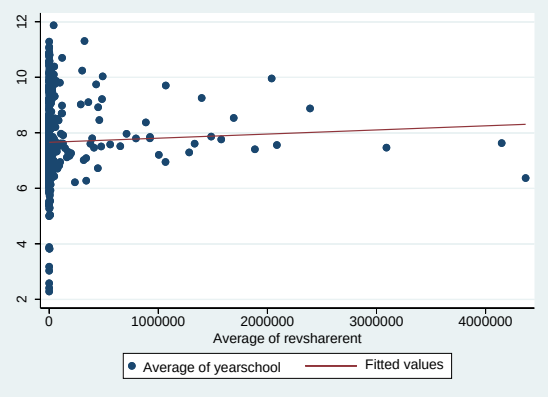
Figure 9. Scatterplot Correlation Between Government Revenue Dependence from Oil and Gas Per Capita and Education Outcomes



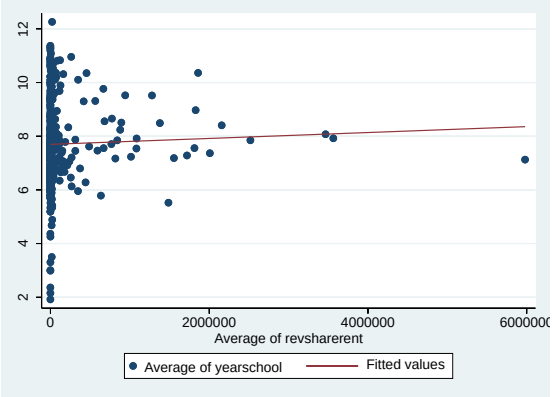
Oil and Gas revenue per capita vs. education expenditure (Average)



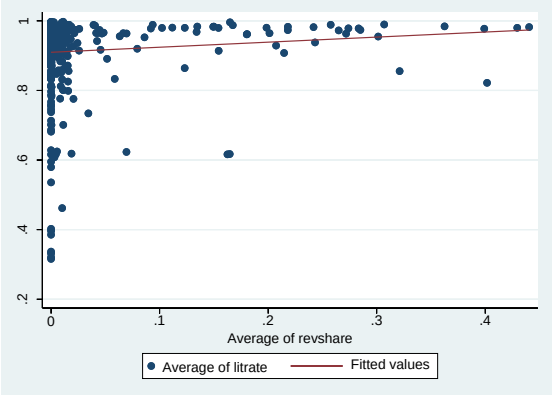
Oil and Gas revenue per capita vs. Net Enrollment Rate: Senior Secondary (Average)



Oil and Gas revenue per capita vs. year of schooling 2007-2009 (Average)



Oil and Gas revenue per capita vs. year of schooling 2010-2017 (Average)



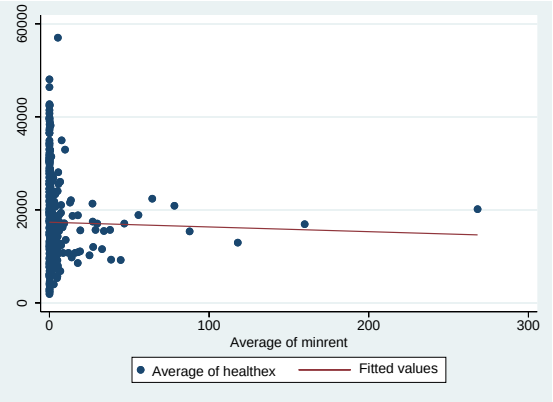
Oil and Gas revenue per capita vs. Literacy Rate (Average)

Source: Own construction using Stata Program

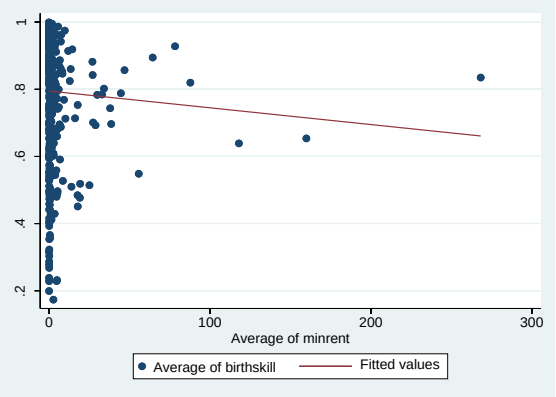
5.1.2. Resource Dependence vs. Health Outcomes

Based on the scatterplots in Figure 9, we can see the variation of the correlation between mining rents per capita and each health outcome. Only life expectancy does show the positive correlation with the mineral rents per capita, confirmed by the upward slopping of fitted value lines.

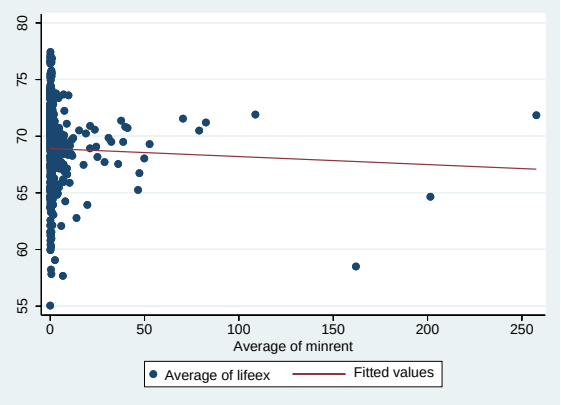
Figure 10. Scatterplot Correlation Between Mining Rents Per Capita and Health Outcomes



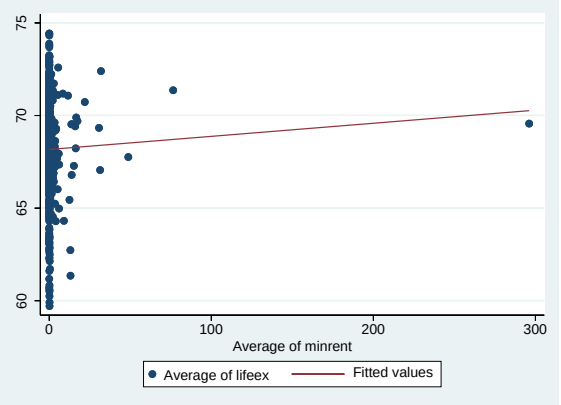
Mining rents per capita vs. health expenditure (Average)



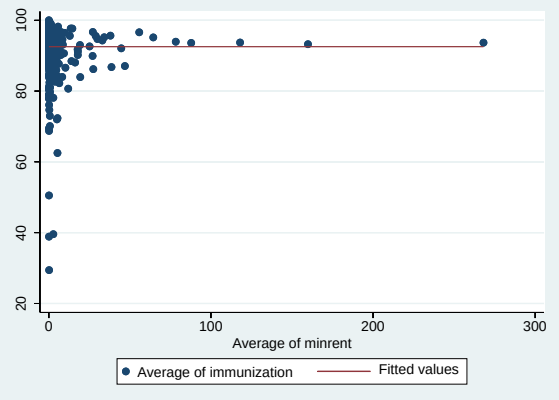
Mining rents per capita vs. birth attended by skilled health worker (Average)



Mining rents per capita vs. life expectancy 2007-2009 (Average)



Mining rents per capita vs. life expectancy 2010-2017 (Average)

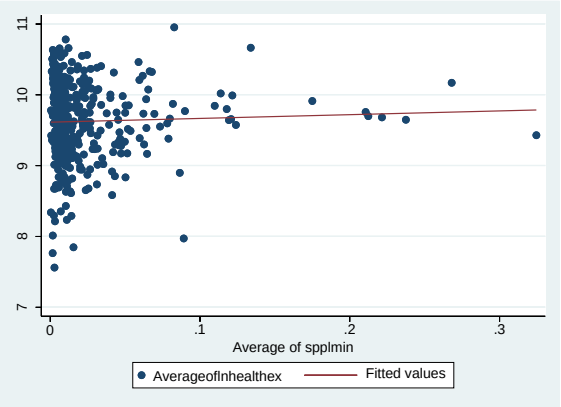


Mining rents per capita vs. Immunization (Average)

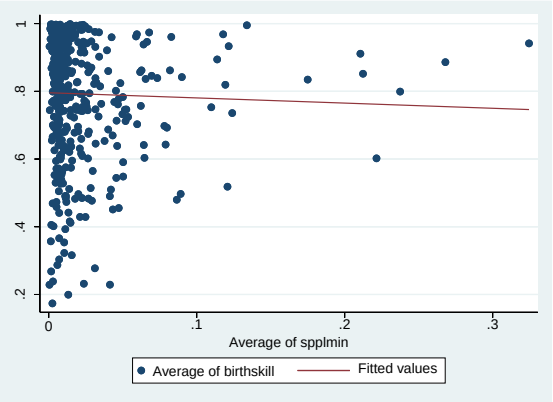
Source: Own construction using Stata Program

The Figure 10 below, tells us that the resource dependence in labor market shows different correlation with each of health outcome. There are possibilities of positive correlation between the employment dependence and health expenditure, life expectancy (new method) and the immunization rate. Whereas, it negatively correlates with the percentage of Birth attended by a skilled health worker (in % of total birth) and the life expectancy (old method).

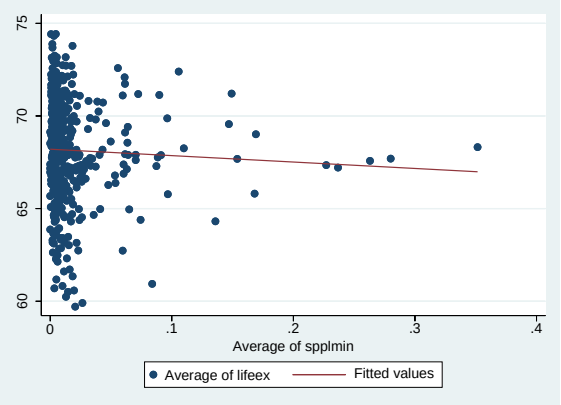
Figure 11. Scatterplot Correlation Between the Share of People Employed in Mining and Quarrying Sector and Health Outcomes



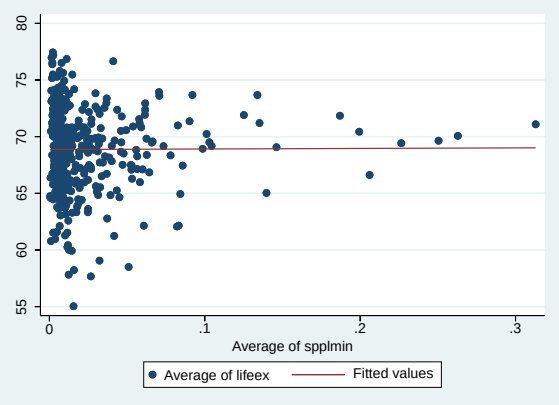
Employment dependence vs. health expenditure (Average)



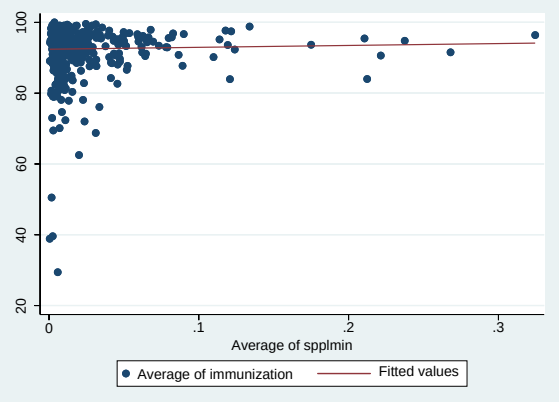
Employment dependence vs. birth attended by skilled health worker (Average)



Employment dependence vs. life expectancy 2007-2009 (Average)



Employment dependence vs. life expectancy 2010-2017 (Average)

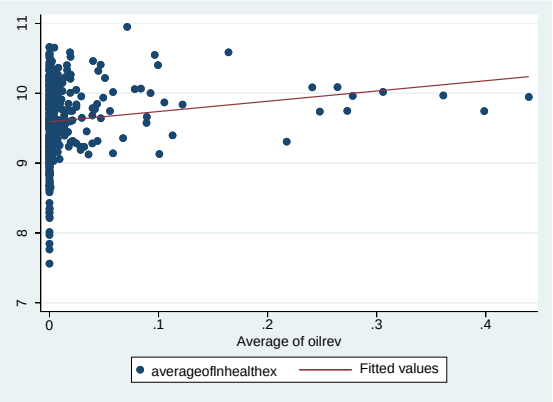


Employment dependence vs. Immunization (Average)

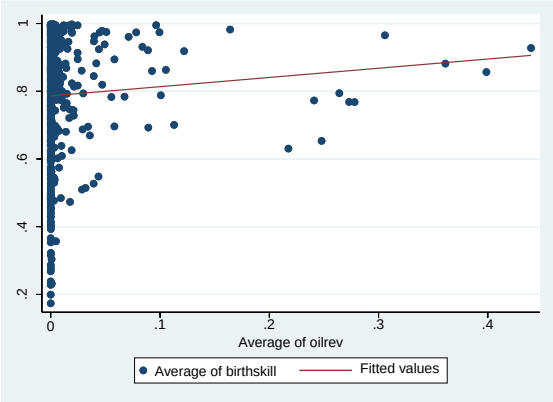
Source: Own construction using Stata Program

A little difference with the mining rent variable, the government revenue dependence from oil per capita as a proxy of resource dependence, shows some positive correlations with health outcomes, especially with health expenditure, birth attended by skilled health worker also for life expectancy before 2010.

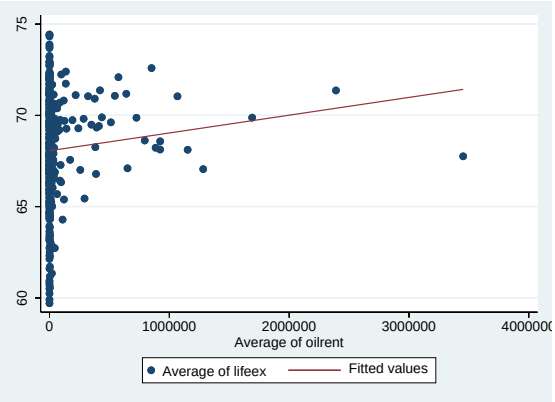
Figure 12. Scatterplot Correlation Between Government Revenue Dependence from Oil Per Capita and Health Outcomes



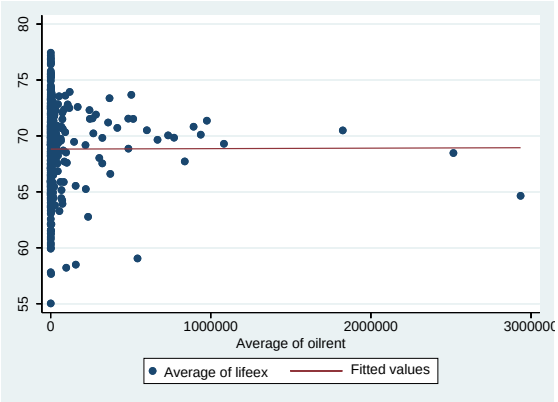
Oil revenue per capita vs. health expenditure (Average)



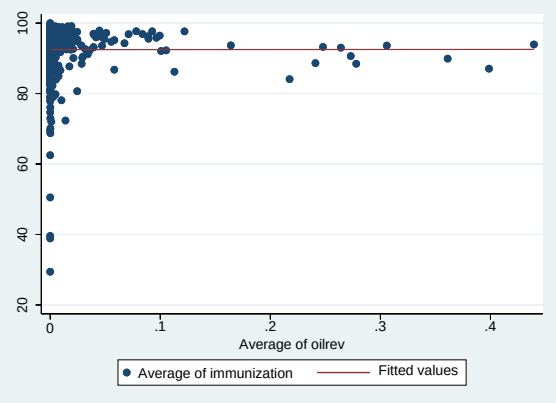
Oil revenue per capita vs. birth attended by skilled health worker (Average)



Oil revenue per capita vs. life expectancy 2007-2009 (Average)



Oil revenue per capita vs. life expectancy 2010-2017 (Average)

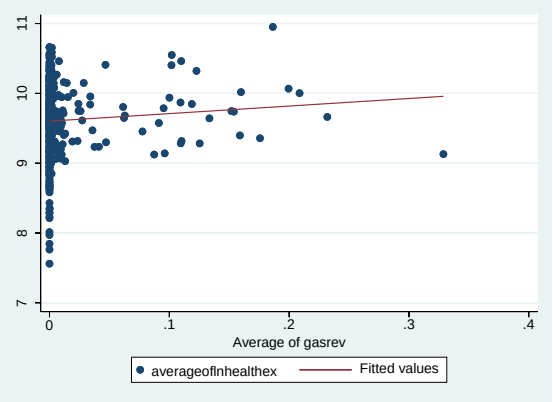


Oil revenue per capita vs. Immunization (Average)

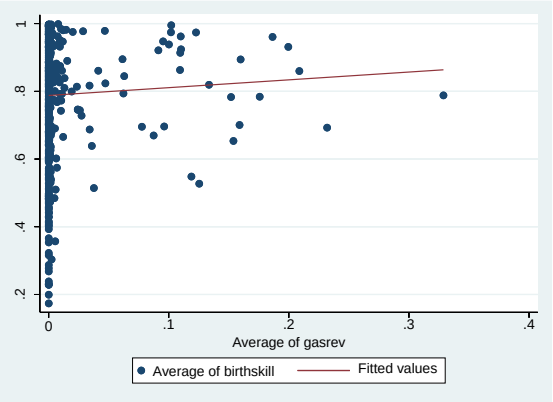
Source: Own construction using Stata Program

In brief, there is also positive impact of the government revenue dependence from gas (per capita) on Health Outcomes. The effect is significantly shown in average life expectancy before 2010.

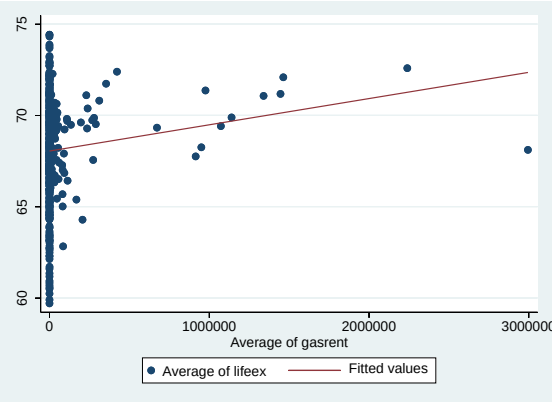
Figure 13. Scatterplot Correlation Between Government Revenue Dependence from Gas Per Capita and Health Outcomes



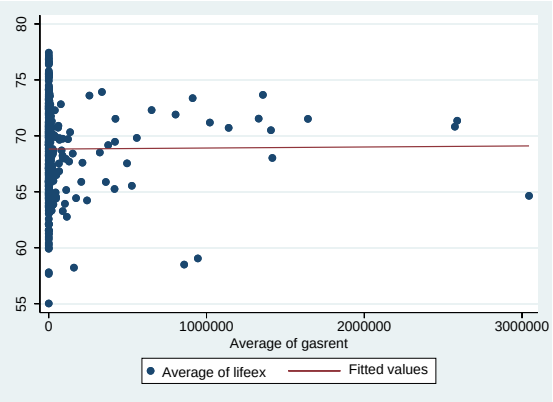
Gas revenue per capita vs. health expenditure (Average)



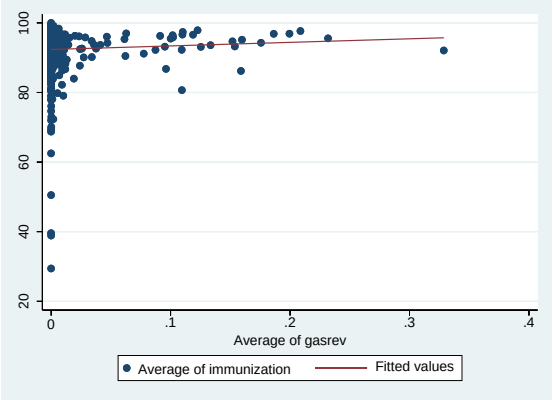
Gas revenue per capita vs. birth attended by skilled health worker (Average)



Gas revenue per capita vs. life expectancy 2007-2009 (Average)



Gas revenue per capita vs. life expectancy 2010-2017 (Average)

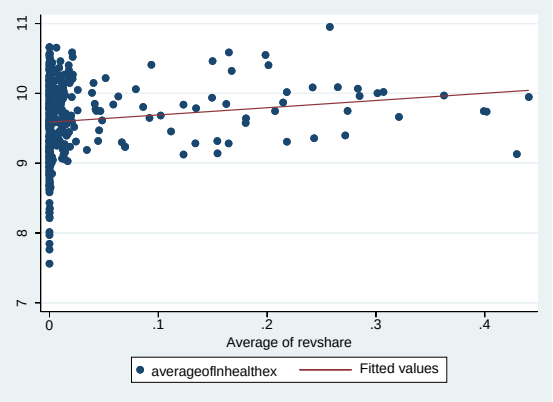


Gas revenue per capita vs. Immunization (Average)

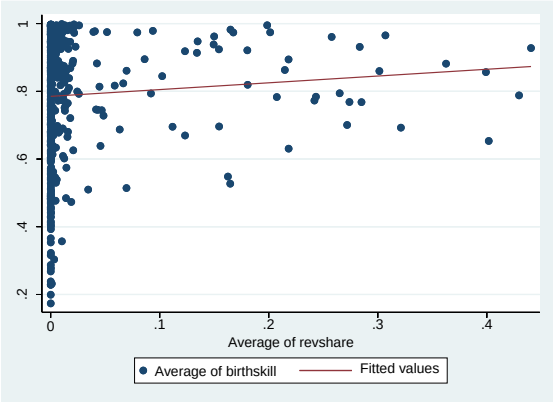
Source: Own construction using Stata Program

Furthermore, Figure 13 presents the positive correlation between the government revenue dependence from gas per capita as a proxy of resource dependence and the health outcomes.

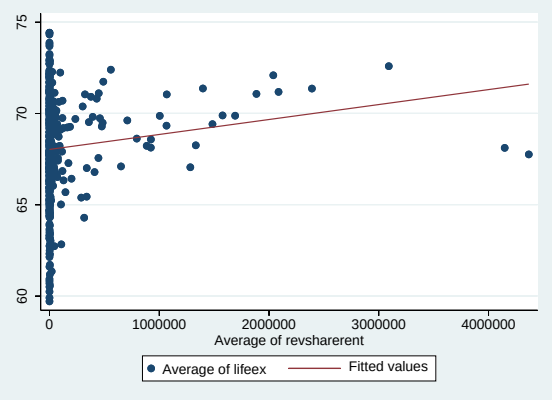
Figure 14. Scatterplot Correlation Between Government Revenue Dependences from Oil and Gas Per Capita and Health Outcomes



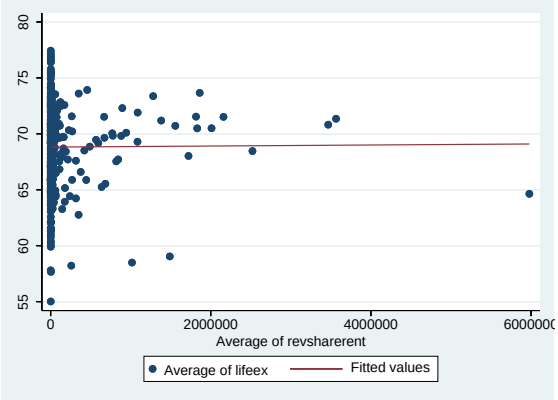
Oil and gas revenue per capita vs. health expenditure (Average)



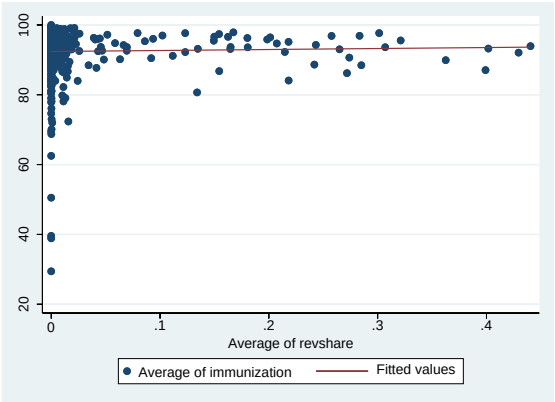
Oil and gas revenue per capita vs. birth attended by skilled health worker (Average)



Oil and gas revenue per capita vs. life expectancy 2007-2009 (Average)



Oil and gas revenue per capita vs. life expectancy 2010-2017 (Average)



Oil and gas revenue per capita vs. Immunization (Average)

Source: Own construction using Stata Program

In summary, in the simple scatterplot graph correlation, the district's average resource dependence shows mixed correlation with each education and health outcome. Therefore, I must scrutinize each correlation in detailed way.

5.2. Fixed Effect Estimation

In this model, I try to test the correlation between resource dependence proxy and education and health outcomes using simple fixed effect estimation (FE) with time dummies to capture the time-specific effects.

5.2.1. Resource Dependence vs. Education Outcome

Here, I want to test whether the district's resource dependence variables affect the district's education outcome using Fixed Effect model. At first, I run a regression without including any other independent variables except for mineral dependence. For the education outcomes, the FE result (Table 5) shows that the mining rent has positive correlation with several dependent variables. The coefficient of the mining rent in ln education expenditure is 0,0131 and it is statistically significant in 1% level, meaning that 1% increase in the district's mining rent will increase 0,0131% in the district's education expense. As for the correlation with the net enrolment ratio of senior secondary school, the mining rent shows positive correlation with significancy level of 1%. This positive correlation also happens with the literacy rate and year of schooling after 2010. However, the positive correlation with year of schooling 207-2009, the effect is not significant, or I can see that there is no correlation between mining rent and the year of schooling 2007-2009.

Table 5. The Fixed Effect Estimates of Mining Rent on Education Outcomes
(Without Any Other Independent Variables)

The second step, I run the regression using others independent variables, including binary variable of audit opinion from BPK, ln population, and district's poverty rate. Here, I also include time dummies variable to capture the specific time effect. However, the effect of the mining rent to district's education expenditure here become insignificant; even though the sign remains the same. For the net enrolment ratio of senior secondary school, the

correlation is still positively significant at the 1% level. For the literacy rate, the sign remains the same and become less significant (at 10% level) compared to the previous model. Also, there is a different effect to the year of schooling before 2010; the effect become negative at 10% significance level. Last, there is no effect on the year of schooling after 2010 when I include others independent variables in the model.

Table 6. The Fixed Effect Estimates of Mining Rent on Education Outcomes (After Including Other Independent Variables)

VARIABLES	(1) ln education expenditure	(2) enrolment rate	(3) literacy rate	(4) year of schooling 2007-2009	(5) year of schooling 2010-2017
minrent	0.00175	0.000942***	0.000953*	-0.00186*	4.88e-05
	(0.00108)	(0.000322)	(0.000565)	(0.00109)	(0.00108)
auditopinion	-0.0251*	0.00534	-0.00700	0.0543*	0.00249
	(0.0148)	(0.00710)	(0.00466)	(0.0289)	(0.0121)
lnpop	-0.0716	0.0409	0.0495**	-0.00654	0.0712
	(0.0511)	(0.0333)	(0.0244)	(0.0168)	(0.0707)
poverty	-0.00600*	0.0136	-0.00191*	0.000680	-0.0134**
	(0.00346)	(0.0151)	(0.00108)	(0.00252)	(0.00575)
year = 2008		-0.0125*	0.000904	0.0211***	
		(0.00678)	(0.00214)	(0.00597)	
year = 2009	0.699***	0.0239	0.00985**	0.130***	
	(0.0206)	(0.0167)	(0.00441)	(0.0106)	
year = 2010	0.703***	0.0416	0.0297***		
	(0.0214)	(0.0278)	(0.00685)		
year = 2011	0.855***	0.0735*	0.0218***		0.130***
	(0.0227)	(0.0399)	(0.00747)		(0.00894)
year = 2012	0.988***	0.102**	0.0242***		0.249***
	(0.0259)	(0.0503)	(0.00815)		(0.0132)
year = 2013	1.050***	0.138***	0.0338***		0.390***
	(0.0267)	(0.0518)	(0.00842)		(0.0167)
year = 2014	1.111***	0.207***	0.0437***		0.496***
	(0.0269)	(0.0607)	(0.00907)		(0.0192)
year = 2015	1.137***	0.207***	0.0598***		0.609***
	(0.0279)	(0.0530)	(0.0101)		(0.0196)
year = 2016	1.271***	0.211***	0.0610***		0.692***
	(0.0295)	(0.0572)	(0.0107)		(0.0214)
year = 2017	1.341***	0.221***	0.0634***		0.805***
	(0.0312)	(0.0596)	(0.0110)		(0.0227)
Constant	10.07***	-0.303	0.277	7.734***	6.584***
	(0.648)	(0.628)	(0.310)	(0.213)	(0.893)
Observations	4,355	4,788	4,790	1,302	3,488
R-squared	0.723	0.122	0.175	0.179	0.782
Number of iddist	436	436	436	435	436

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

Source: Own construction using Stata Program

The second resource dependence proxy is the share of people working in mining and quarrying sector. Similar with the previous variable, I try to estimate without any other independent variables and then compare the result after including other independents variables in my regression. The effect of this resource dependence variable is positive and significant at 1% level on education expense and literacy rate. If there is 1% increase in people working in mining and quarrying sector, the education expenditure will increase by

2,777%. Similarly, 1% increase in the number of people working in mining and quarrying sector, the district's literacy rate will increase by 0,25%. However, the effects on other education outcomes are not significant.

Table 7. The Fixed Effect Estimates of the Share of People Employed in Mining and Quarrying Sector on Education Outcomes (Without Any Other Independent Variables)

VARIABLES	(1) ln education expenditure	(2) enrolment rate	(3) literacy rate	(4) year of schooling 2007-2009	(5) year of schooling 2010-2017
spplmin	2.777***	0.195	0.250***	-0.106	0.615
	(0.725)	(0.151)	(0.0727)	(0.211)	(0.520)
Constant	9.905***	0.511***	0.905***	7.651***	7.677***
	(0.0162)	(0.00342)	(0.00165)	(0.00437)	(0.0122)
Observations	3,525	3,793	3,793	1,040	2,754
R-squared	0.012	0.000	0.004	0.000	0.001
Number of iddist	436	436	436	407	436

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

Source: Own construction using Stata Program

Including other independent variables, the estimate result can be seen in table 8. The effect of the share of people employed in mining and quarrying sector on literacy rate of the population age 15 and over is still positive and significant at 10% level. However, the effect become negative and significant (also at 10% level) on the years of schooling variables (2007-2009). Besides, there is no effect for other education outcomes.

Table 8. The Fixed Effect Estimates of the Share of People Employed in Mining and Quarrying Sector on Education Outcomes (After Including Other Independent Variables)

VARIABLES	(1) ln education expenditure	(2) enrolment rate	(3) literacy rate	(4) year of schooling 2007-2009	(5) year of schooling 2010-2017
spplmin	-0.184	-0.0316	0.134*	-0.303*	-0.152
	(0.300)	(0.0928)	(0.0687)	(0.178)	(0.208)
auditopinion	-0.0256	0.0101	-0.00533	0.0935***	0.00854
	(0.0167)	(0.00949)	(0.00528)	(0.0322)	(0.0131)
lnpop	-0.0297	0.0250	0.0624**	-0.00957	0.0564
	(0.0506)	(0.0350)	(0.0261)	(0.0243)	(0.0727)
poverty	-0.00930***	0.0194	-0.00228*	0.00511	-0.0123**
	(0.00311)	(0.0205)	(0.00134)	(0.00346)	(0.00570)
year = 2008		-0.00820	-0.0138***	0.0253***	
		(0.00709)	(0.00384)	(0.00887)	
year = 2009	0.690***	0.0411	0.00974*	0.139***	
	(0.0215)	(0.0309)	(0.00524)	(0.0129)	
year = 2010	0.701***	0.0690	0.0326***		
	(0.0221)	(0.0454)	(0.00796)		
year = 2011	0.864***	0.107*	0.0260***		0.138***
	(0.0223)	(0.0620)	(0.00884)		(0.00992)
year = 2012	0.997***	0.140*	0.0280***		0.256***
	(0.0254)	(0.0756)	(0.00955)		(0.0137)
year = 2013	1.052***	0.176**	0.0369***		0.390***
	(0.0252)	(0.0776)	(0.00983)		(0.0172)

year = 2014	1.105***	0.247***	0.0466***		0.500***
	(0.0266)	(0.0891)	(0.0105)		(0.0197)
year = 2015	1.132***	0.248***	0.0634***		0.610***
	(0.0287)	(0.0783)	(0.0117)		(0.0202)
year = 2017	1.334***	0.262***	0.0643***		0.812***
	(0.0317)	(0.0876)	(0.0124)		(0.0232)
Constant	9.601***	-0.207	0.111	7.634***	6.733***
	(0.642)	(0.729)	(0.332)	(0.315)	(0.921)
Observations	3,524	3,792	3,792	1,038	2,754
R-squared	0.751	0.110	0.177	0.162	0.783
Number of iddist	436	436	436	407	436

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

Source: Own construction using Stata Program

My next regression includes government revenue dependences from oil as a proxy of resource dependence. Without including any other independent variables, the result can be seen in table 9. The effect of the government revenue dependence from oil is only positive and significant on education expenditure. While for net enrolment ratio of senior secondary school, literacy rate of the population age 15 and over and the average years of schooling after 2010, the effects of government revenue dependence from oil in each district are negative, showing that there is possibility of development curse.

Table 9. The Fixed Effect Estimates of Government Revenue Dependences from Oil (Per Capita) on Education Outcomes (Without Any Other Independent Variables)

VARIABLES	(1) ln education expenditure	(2) enrolment rate	(3) literacy rate	(4) year of schooling 2007-2009	(5) year of schooling 2010-2017
oilrev	1.20e-07**	-4.03e-08***	-1.05e-08**	-3.35e-08	-2.98e-07***
	(5.48e-08)	(9.04e-09)	(4.37e-09)	(3.77e-08)	(8.16e-08)
Constant	9.971***	0.526***	0.914***	7.673***	7.723***
	(0.00269)	(0.000495)	(0.000239)	(0.00224)	(0.00432)
Observations	4,306	4,734	4,736	1,291	3,448
R-squared	0.001	0.001	0.001	0.002	0.017
Number of iddist	431	431	431	431	431

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

Source: Own construction using Stata Program

In contrast, after utilizing other independent variables and time dummies, the effects of the government revenue dependences from oil becomes not significant for all of the education outcomes.

Table 10. The Fixed Effect Estimates of Government Revenue Dependence from Oil (Per Capita) on Education Outcomes (After Including Other Independent Variables)

VARIABLES	(1) ln education expenditure	(2) enrolment rate	(3) literacy rate	(4) year of schooling 2007-2009	(5) year of schooling 2010-2017
oilrev	1.94e-08	-6.88e-11	1.98e-09	-4.89e-08	-3.11e-08
	(2.26e-08)	(9.57e-09)	(6.83e-09)	(3.30e-08)	(2.01e-08)
auditopinion	-0.0248*	0.00494	-0.00693	0.0535*	0.00186
	(0.0149)	(0.00679)	(0.00478)	(0.0290)	(0.0122)
lnpop	-0.0712	0.0424	0.0514**	-0.00436	0.0649
	(0.0512)	(0.0332)	(0.0246)	(0.0159)	(0.0686)
poverty	-0.00609*	0.0140	-0.00167	0.000793	-0.0129**
	(0.00348)	(0.0152)	(0.00110)	(0.00254)	(0.00575)
year = 2008		-0.0118	0.00141	0.0264***	
		(0.00741)	(0.00243)	(0.00644)	
year = 2009	0.699***	0.0257	0.0110**	0.134***	
	(0.0209)	(0.0168)	(0.00455)	(0.0106)	
year = 2010	0.706***	0.0458	0.0330***		
	(0.0217)	(0.0282)	(0.00710)		
year = 2011	0.857***	0.0790*	0.0257***		0.132***
	(0.0232)	(0.0404)	(0.00776)		(0.00895)
year = 2012	0.993***	0.108**	0.0287***		0.251***
	(0.0266)	(0.0510)	(0.00841)		(0.0132)
year = 2013	1.054***	0.144***	0.0386***		0.393***
	(0.0272)	(0.0526)	(0.00863)		(0.0168)
year = 2014	1.115***	0.214***	0.0488***		0.501***
	(0.0275)	(0.0617)	(0.00928)		(0.0194)
year = 2015	1.142***	0.214***	0.0646***		0.613***
	(0.0284)	(0.0544)	(0.0103)		(0.0199)
year = 2016	1.277***	0.218***	0.0659***		0.695***
	(0.0302)	(0.0588)	(0.0109)		(0.0217)
year = 2017	1.348***	0.229***	0.0687***		0.808***
	(0.0318)	(0.0613)	(0.0112)		(0.0230)
Constant	10.05***	-0.329	0.250	7.666***	6.625***
	(0.648)	(0.632)	(0.311)	(0.201)	(0.865)
Observations	4,305	4,733	4,735	1,287	3,448
R-squared	0.721	0.122	0.169	0.185	0.782
Number of iddist	431	431	431	430	431

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Own construction using Stata Program

Afterward, using my fourth resource dependence proxy, the government revenue dependence from gas (Per Capita), I can see that the effect of this variable is positive and significant (5% level) on education expenditure, but negative and significant (1% level) on year of schooling after 2010.

Table 11. The Fixed Effect Estimates of Government revenue dependences from Gas (Per Capita) on Education Outcomes (Without Any Other Independent Variables)

VARIABLES	(1) ln education expenditure	(2) enrolment rate	(3) literacy rate	(4) year of schooling 2007-2009	(5) year of schooling 2010-2017
gasrev	8.44e-08**	7.29e-09	1.39e-08	8.54e-09	-1.55e-07***
	(4.06e-08)	(9.06e-09)	(9.78e-09)	(1.86e-08)	(1.83e-08)
Constant	9.972***	0.524***	0.913***	7.671***	7.717***
	(0.00240)	(0.000544)	(0.000587)	(0.000872)	(0.00119)
Observations	4,306	4,734	4,736	1,291	3,448
R-squared	0.002	0.000	0.002	0.000	0.011
Number of iddist	431	431	431	431	431

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

Source: Own construction using Stata Program

After including the time dummies and other explanatory variables, the government revenue dependence from gas (Per Capita) shows a strong positive correlation with net enrolment ratio of senior secondary school and the literacy rate, but the significance level decreases on second variable. However, this resource dependence variable has a negative relationship with the year of schooling 2010-2017 (new method).

Table 12. The Fixed Effect Estimates of Government Revenue Dependence from Gas (Per Capita) on Education Outcomes (After Including Other Independent Variables)

VARIABLES	(1) ln education expenditure	(2) enrolment rate	(3) literacy rate	(4) year of schooling 2007-2009	(5) year of schooling 2010-2017
gasrev	1.20e-08	1.88e-08***	1.74e-08*	-2.72e-08	-2.29e-08*
	(2.41e-08)	(7.07e-09)	(9.26e-09)	(1.98e-08)	(1.28e-08)
auditopinion	-0.0248*	0.00442	-0.00740	0.0544*	0.00200
	(0.0150)	(0.00680)	(0.00478)	(0.0289)	(0.0122)
lnpop	-0.0711	0.0428	0.0517**	-0.00490	0.0646
	(0.0513)	(0.0330)	(0.0247)	(0.0161)	(0.0685)
poverty	-0.00609*	0.0139	-0.00169	0.000663	-0.0126**
	(0.00348)	(0.0152)	(0.00110)	(0.00251)	(0.00575)
year = 2008		-0.0131*	0.000414	0.0226***	
		(0.00696)	(0.00228)	(0.00591)	
year = 2009	0.699***	0.0243	0.00981**	0.132***	
	(0.0209)	(0.0171)	(0.00451)	(0.0107)	
year = 2010	0.707***	0.0446	0.0321***		
	(0.0217)	(0.0284)	(0.00697)		
year = 2011	0.857***	0.0773*	0.0243***		0.132***
	(0.0231)	(0.0407)	(0.00759)		(0.00899)
year = 2012	0.993***	0.106**	0.0270***		0.252***
	(0.0265)	(0.0513)	(0.00826)		(0.0133)
year = 2013	1.054***	0.142***	0.0368***		0.395***
	(0.0271)	(0.0529)	(0.00850)		(0.0169)
year = 2014	1.115***	0.212***	0.0472***		0.502***
	(0.0274)	(0.0621)	(0.00913)		(0.0194)
year = 2015	1.142***	0.213***	0.0643***		0.614***
	(0.0284)	(0.0545)	(0.0103)		(0.0198)
year = 2016	1.277***	0.218***	0.0658***		0.696***
	(0.0302)	(0.0589)	(0.0109)		(0.0216)
year = 2017	1.348***	0.228***	0.0686***		0.809***
	(0.0318)	(0.0614)	(0.0112)		(0.0228)
Constant	10.05***	-0.334	0.246	7.675***	6.625***
	(0.648)	(0.629)	(0.313)	(0.204)	(0.865)
Observations	4,305	4,733	4,735	1,287	3,448
R-squared	0.721	0.122	0.171	0.181	0.782
Number of iddist	431	431	431	430	431

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

Source: Own construction using Stata Program

The last my resource dependence variable is the total of oil and gas in district government's revenue. Excluding other explanatory variable, the result of the regression can be seen in the Table 13 below. The effect of the government revenue from oil and gas is positive and significant at 5% level on the education expenditure, but it becomes negative on

the year of schooling after 2010 (significant at 1% level). There is no significant effect on other education outcomes

Table 13. The Fixed Effect Estimates of Government Revenue Dependence from Oil and Gas (Per Capita) on Education Outcomes (Without Any Other Independent Variables)

VARIABLES	(1) ln education expenditure	(2) enrolment rate	(3) literacy rate	(4) year of schooling 2007-2009	(5) year of schooling 2010-2017
oilgasrev	6.04e-08**	-7.06e-09	3.28e-09	-1.10e-08	-1.25e-07***
	(2.57e-08)	(4.62e-09)	(3.77e-09)	(2.37e-08)	(2.00e-08)
Constant	9.970***	0.525***	0.913***	7.672***	7.722***
	(0.00278)	(0.000531)	(0.000433)	(0.00252)	(0.00235)
Observations	4,306	4,734	4,736	1,291	3,448
R-squared	0.002	0.000	0.000	0.001	0.016
Number of iddist	431	431	431	431	431

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

Source: Own construction using Stata Program

Furthermore, including other independent variables and time dummies, the result changes. The effect on education expenditure become insignificant. While for the net enrolment ratio of senior secondary school and literacy rate, the effect become positively significant. Consistent with previous result, the effect of the oil and gas revenue on year of schooling (after 2010) remains negative and significant.

Table 14. The Fixed Effect Estimates of Government Revenue Dependence from Oil and Gas (Per Capita) on Education Outcomes (After Including Other Independent Variables)

VARIABLES	(1) ln education expenditure	(2) enrolment rate	(3) literacy rate	(4) year of schooling 2007-2009	(5) year of schooling 2010-2017
oilgasrev	9.10e-09	8.08e-09*	8.01e-09**	-2.89e-08	-1.61e-08*
	(1.38e-08)	(4.68e-09)	(3.58e-09)	(2.18e-08)	(8.63e-09)
auditopinion	-0.0249*	0.00465	-0.00720	0.0539*	0.00204
	(0.0150)	(0.00676)	(0.00478)	(0.0290)	(0.0122)
lnpop	-0.0711	0.0429	0.0519**	-0.00316	0.0638
	(0.0512)	(0.0332)	(0.0247)	(0.0154)	(0.0683)
poverty	-0.00609*	0.0140	-0.00168	0.000654	-0.0127**
	(0.00348)	(0.0152)	(0.00111)	(0.00251)	(0.00574)
year = 2008		-0.0133*	0.000196	0.0259***	
		(0.00723)	(0.00236)	(0.00641)	
year = 2009	0.699***	0.0246	0.0100**	0.134***	
	(0.0209)	(0.0169)	(0.00452)	(0.0107)	
year = 2010	0.706***	0.0448	0.0322***		
	(0.0217)	(0.0283)	(0.00703)		
year = 2011	0.857***	0.0777*	0.0246***		0.133***
	(0.0232)	(0.0405)	(0.00767)		(0.00898)
year = 2012	0.993***	0.107**	0.0274***		0.252***
	(0.0265)	(0.0510)	(0.00834)		(0.0132)
year = 2013	1.053***	0.143***	0.0374***		0.394***
	(0.0271)	(0.0526)	(0.00859)		(0.0168)
year = 2014	1.115***	0.213***	0.0475***		0.502***
	(0.0274)	(0.0618)	(0.00922)		(0.0194)
year = 2015	1.142***	0.213***	0.0643***		0.613***
	(0.0284)	(0.0545)	(0.0104)		(0.0198)
year = 2016	1.277***	0.218***	0.0658***		0.695***
	(0.0302)	(0.0589)	(0.0109)		(0.0216)

year = 2017	1.348***	0.228***	0.0686***		0.808***
	(0.0318)	(0.0614)	(0.0112)		(0.0229)
Constant	10.05***	-0.336	0.244	7.653***	6.637***
	(0.648)	(0.631)	(0.313)	(0.195)	(0.862)
Observations	4,305	4,733	4,735	1,287	3,448
R-squared	0.721	0.122	0.170	0.184	0.782
Number of iddist	431	431	431	430	431

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

Source: Own construction using Stata Program

5.2.2. Resource Dependence vs. Health Outcome

I also use similar estimation strategy to gauge the effect of natural resource dependence on health outcomes. First, I run a Fixed Effect regression between the resource dependence proxy and the health outcomes directly, then I run another regression including other explanatory variables and time dummies.

For the first resource dependence variable, the mining rent per capita, the effects of this variable are positively significant for all of the health outcomes. If the mining rent per capita increase by 1%, then the health expenditure, the birth attended by a skilled health worker (in % of total birth), the immunization coverage for children under 5 years old and the life expectancy old method and new method will also increase by 0,0157%, 0,000367%, 0,000363%, 0,0119% and 0,00986% retrospectively.

Table 15. The Fixed Effect Estimates of Mining Rent on Health Outcomes (Without Any Other Independent Variables)

VARIABLES	(1) ln health expenditure	(2) birth attended by health worker	(3) immunization rate	(4) life expectancy 2007-2009	(5) life expectancy 2010-2017
minrent	0.0157***	0.00367***	0.000363***	0.0119***	0.00986**
	(0.00379)	(0.000767)	(8.84e-05)	(0.00406)	(0.00496)
Constant	9.443***	0.777***	0.923***	68.16***	68.82***
	(0.0170)	(0.00328)	(0.000378)	(0.00853)	(0.0252)
Observations	4,356	4,790	4,796	1,307	3,488
R-squared	0.035	0.043	0.002	0.011	0.010
Number of iddist	436	436	436	436	436

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

Source: Own construction using Stata Program

Similarly, after controlling the district and time specific characteristic, the mining rent shows a significant and positive impact on almost all of the health outcomes. However, this resource dependence has no effect on life expectancy (new method). This result is not in line with the resource curse hypothesis, as it shows resource blessing.

Table 16. The Fixed Effect Estimates of Mining Rent on Health Outcomes (After Including Other Independent Variables)

VARIABLES	(1) ln health expenditure	(2) birth attended by health worker	(3) immunization rate	(4) life expectancy 2007-2009	(5) life expectancy 2010-2017
minrent	0.00202**	0.00149***	0.0238***	0.00231**	0.00278
	(0.000865)	(0.000425)	(0.00834)	(0.00100)	(0.00294)
auditopinion	0.0246	-0.00901	0.0740	0.0762*	0.0116
	(0.0185)	(0.00583)	(0.289)	(0.0430)	(0.0139)
lnpop	-0.150**	0.0363	-0.621	0.0302	-0.0815
	(0.0631)	(0.0274)	(1.445)	(0.0487)	(0.0754)
poverty	-0.00175	-0.00605***	-0.168***	0.000345	-0.0210**
	(0.00360)	(0.00113)	(0.0651)	(0.00209)	(0.00900)
year = 2008		0.00668*	-0.463	0.192***	
		(0.00393)	(0.320)	(0.00776)	
year = 2009	0.505***	0.0273***	0.474	0.403***	
	(0.0222)	(0.00502)	(0.370)	(0.0136)	
year = 2010	0.660***	0.0569***	0.945**		
	(0.0256)	(0.00750)	(0.405)		
year = 2011	0.975***	0.0611***	0.518		0.0674***
	(0.0274)	(0.00799)	(0.401)		(0.00887)
year = 2012	1.077***	0.0819***	1.324***		0.128***
	(0.0294)	(0.00922)	(0.432)		(0.0169)
year = 2013	1.216***	0.102***	1.534***		0.193***
	(0.0310)	(0.00967)	(0.430)		(0.0195)
year = 2014	1.348***	0.115***	1.673***		0.240***
	(0.0328)	(0.0105)	(0.428)		(0.0261)
year = 2015	1.108***	0.172***	-1.921***		0.444***
	(0.0317)	(0.0118)	(0.499)		(0.0266)
year = 2016	1.223***	0.186***	-0.484		0.541***
	(0.0322)	(0.0128)	(0.540)		(0.0317)
year = 2017	1.357***	0.213***	-1.313**		0.634***
	(0.0333)	(0.0140)	(0.610)		(0.0356)
Constant	10.49***	0.318	102.5***	67.60***	69.89***
	(0.803)	(0.348)	(18.18)	(0.619)	(0.958)
Observations	4,355	4,789	4,790	1,302	3,488
R-squared	0.673	0.517	0.081	0.707	0.658
Number of iddist	436	436	436	435	436

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

Source: Own construction using Stata Program

Using the number of people employed in mining and quarrying sector as resource dependence variable, we can see that this variable has positive and significant impact on health expenditure, the percentage of birth attended by a skilled health worker and life expectancy 2007-2009. However, the effect of this variable to other health outcomes are not significant.

Table 17. The Fixed Effect Estimates of the Share of People Employed in Mining and Quarrying Sector on Health Outcomes (Without Any Other Independent Variables)

VARIABLES	(1) ln health expenditure	(2) birth attended by health worker	(3) immunization rate	(4) life expectancy 2007-2009	(5) life expectancy 2010-2017
spplmin	3.524***	0.457**	0.0132	0.983**	0.599
	(0.765)	(0.188)	(0.0340)	(0.391)	(0.438)
Constant	9.418***	0.774***	0.927***	68.04***	68.82***
	(0.0171)	(0.00426)	(0.000770)	(0.00811)	(0.0103)
Observations	3,525	3,793	3,794	1,040	2,754
R-squared	0.014	0.006	0.000	0.004	0.001
Number of iddist	436	436	436	407	436

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

Source: Own construction using Stata Program

However, when I include the time dummies and other independent variables, the correlation between the number of people employed in mining and quarrying sector and all of the health outcomes become not significant.

Table 18. The Fixed Effect Estimates of the Share of People Employed in Mining and Quarrying Sector on Health Outcomes (After Including Other Independent Variables)

VARIABLES	(1) ln health expenditure	(2) birth attended by health worker	(3) immunization rate	(4) life expectancy 2007-2009	(5) life expectancy 2010-2017
spplmin	-0.0159	0.0736	-2.623	-0.0786	-0.0364
	(0.338)	(0.119)	(3.413)	(0.161)	(0.232)
auditopinion	0.0227	-0.0116*	-0.0520	0.0692	0.0139
	(0.0199)	(0.00635)	(0.285)	(0.0569)	(0.0142)
lnpop	-0.130**	0.0444	0.518	0.0529	-0.0942
	(0.0627)	(0.0310)	(1.170)	(0.0601)	(0.0687)
poverty	-0.00252	-0.00616***	-0.208***	0.00174	-0.0245***
	(0.00385)	(0.00129)	(0.0662)	(0.00295)	(0.00916)
year = 2008		-0.000746	-0.252	0.200***	
		(0.00518)	(0.302)	(0.0103)	
year = 2009	0.500***	0.0275***	0.483	0.412***	
	(0.0241)	(0.00574)	(0.329)	(0.0160)	
year = 2010	0.652***	0.0610***	1.094***		
	(0.0273)	(0.00837)	(0.328)		
year = 2011	0.994***	0.0661***	0.491		0.0683***
	(0.0292)	(0.00900)	(0.334)		(0.00927)
year = 2012	1.087***	0.0897***	1.375***		0.127***
	(0.0319)	(0.0100)	(0.348)		(0.0171)
year = 2013	1.220***	0.109***	1.563***		0.193***
	(0.0336)	(0.0105)	(0.369)		(0.0198)
year = 2014	1.346***	0.123***	1.586***		0.238***
	(0.0356)	(0.0115)	(0.401)		(0.0256)
year = 2015	1.114***	0.184***	-1.874***		0.445***
	(0.0346)	(0.0130)	(0.516)		(0.0268)
year = 2017	1.360***	0.221***	-1.326**		0.633***
	(0.0361)	(0.0150)	(0.573)		(0.0354)
Constant	10.27***	0.210	88.75***	67.15***	70.10***
	(0.803)	(0.396)	(14.80)	(0.772)	(0.876)
Observations	3,524	3,792	3,792	1,038	2,754
R-squared	0.708	0.512	0.109	0.705	0.657
Number of iddist	436	436	436	407	436

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

Source: Own construction using Stata Program

Regarding the government revenue dependence from oil, its correlation with the health outcome can be seen in the table 19. It affects the health expenditure in a positive

way, but negative on the percentage of birth attended by a skilled health worker (in % of total birth) and life expectancy 2010-2017.

Table 19. The Fixed Effect Estimates of Government revenue dependences from Oil (Per Capita) on Health Outcomes (Without Any Other Independent Variables)

VARIABLES	(1) ln health expenditure	(2) birth attended by health worker	(3) immunization rate	(4) life expectancy 2007-2009	(5) life expectancy 2010-2017
oilrev	1.76e-07***	-4.05e-08***	6.48e-09	4.06e-08	-3.75e-07***
	(6.37e-08)	(7.60e-09)	(5.78e-09)	(4.36e-08)	(9.47e-08)
Constant	9.493***	0.793***	0.924***	68.13***	68.84***
	(0.00312)	(0.000416)	(0.000316)	(0.00259)	(0.00502)
Observations	4,306	4,735	4,739	1,291	3,448
R-squared	0.002	0.003	0.001	0.002	0.032
Number of iddist	431	431	431	431	431

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

Source: Own construction using Stata Program

Utilizing other independent variables and time dummies, I find that the government revenue dependence from oil has negative association with life expectancy, either new or old method. But it does not provide any effect on others health outcomes.

Table 20. The Fixed Effect Estimates of Government revenue dependences from Oil (Per Capita) on Health Outcomes (After Including Other Independent Variables)

VARIABLES	(1) ln health expenditure	(2) birth attended by health worker	(3) immunization rate	(4) life expectancy 2007-2009	(5) life expectancy 2010-2017
oilrev	1.09e-08	-2.15e-09	-7.00e-08	-5.64e-08***	-1.23e-07**
	(3.10e-08)	(7.95e-09)	(4.07e-07)	(1.27e-08)	(5.46e-08)
auditopinion	0.0254	-0.00936	0.0914	0.0738*	0.0122
	(0.0187)	(0.00590)	(0.293)	(0.0429)	(0.0140)
lnpop	-0.149**	0.0386	-0.573	0.0338	-0.108
	(0.0633)	(0.0274)	(1.444)	(0.0468)	(0.0737)
poverty	-0.00202	-0.00551***	-0.165**	0.000451	-0.0204**
	(0.00361)	(0.00116)	(0.0659)	(0.00211)	(0.00898)
year = 2008		0.00850**	-0.450	0.200***	
		(0.00418)	(0.331)	(0.00796)	
year = 2009	0.502***	0.0301***	0.501	0.409***	
	(0.0226)	(0.00518)	(0.378)	(0.0138)	
year = 2010	0.663***	0.0634***	1.025**		
	(0.0260)	(0.00771)	(0.417)		
year = 2011	0.977***	0.0689***	0.615		0.0728***
	(0.0279)	(0.00824)	(0.417)		(0.00905)
year = 2012	1.082***	0.0908***	1.437***		0.135***
	(0.0299)	(0.00945)	(0.449)		(0.0168)
year = 2013	1.218***	0.111***	1.652***		0.200***
	(0.0316)	(0.00986)	(0.447)		(0.0189)
year = 2014	1.351***	0.125***	1.790***		0.251***
	(0.0335)	(0.0106)	(0.447)		(0.0260)
year = 2015	1.111***	0.182***	-1.851***		0.448***
	(0.0323)	(0.0120)	(0.515)		(0.0255)
year = 2016	1.226***	0.196***	-0.394		0.546***
	(0.0329)	(0.0130)	(0.558)		(0.0304)
year = 2017	1.361***	0.224***	-1.221*		0.642***
	(0.0339)	(0.0141)	(0.626)		(0.0342)
Constant	10.46***	0.280	101.8***	67.50***	70.19***
	(0.804)	(0.348)	(18.14)	(0.594)	(0.934)

Observations	4,305	4,734	4,735	1,287	3,448
R-squared	0.671	0.514	0.080	0.710	0.663
Number of iddist	431	431	431	430	431

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

Source: Own construction using Stata Program

Meanwhile, for government revenue dependence from gas, the effect of this resource dependence is positively significant on health expenditure immunization rate and life expectancy 2007-2009, but negatively significant on life expectancy 2010-2017.

Table 21. The Fixed Effect Estimates of Government Revenue Dependence from Gas (Per Capita) on Health Outcomes (Without Any Other Independent Variables)

VARIABLES	(1) ln health expenditure	(2) birth attended by health worker	(3) immunization rate	(4) life expectancy 2007-2009	(5) life expectancy 2010-2017
gasrev	1.15e-07**	-2.24e-09	1.22e-08***	1.14e-07***	-1.57e-07***
	(5.01e-08)	(9.94e-09)	(3.47e-09)	(3.67e-08)	(2.12e-08)
Constant	9.495***	0.791***	0.924***	68.13***	68.83***
	(0.00296)	(0.000597)	(0.000208)	(0.00172)	(0.00138)
Observations	4,306	4,735	4,739	1,291	3,448
R-squared	0.002	0.000	0.003	0.011	0.013
Number of iddist	431	431	431	431	431

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

Source: Own construction using Stata Program

After including other independent variables and time dummies, the government revenue dependence from gas (per capita) only has negative effect on health outcome through life expectancy 2007-2009. There is no significant effect of the oil revenue on other health outcomes.

Table 22. The Fixed Effect Estimates of Government Revenue Dependence from Gas (Per Capita) on Health Outcomes (After Including Other Independent Variables)

VARIABLES	(1) ln health expenditure	(2) birth attended by health worker	(3) immunization rate	(4) life expectancy 2007-2009	(5) life expectancy 2010-2017
gasrev	-6.71e-09	9.41e-09	4.87e-07	-2.70e-08*	-1.77e-08
	(2.89e-08)	(7.37e-09)	(2.98e-07)	(1.54e-08)	(2.21e-08)
auditopinion	0.0258	-0.00963	0.0774	0.0749*	0.0111
	(0.0187)	(0.00591)	(0.293)	(0.0430)	(0.0140)
lnpop	-0.149**	0.0389	-0.559	0.0328	-0.0959
	(0.0634)	(0.0274)	(1.442)	(0.0476)	(0.0734)
poverty	-0.00203	-0.00552***	-0.165**	0.000322	-0.0197**
	(0.00361)	(0.00116)	(0.0659)	(0.00210)	(0.00926)
year = 2008		0.00761*	-0.491	0.195***	
		(0.00399)	(0.325)	(0.00788)	
year = 2009	0.504***	0.0292***	0.462	0.407***	
	(0.0225)	(0.00514)	(0.376)	(0.0138)	
year = 2010	0.664***	0.0627***	0.991**		
	(0.0259)	(0.00761)	(0.416)		
year = 2011	0.978***	0.0679***	0.567		0.0712***
	(0.0279)	(0.00811)	(0.413)		(0.00920)
year = 2012	1.083***	0.0897***	1.382***		0.134***
	(0.0299)	(0.00934)	(0.447)		(0.0176)

year = 2013	1.220***	0.110***	1.595***		0.201***
	(0.0316)	(0.00977)	(0.445)		(0.0202)
year = 2014	1.353***	0.124***	1.736***		0.250***
	(0.0334)	(0.0106)	(0.443)		(0.0270)
year = 2015	1.111***	0.182***	-1.863***		0.453***
	(0.0323)	(0.0120)	(0.514)		(0.0267)
year = 2016	1.226***	0.196***	-0.400		0.552***
	(0.0329)	(0.0130)	(0.558)		(0.0318)
year = 2017	1.361***	0.224***	-1.226*		0.647***
	(0.0340)	(0.0142)	(0.626)		(0.0357)
Constant	10.47***	0.276	101.6***	67.52***	70.01***
	(0.805)	(0.349)	(18.11)	(0.604)	(0.925)
Observations	4,305	4,734	4,735	1,287	3,448
R-squared	0.671	0.514	0.081	0.707	0.659
Number of iddist	431	431	431	430	431

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

Source: Own construction using Stata Program

While for the combination of oil and gas revenue, the effect of this resource dependence is positively significant on health expenditure (1% level), immunization rate (5% level), and life expectancy 2007-2009(5% level). For the percentage of birth attended by a skilled health worker and life expectancy 2010-2017, the correlation is negative and significant.

Table 23. The Fixed Effect Estimates of Government Revenue Dependence from Oil and Gas (Per Capita) on Health Outcomes (Without Any Other Independent Variables)

VARIABLES	(1) ln health expenditure	(2) birth attended by health worker	(3) immunization rate	(4) life expectancy 2007-2009	(5) life expectancy 2010-2017
oilgasrev	8.49e-08***	-1.12e-08***	6.85e-09**	5.23e-08**	-1.41e-07***
	(2.91e-08)	(4.16e-09)	(3.08e-09)	(2.58e-08)	(2.21e-08)
Constant	9.493***	0.792***	0.924***	68.13***	68.84***
	(0.00314)	(0.000478)	(0.000354)	(0.00274)	(0.00260)
Observations	4,306	4,735	4,739	1,291	3,448
R-squared	0.003	0.001	0.002	0.007	0.023
Number of iddist	431	431	431	431	431

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

Source: Own construction using Stata Program

In addition, after I include other independent variables and time dummies, the result become slightly different. The government revenue dependence from oil and gas (Per Capita) has negative and significant impact (at 5% level) on the life expectancy (old method). Moreover, it does not affect other health outcomes.

Table 24. The Fixed Effect Estimates of Government Revenue Dependence from Oil and Gas (Per Capita) on Health Outcomes (After Including Other Independent Variables)

VARIABLES	(1) ln health expenditure	(2) birth attended by health worker	(3) immunization rate	(4) life expectancy 2007-2009	(5) life expectancy 2010-2017
oilgasrev	-8.06e-10	3.51e-09	1.92e-07	-3.19e-08**	-3.15e-08

	(1.90e-08)	(3.21e-09)	(2.49e-07)	(1.26e-08)	(2.07e-08)
auditopinion	0.0256	-0.00950	0.0841	0.0743*	0.0118
	(0.0187)	(0.00591)	(0.293)	(0.0429)	(0.0141)
lnpop	-0.149**	0.0389	-0.557	0.0350	-0.103
	(0.0634)	(0.0275)	(1.443)	(0.0463)	(0.0736)
poverty	-0.00203	-0.00551***	-0.165**	0.000297	-0.0197**
	(0.00361)	(0.00116)	(0.0659)	(0.00211)	(0.00917)
year = 2008		0.00764*	-0.492	0.199***	
		(0.00405)	(0.329)	(0.00806)	
year = 2009	0.503***	0.0295***	0.472	0.409***	
	(0.0226)	(0.00516)	(0.377)	(0.0138)	
year = 2010	0.664***	0.0628***	0.998**		
	(0.0260)	(0.00766)	(0.417)		
year = 2011	0.978***	0.0682***	0.578		0.0723***
	(0.0279)	(0.00818)	(0.416)		(0.00931)
year = 2012	1.083***	0.0900***	1.398***		0.136***
	(0.0299)	(0.00941)	(0.450)		(0.0176)
year = 2013	1.219***	0.110***	1.615***		0.202***
	(0.0316)	(0.00984)	(0.447)		(0.0200)
year = 2014	1.352***	0.124***	1.750***		0.251***
	(0.0335)	(0.0106)	(0.446)		(0.0269)
year = 2015	1.111***	0.182***	-1.860***		0.452***
	(0.0323)	(0.0120)	(0.514)		(0.0261)
year = 2016	1.226***	0.196***	-0.399		0.550***
	(0.0329)	(0.0130)	(0.558)		(0.0312)
year = 2017	1.361***	0.224***	-1.227*		0.646***
	(0.0340)	(0.0142)	(0.626)		(0.0351)
Constant	10.47***	0.276	101.6***	67.49***	70.10***
	(0.805)	(0.349)	(18.12)	(0.587)	(0.930)
Observations	4,305	4,734	4,735	1,287	3,448
R-squared	0.671	0.514	0.081	0.709	0.660
Number of iddist	431	431	431	430	431

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

Source: Own construction using Stata Program

5.3. Robustness Check

To check whether the model is robust or not, I try to exclude the outlier districts that have the highest and the lowest percentile of the average resource dependence proxies. For the mining rent proxy, I exclude 19 districts in the lowest percentile, and 4 districts in the highest percentile. For the share of people employed in mining and quarrying sector as resource dependence proxy, I exclude 4 highest percentile districts and also 4 lowest percentile districts. For the government revenue dependence from oil as resource dependence proxy, I exclude 4 highest percentile districts and also 169 lowest percentile districts. For the government revenue dependence from gas as resource dependence proxy, I exclude 4 highest percentile districts and also 175 lowest percentile districts. For the government revenue dependence from oil and gas as resource dependence proxy, I exclude 4 highest percentile districts and also 147 lowest percentile districts.

After cleaning the outlier, I run a regression including the explanatory variables and time dummies. The comparison of the estimates results from the previous sub chapter and this part can be seen in the table 25. There we can see that not all the models are robust. However, some models that are robust are:

a. The correlation between the mining rent per capita and the net enrolment ratio of senior secondary school that shows positive and significant result;
b. The correlation between the mining rent per capita and the health expenditure that shows positive and significant result;
c. The correlation between the mining rent per capita and the percentage of birth attended by a skilled health worker that shows positive and significant result;
d. The correlation between the share of people employed in mining and quarrying sector and the net enrolment ratio of senior secondary school that shows no significant correlation;
e. The correlation between the share of people employed in mining and quarrying sector and the literacy rate that shows positive and significant result;
f. The correlation between the share of people employed in mining and quarrying sector and the year of schooling 2010-2017 that shows no significant correlation;
g. The correlation between the share of people employed in mining and quarrying sector and the immunization coverage for children under 5 years old that shows no significant correlation;
h. The correlation between the government revenue dependence from oil and the immunization coverage for children under 5 years old that shows no significant correlation;
i. The correlation between the government revenue dependence from oil and the life expectancy 20010-2017 that shows negative and significant result;
j. The correlation between the government revenue dependence from gas and the year of schooling 2007-2009 that shows no significant correlation;
k. The correlation between the government revenue dependence from gas and the year of schooling 2007-2009 that shows no significant correlation;
l. The correlation between the government revenue dependence from oil and gas and the percentage of birth attended by a skilled health worker that shows no significant correlation;

Overall, from the robust model, only for the correlation between the government revenue dependence from oil and the life expectancy 20010-2017 does show negative and significant result, while for other, there is positive and significant or no significant correlation.

Table 25. The Comparison of the Estimates Result

	Education Outcomes															Health Outcomes														
Outcomes	**ln education expenditure**			**enrolment rate**			**literacy rate**			**year of schooling 2007-2009**			**year of schooling 2010-2017**			**ln health expenditure**			**birth attended by health worker**			**immunization rate**			**life expectancy 2007-2009**			**life expectancy 2010-2017**		
Model	FE1	FE2	FE3	FE1	FE2	FE3	FE1	FE2	FE3	FE1	FE2	FE3	FE1	FE2	FE3	FE1	FE2	FE3	FE1	FE2	FE3	FE1	FE2	FE3	FE1	FE2	FE3	FE1	FE2	FE3
Resource Dependence:																														
minrent	+***	0	0	+***	+***	+**	+***	+*	0	0	-*	0	+**	0	0	+***	+**	+*	+***	+***	+***	+***	+***	0	+***	+**	0	+**	0	0
spplmin	+***	0	0	0	0	0	+***	+*	+**	0	-*	-*	0	0	0	+***	0	+***	-***	0	+**	0	0	0	0	0	+**	-***	0	0
oilrev	+**	0	+**	-***	0	0	-**	0	0	0	0	-**	-***	0	-***	+***	0	0	-***	0	-***	0	0	0	0	-***	-***	-***	-**	-***
gasrev	+**	0	0	0	+***	+*	0	+*	0	0	0	0	-***	-*	0	+**	0	0	0	0	0	+***	0	0	+***	-*	0	-***	0	0
oilgasrev	+**	0	0	0	+*	0	0	+**	0	0	0	0	-***	-*	0	+***	0	0	-***	0	0	+**	0	+***	+**	-**	0	-***	0	0

FE1 : Fixed Effect Without Other Explanatory Variables
FE2 : Fixed Effect Including Explanatory Variables and Time Dummies
FE3 : Fixed Effect Including Explanatory Variables and Time Dummies Without Outliers Data
+: positive correlation, -: negative correlation, 0: no correlation
*** p<0.01, ** p<0.05, * p<0.1

Source: Own construction using Stata Program

5.4. Potential Transmission Channels

In this section, I scrutinize the indirect effect of natural resource dependence to education and health outcome by estimating the correlation between natural resource dependence and per capita gross regional domestic product (GRDP), poverty rate and institutional quality, represented by the BPK audit opinion.

The first transmission channel that I take into account is per capita GRDP. As I already mentioned in Chapter 3, the abundance of natural resources especially during price boom, can become revenue windfall both for government and household. Those income can be used to improve household or public expenditure on education and health. The increase of the income can be represented by the increase of per capita GRDP. Therefore, it is possible that the education and health outcome getting better because of the improvement on their per capita GRDP from the natural resource.

The second transmission channel that I consider is the inequality. However, due to the lack availability of the inequality data in district level, I choose poverty rate. Natural resources can be a blessing if everyone can benefit from this sector. However, sometimes the income from the natural resources only concentrated in several group. Therefore, not everybody can enjoy the benefit of this low hanging fruit. The poverty rate, in my opinion can capture groups that do not receive favourable benefit from the resource windfall.

The next transmission channel is the impact of natural resource dependence on government institutional quality. Several empirical studies have proved that natural resource dependence is prone to rent seeking, corruption and inefficiency of government spending (Sachs and Warner, 1995; Gylfason, 2001; Mavrotas et al., 2011). The Politician's greed to achieve more from the rent-seeking activities may limit the availability of productive capital for production that endangers economic efficiency and social equity (Gylfason, 2001).

However, in Indonesia there is no reliable data of the corruption proxy in district level; alternatively, I choose the audit opinion given by BPK for the district's annual financial report. This opinion also considers the conformity with government accounting standards, the adequacy of disclosures, the compliance with laws and regulations; and the effectiveness of the internal control system. Therefore, I consider this variable as the best alternative to depict the institutional quality.

Using mining rent variable, we can see that the effect of this resource dependence on per capita GRDP is positive and significant at 1% level. It means that if the mining rent increases by 1 point, then the per capita GRDP will increase by 1,237 points. While for

poverty rate, the correlation is negative and significant at 1% level, meaning that if mining rent increase by 1 point, the poverty rate will decrease by 0,0548 point.

Table 26. Indirect Transmission Channel for Mining Rent Dependence

VARIABLES	(1) GRDP per capita	(2) poverty rate	(3) audit opinion
minrent	1.237***	-0.0548***	0.00305***
	(0.327)	(0.0203)	(0.000946)
Constant	27.88***	14.27***	-0.648***
	(1.400)	(0.0870)	(0.0200)
Observations	4,794	4,790	4,796
R-squared	0.003	0.017	
Number of iddist	436	436	

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

Source: Own construction using Stata Program

Regarding the share of people employed in mining and quarrying sector, the relationship of this variable is negative at significance level 1%. Meaning that the more people working in mining and quarrying sector, the poverty rate will decrease. This result suggest that the mining and quarrying sector provide a better income source to improve household's welfare to move from the poverty zone.

Table 27. Indirect Transmission Channel for Share of People Employed in Mining and Quarrying Sector

VARIABLES	(1) GRDP per capita	(2) poverty rate	(3) audit opinion
spplmin	-156.7	-11.16***	-0.733
	(210.7)	(3.286)	(0.575)
Constant	36.94***	14.03***	-0.724***
	(4.774)	(0.0745)	(0.0258)
Observations	3,794	3,792	3,794
R-squared	0.000	0.006	
Number of iddist	436	436	

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

Source: Own construction using Stata Program

The government revenue dependence from oil does not show significant result to any potential transmission channel. This relationship also happens with other proxies of government revenue dependence from gas and oil and gas. My prediction is due to another potential income source that the district's level has instead of the revenue sharing from oil and gas. In Indonesia, instead of oil and gas revenue sharing, district government also receive some other transfer fund from central government, namely transfers of balancing funds, transfers of special autonomy and adjustment funds. The balancing funds transfer includes revenue sharing from agriculture, forestry, fishery, coal, geothermal, income tax,

and excise. Some district in Indonesia receive revenue sharing from another source which are much higher than that from oil and gas. Take an example is the districts Jakarta the capital of Indonesia; the oil and gas revenue sharing in district level is zero, but they receive a high level of revenue sharing from tax and excise, making those districts able to provide high quality of education and health quality.

Table 28. Indirect Transmission Channel for Government Revenue Dependences from Oil

VARIABLES	(1) GRDP per capita	(2) poverty rate	(3) audit opinion
oilrev	-1.37e-05	-5.47e-09	-1.25e-07
	(1.35e-05)	(2.52e-07)	(7.80e-08)
Constant	32.63***	14.15***	-0.621***
	(0.741)	(0.0138)	(0.0200)
Observations	4,739	4,735	4,739
R-squared	0.000	0.000	
Number of iddist	431	431	

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

Source: Own construction using Stata Program

Table 29. Indirect Transmission Channel for Government Revenue Dependences from Gas

VARIABLES	(1) GRDP per capita	(2) poverty rate	(3) audit opinion
gasrev	1.80e-05	-3.35e-07	-3.01e-08
	(1.20e-05)	(2.66e-07)	(5.89e-08)
Constant	30.80***	14.17***	-0.625***
	(0.718)	(0.0160)	(0.0199)
Observations	4,739	4,735	4,739
R-squared	0.001	0.001	
Number of iddist	431	431	

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

Source: Own construction using Stata Program

Table 30. Indirect Transmission Channel for Government Revenue Dependences from Oil and Gas

VARIABLES	(1) GRDP per capita	(2) poverty rate	(3) audit opinion
oilgasrev	4.20e-06*	-1.44e-07	-4.11e-08
	(2.19e-06)	(1.39e-07)	(3.69e-08)
Constant	31.40***	14.17***	-0.623***
	(0.251)	(0.0160)	(0.0200)
Observations	4,739	4,735	4,739
R-squared	0.000	0.000	
Number of iddist	431	431	

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

Source: Own construction using Stata Program

Beside those transmission channel as above mentioned, I consider there is any possibilities of another channel that a little bit difficult to measure, for example the pollution. The mining activity can increase the pollution level that may affect the health outcome. However, there is no reliable data source of pollution in Indonesian district level.

The next is the possibility of child labor, even though some resource dependence proxies show positive impact on the secondary school enrolment rate, but some resource dependence negatively affect year of schooling. It can be assumed that the children cannot continue their education and leave their school to work in mining activity, since in Indonesia, the traditional mining does not require a high skilled labor. However, it needs more study to prove the level of child labor in the mining area that can be a better suggestion for future study.

CHAPTER 6
CONCLUSION

Whether natural resource has positive or negative effect on social development indicator has been a long-standing debate between economists. Existing studies shows the mixed results with their own justification. I contribute to this topic by examining the effect of natural resource dependence on some health and education outcomes utilizing a large sample of Indonesian district's data from 2007-2017.

The conceptual framework for this study, indicates that there are several transmission channels on how natural resource dependence may affect education and health outcome. First, natural resource may affect household income. Second, it may affect government revenue and spending. Third, it may affect the institutional quality, and last, it may cause pollution that affects human capital accumulation.

My empirical analysis involves five resource dependences proxy, namely: mining rent; share of people employed in mining and quarrying sector; government revenue dependence from oil; government revenue dependence from gas and government revenue dependence from oil and gas. I utilize four independent variables to depict the education outcomes, and four independent variables for health. The education outcomes are monthly per capita household education expenditure, net enrolment ratio of senior secondary school, literacy rate of population age 15 and over and the average of years of schooling in each district. Whereas for the health outcomes are monthly per capita household health expenditure, birth attended by skilled health worker, immunization coverage for children under 5 years old, and life expectancy.

The empirical result indicates that there is positive and significant correlation between the mining rent per capita and the net enrolment ratio of senior secondary school. Also, between mining rent per capita and the health expenditure and the percentage of birth attended by a skilled health worker, the correlation is positive and significant. The model is robust. Even though the result is less robust, the mining rent per capita also has positive correlation with literacy rate, immunization rate and life expectancy (old method).

There is one robust correlation between the share of people employed in mining and quarrying sector and the literacy rate, and it is positive and significant. The government revenue dependences also almost do not have a robust correlation with education and health outcomes, except for negative correlation between oil revenue and life expectancy 2010-2017. Overall, I can conclude that the resource dependence in Indonesia mostly support education and health outcomes.

The possible transmission channel on how natural resource dependence may affect education and health outcomes come from income, inequality and government institutional quality proxy. However, based on the Indonesian condition, there is possibility of other transmission channel that is a little difficult to measure in district level due to the unavailability of the data such as, pollution and child labor. Extension of my study can take those variables into account and scrutinize more on the possibility of other transmission channel mechanisms.

References

Atkinson, G., & Hamilton, K. (2003). Savings, Growth and the Resource Curse Hypothesis. *World Development, 31*(11), 1793-1807.

Auty, R. (1994). Industrial Policy Reform in Six Large Newly Indutrializing Countries: The Resource Curse Thesis. *World Development, 22*(1), 11-26.

Blanco, L., & Grier, R. (2012). Natural Resource Dependence and The Accumulation of Physical and Human Capital in Latin America. *Resources Policy 37*, 281-295.

Cotet, A., & Tsui, K. (2013). Oil, Growth, and Health: What Does the Cross-Country Evidence Really Shows? *The Scandinavian Journal of Economics, Vol 115, No. 4*, 1107-1137.

Cust, J., & Rusli, R. (2014). *The Economic Spillovers from Resource Extraction: a Partial Resource Blessing at the Subnational Level.* DEM Discussion Paper Series, Department of Economics at the University of Luxembourg.

Dietz, S., Neumayer, E., & De Soysa, I. (2007). Corruption, the Resource Curse and Genuine Saving. *Environmental and Development Economics 12*, 33-53.

Dutu, R. (2015). *Making the Most of Natural Resources in Indonesia.* Paris: OECD.

Edwards, R. (2016). Mining Away the Preston Curve. *World Development Vol. 78*, 22-36.

Elovainio, R., & Evans, D. (2013). *Raising and Spending Domestic Money for Health.* London: Centre on Global Health Security Working Group Papers: Working Group FInancing Paper 2.

Emery, J., Ferrer, A., & Green, D. (2012). Long-Term Consequences of Natural Resource Booms for Human Capital Accumulation. *ILR Review 65 (3)*, 708-734.

Fenske, J., & Zurimendi, I. (2017). Oil and Ethnic Inequality in Nigeria. *Journal of Economic Growth*, 397-420.

Gradstein, M., & Ishak, P. (2020). We Don't Need No Education: The Effect of Natural Resource Income Shock on Human Capital. *IZA-Institute of Labor Economics*, 1-31.

Gylfason, T. (2001). Natural Resources, Education, and Economice Development. *European Economic Review 45*, 847-859.

Hilmawan, R., & Clark, J. (2019). AN Investigation of the Resource Curse in Indonesia. *Resources Policy, 64*, 1-17.

International Labour Office. (2004). *Pekerja Anak di Pertambangan Informal di Kutai Barat, Kalimantan Timur: Kajian Cepat.* Jakarta: Kantor Perburuhan Internasional.

Karl, T. L. (2004). Oil-Led Development: Social, Political, and Economic Consequences. *Encyclopedia of Energy, Volume 4*, 661-672.

Kim, D. H., & Lin, S. C. (2016). Human Capital and Natural Resource Dependence. *Structural Change and Economic Dynamics. 40*.

Komarulzaman, A., & Alisjahbana, A. (2006). Testing the Natural Resource Curse Hypothesis in Indonesia: Evidence at the Regional Level. *Working Paper in Economics and Development Studies No. 200602*, 1-17.

Mehlum, H., Moene, K., & Torvik, R. (2006). Institutions and The Resource Curse. *Economic Journal 116 (508)*, 1-20.

Mejia, L. B. (2020). Mining and Human Capital Accumulation: Evidence from the Colombian Gold Rush. *Journal of Development Economics 145*, 1-16.

Murshed, S. M. (2018). *The Resource Curse.* Newcastle: Agenda Publishing.

Papyrakis, E., & Gerlagh, R. (2004). The Resource Curse Hypothesis and Its Transmission Channels. *Journal of Comparative Economics 32*, 181-193.

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

Rosser, A. (2007). Escaping the Resource Curse: The Case of Indonesia. *Journal of Contemporary Asia Vol. 37 No. 1*, 38-58.

Rostow, W. (1959). The Stage of Economic Growth. *The Economic History Review, 12 No. 1*, 1-16.

Sachs, J., & Warner, A. (1995). Natural Resource Abundance and Economic Growth. *National Bureu of Economic Research*, 1-47.

Savioa, A., & Sen, K. (2020). *The Political Economy of the 'Resource Curse'.* Helsinki: United Nations University UNU-WIDER.

Sohidin. (2018). Faktor Demografi yang Mempengaruhi Pekerja Anak di Provinsi Kepulauan Bangka Belitung Tahun 2018. *Jurnal Penelitian Kesejahteraan Sosial, 19(1)*, 45-52.

Statistics Indonesia. (2014). *Indeks Pembangunan Manusia Metode Baru.* Jakarta: Badan Pusat Statistik.

Stephens, C., & Ahern, M. (2001). *Worker and Community Health Impacts Related to Mining Operations Internationally.* London: the International Institute of Environment and Development (IIED).

Stijns, J.-P. (2006). Natural Resource Abundance and Human Capital Accumulation. *World Development Vol. 34, No. 6*, 1060-1083.

Von der Goltz, J., & Barnwal, P. (2019). Mines: The Local Wealth and Health Effects of Mineral Mining in Developing Countries. *Journal of Development Economics 139*, 1-16.

Wadho, W. A. (2014). Education, Rent Seeking and The Curse of Natural Resources. *Economics & Politics Volume 26*, 128-156.

Zabsorne, A., Agbo, M., & Some, J. (2018). Gold Exploitation and Socioeconomic Outcomes: The Case of Burkina Faso. *World Development 109*, 206-221.

https://www.esdm.go.id/id/media-center/arsip-berita/kilas-balik-sejarah-pertambangan-dan-energi-di-indonesia 20 June 2021

https://jubi.co.id/pertambangan-di-indonesia-dari-masa-voc-sampai-orde-baru-freeport/ 20 June 2021

https://www.kompas.com/skola/read/2021/01/31/170917169/daftar-barang-tambang-di-seluruh-provinsi-di-indonesia-dan-kegunaannya 20 June 2021