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Mining, Local Governments and Access to Water in Peru

An empirical assessment of the mining industry's impact on district level access to water and the local governments' investment prioritization

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Abstract

This study identifies a negative impact of mining on access to the public water system in Peru using district data from 2011 and a similar methodology as Loayza, Mier y Teran and Rigolini (2013). One potential explanation for this result can be found by assessing the effects of mining on the investment prioritization of local governments; responsible for providing basic services in Peru. A quantitative assessment of public investment data on a district level indicates that mining districts tend to have a lower propensity to invest in water and sanitation and a higher propensity to invest in infrastructure; a pattern which corresponds to the incentive scheme of the mining industry. By studying the potential indirect and direct channels of influence that the industry has over local governments, the study concludes that the presence of mining is affecting local governments to invest in areas which benefit the mining industry on the expense of adequate service delivery for its citizens.

Key words: Mining, local governments, access to water, social conflicts, environmental impact of mining, water supply, Peru, political economy, canon minero, public investment, development

Content

1. Introduction

The growth of mineral export has been recognized as the motor behind the last decades' economic success in Peru (The Economist, 2012). Research on the impact of mining on local development in the country has identified a number of positive impacts on socioeconomic conditions on a local level (Macroconsult, 2012). Despite these positive effects, the mining development has been accompanied by social unrest and protests (Defensoria del Pueblo, 2012). Many of these conflicts concern the environmental concerns of mining. Among them, the access to and the quality of water supply are of key importance (The World Bank, 2005). Do the population have reasons for their concerns? To answer this question, I looked at the average percentage of households with access to the public water system on a districts level using public data from 2011 and compared mining and non-mining districts[1] and found that the population of districts hosting mining production had, on average, close to 5 % lower access to water. When looking at water access in 1993, before the mining boom, there seem to be no difference between the two groups. In this study, I quantitatively assess the impact of mining in Peru on a district level using a methodology found in Loayza, Mier y Teran and Rigolini (2013) and my findings provides support for my initial observations. When controlling for district specific characteristics, mining seems to have a negative impact on the access to water in Peru. What could explain this effect?

The mining industry demands large amounts of water in production and, unfortunately for Peru; water, although abundant, is unequally distributed and tends to be scarce in the areas where mining in located (Olson in Giugale, et al, 2007:409). In fact, the scarcity of water has become one of the main concerns for the future expansion of the mining industry (Wiertz, 2008). There are, in consequence, clear incentives for the mining industry to gain control over local water resources.

[1] I define mining districts as district which hosted a large scale mine during the years 2006-2010 (MEM)

But the mining industry is not responsible for providing water for the population; the local governments, however, are. The following question arises; is the presence of mining affecting the investment prioritizations of local governments? Besides water, I identified infrastructure as investment areas where the mining industry has strong interests. The need to expand and improve the road system has been pinpointed as one of the main concerns for further development of the mining industry in Peru (KPMG, 2013). I therefore focus on public investments in water and sanitation (the expansion and maintenance of public water system) and infrastructure (expansion and maintenance of roads) respectively when assessing the impact of mining on local governments' investment prioritization.

This study proposes that, to understand the negative effect mining seems to have on access to water on a district level, the role of the local governments must be taken into account. Previous attempts at assessing the impact of mining has mostly ignored the role of the public sector. The main contribution of this paper is therefore twofold. By analyzing the potential channels through which the mining industry could influence the investment behavior of local governments, I identify direct and indirect effects of mining which could potentially affect the local governments' priorities. Secondly, as part of the quantitative assessment, I use local government investment data to assess the impact of mining on the propensity of local governments to invest in water and sanitation and infrastructure respectively. In line with expectations, I find that mining tends to have a negative effect on the propensity to invest in water and sanitation during the years preceding 2011. In addition, the influence of mining on the propensity to invest in infrastructure is positive, suggesting a shift, due to the presence of mining, in local governments' prioritization towards areas which could potentially benefit the mining industry. These results could provide an explanation to why districts hosting mining tend to have a lower access to water.

The framework of the study is presented in chapter 2; the methodology of the empirical analysis is presented in chapter 3; finally, the results and conclusions are presented in chapter 4 and 5.

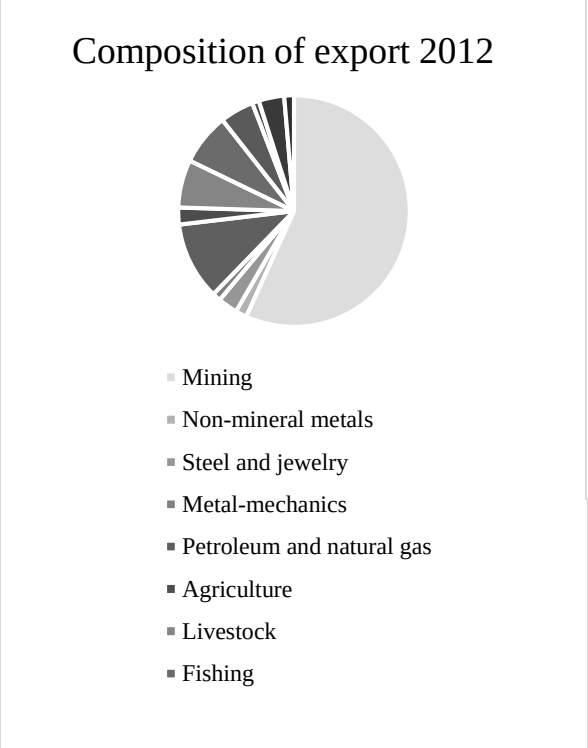
2. Mining in Peru

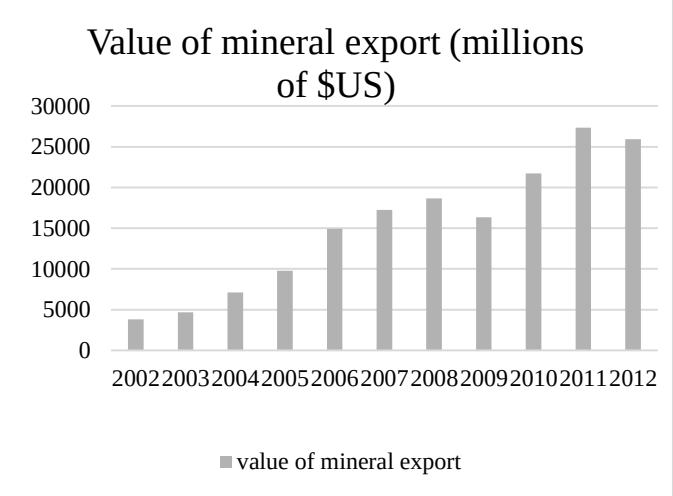
The following part of the study will provide the reader with necessary information about the development of mining in Peru. I begin with an overview over the growth of mining, its relation to water access and the importance of the local governments. Subsequently, I go into more detail about the demand for water in mining production, the current water situation in Peru and the tension that mining has created in the local communities. I provide a literature overview of the impact of mining and finally analyze the political economy of mining on a local level in Peru. The main purpose is to understand the incentive scheme of the mining industry and to explore the channels through which the mining industry could impact water coverage on a local level in Peru focusing on the role of the local governments' investment prioritization.

2.1. Mining, Local Governments and Water – Scope of study

Peru has during the two last decades experiences a mining boom which has increased the importance of the mining industry in the overall Peruvian economy. The mining and refinery industry has gone from representing under 5 % of the total GDP in 1994 to making up 14.4 % of total GDP in 2007 and more than 28.1 % of GDP when excluding Lima (Macroconsult, 2012:7). The mining industry has continued to grow and by 2012, the export of minerals made up over 56 % of total exports (MEM, 2013). Peru is today a top world producer of silver, copper, zinc tin, lead and gold (Pwc, 2012). The growth of export of mining products is illustrated in the diagram below and the importance of mining is illustrated in the circle diagram with the composition of export sector in Peru

Diagram 1 and 2

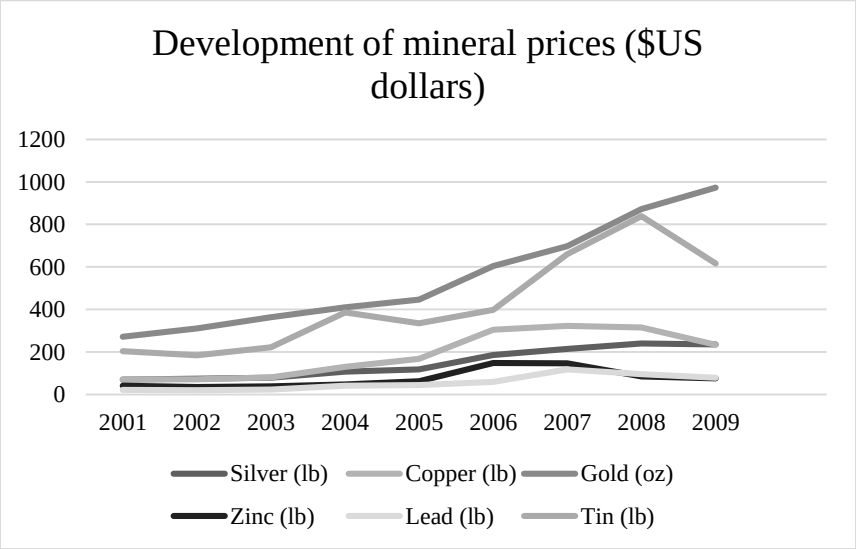




Source: MEM (2013)

The growth of the mineral export in Peru has been pinpointed as the motor behind the economic boom in Peru during the last decade (The Economist, 2012). There are two main forces behind the mining development in Peru. The liberalization policies, backed by the World Bank, implemented during the nineties which resulted in the privatization of the mining sector and opened up the market for foreign investments (De Echeve, 2009:291-292). The second force is the favorable development of mineral prices during the last two decades which has made it profitable to exploit mining areas which were previously unfeasible and which has created profits on the market facilitating expansion of the industry (Macroconsult, 2012). The development of mineral prices is illustrated in diagram 3.

Diagram 3



Source: MEM (2009), MEM(2010)

The Peruvian government and the World Bank believed in the potential of the mining industry as a positive force towards development in the country. Quantitative studies assessing the impact of mining on a local level in Peru have indeed identified a number of positive effects; for example an increase in household consumption, a decreased level of poverty on an increased literacy rate (Loayza, et al, 2013; Macroconsult, 2012). Despite these positive results, the mining boom has been accompanied by an increase in social conflicts related to the expansion of mining in the country (La Defensoria del Pueblo, 2012). Many of these conflicts are related to environmental concerns due to the effects of mining expressed by the local population. Access to and the quality of water supply are the main focus of these concerns (The World Bank, 2005).

By comparing the percentage of households with access to the public water system on a district level in Peru between mining districts and non-mining districts in 2011, I found support for the concerns of the local communities. Districts which hosted producing mines between the years 2006-2010 have on average 5 % lower access to water than the non-mining districts. This is a peculiar result worth exploring since mining districts have lower levels of poverty; which has a significantly negative effect on water access (as shown in my results as well as others), and the local government of mining districts have substantially larger budgets and hence more fiscally apt

to meet the demands of their citizens. In addition, it seems as though, the difference did not exist before the mining boom, in 1993. The simple comparison is displayed in table 1.

Table 1. Average poverty, budget size, access to water in 1993 and 2011 in non-mining and mining districts

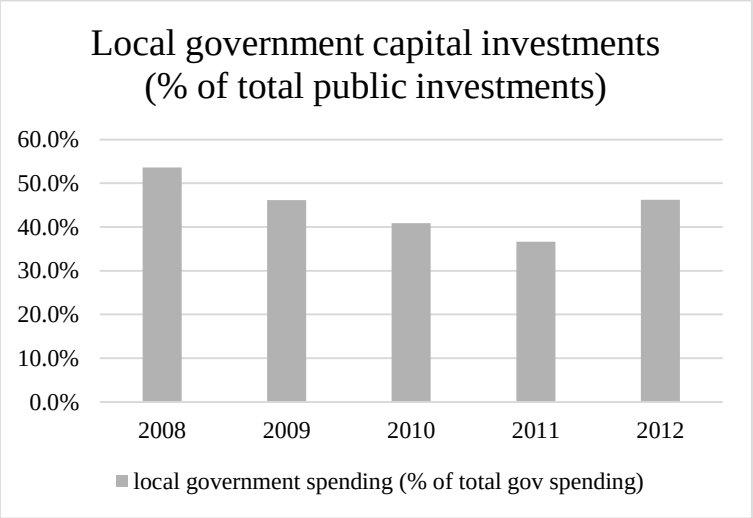
	Poverty 2011	Average annual budget 2008-2011	Average access to water 1993	Average access to water 2011
Non-mining districts	47.1%	10,062,860	20.3%	51.1%
Mining districts	32.7%	22,792,521	20.2%	46.7%
Total average	46.1%	10,912,525	20.3%	50.8%

Source: INEI, Own elaboration

To statistically assess these findings, I carried out a quantitative analysis of the determinants of water access on a district level in Peru and found that mining indeed has statistically significant negative impact on access to water when controlling for district specific characteristics. Methodology and results of this analysis are presented in chapter 3 and 4.

The local governments have the main responsibility for providing drinking water to the local population and play a crucial role in the connection between the mining industry and its impact on society. Since 2002, the local governments' role in development in Peru has gained importance due to decentralization policies (Serrano; Acosta, 2011). Peru is a unitary country with three tiers of government (central, regional and local). The local level includes 1838 districts and 194 provinces. In this study, however, when I discuss local governments, I am referring to district level governmental entities and provincial capitals (which are also districts). I only include the provinces in the discussion about "administrative distance" to the mines when looking at spillover effects of mining onto neighboring districts. The regional level includes the departments. Throughout this study I will refer to local and regional governments when addressing the governmental entities of districts and departments and refer to districts, provinces and departments when addressing the geographic areas they make out.

Diagram 4



Source: MEF - SIAF/SP

As of 2012, 16.5% of public spending was located at the local governmental level and 15.4% on a regional level (Serrano; Acosta, 2011). These numbers imply that Peru's spending is relatively decentralized when it comes to public spending, even compared to some of Europe's relatively decentralized countries (Rosales, 2012:43). In addition, around 40% of all public investments are carried out on a local level (see diagram 4). The increased importance of local government in public investment is related to the growth of the *canon minero*. The *canon minero* is the public income, generated from the corporate tax paid by mining companies, transferred from the central to the regional and local governments where the mines are located. Due to the growth of the mining production in the country the *canon minero* is today one of the main sources of income in mining regions. I will return to the *canon minero*, but worth mentioning is that mining, due to the *canon*, does not only have a direct effect on society, but also an indirect effect through the fiscal transfer system. An effect important to account for when assessing the impact of mining.

Basically, this study proposes therefore that if mining has an impact on access to water it must occur through its interaction with local governments. In consequence, I explore the potential channels of influence by assessing the political economy of mining on a local level in Peru and, in addition, I quantitatively assess the impact of mining on the investment behavior of local governments during the years preceding 2011, which is my base year. My findings suggest that mining has a negative effect on the propensity to invest in water and sanitation. Instead, mining

districts tend to have a higher propensity to invest in infrastructure, an investment area promoted by the mining industry.

Before jumping to conclusions, however, the section below provides key information to understand the forces at work in the interaction between mining, local communities and local governments. The demand of water in mining production is an important component to understand the incentive scheme of the mining industry. The overall importance of the water issue in Peru is highlighted in the section on the social conflicts related to mining which helps understand the context of the issue at hand. Previous findings on the impact of mining is discussed in the third part and finally, the political economy of mining in local governments explores the forces at work in public decision making on a local level to understand what governs investment behavior of local governments in relation to mining.

2.2. Water and Mining

Mining is a water intensive industry and mineral deposits tend to be located in areas where water is scarce (Budds; Hinojosa, 2012). Water has historically been considered a never-ending common good. However, due to the growing scarcity of water supply it is considered one of the major challenges for further expansion of the mining industry (Wiertz, 2008). Even though Peru has the highest per capita availability of renewable freshwater in Latin America, the resources are unequally distributed in the country (Olson in Giugale, et al, 2007:409). Two thirds of the population live on the dry side of the Andean ridge, where only 2 % of the water resources are found (Bebbington; Williams, 2008). In the mountain area, where most of the mining is located, the freshwater availability is 48 % of the national average of 77,600 cubic meters per person per year (Olson in Giugale, et al, 2007:409). In addition to the scarcity of water supply in the most populated parts of the country, the country is also suffering the consequences of climate change with melting glaciers which is endangering the already scarce supply. For these reasons, Peru is considered South America's most water stressed country (Bebbington; Williams, 2008).

Agriculture consume about 80 % of the total water consumption and the mining industry accounts for about 5 % of the total water use in the country. However, mines do not, as some farmers do, have to pay for the water they use (The Economist, 2005). According to Scurrah (2008), the impact of mining on water is serious both in terms of quality and quantity, especially

in areas where water shortage is critical and where mines are located in connection to the main drainage basins for water collection. Population living in mining areas have observed that river flows have diminished resulting in a lower turnaround in agricultural production. In addition, health studies on children in mining areas found high levels of contamination both in areas directly affected as well as neighboring areas. In consequence, the impact of mining on water supply seems to go beyond the 5 % of total water usage as an industry by also affecting downstream water availability as well as the quality of water supply (Bebbington; Williams, 2008).

2.3. Mining and Social Conflicts

Social conflicts have arisen opposing the expansion and operation of mining. At the core of many of these conflicts is the concern regarding water quality and water access. As noted by the World Bank (2005:105), the majority of social conflicts in Peru regards the environmental concern of mining's effects on the usage of natural resources and health. These concerns are not new. In the city of Llo, the civil society managed to take their case against the Southern Copper Corporation to the International Water Tribunal in The Hague in 1992 (Scurrah, 2008). However, with the growth of mining activities in the country, the amount of social conflicts have increased with 300% during the last five years (The Economist, 2012). The Peruvian Ombudsman reports 149 social disputes involving extractive industries and the action taken by the state to mitigate these conflicts have failed (Defensoria del Pueblo, 2012; De Echave, et al, 2009).

The social conflicts, which left 2312 wounded and caused 195 dead between 2001-2006 (Defensoria del pueblo, 2012), involved the mining companies, the governments (national, regional and local) and discontent local communities (Thomson, 2013). In a study on the impact of the largest gold mine in Peru, Yanacocha, the population in the surrounding areas expressed discontent for feeling excluded from economic opportunities and benefits generated from the mining: "More people came to the city, but public services did not improve – all that has added up to a huge sense of resentment" (Kemp, et al, 2012). Research indicates, in addition, that the reasons behind this development is not only related to the expansion of mining but also caused by the design of decentralization policies (Arellano-Yanguas, 2011). Other studies highlight the importance to include local government capacity and management when understanding the causes of social conflicts (Wilson, 2012). To understand the impact of mining it seems therefore crucial

to study the relation between local governments, communities and mining companies and analyze the policies and practices that govern these relations. Before turning to the political economy of mining on a local level in Peru; an overview of the global discussion on the potential effects of mining as well as previous studies assessing the effects of mining on a district level in Peru is presented below.

2.4. The Effects of Mining – a literature overview

The international discourse on the relationship between development and mining is highly divided and politically charged. Financial institutions and international organizations, such as the World Bank and the IMF, plus most governments represent the supporters of the idea that extractive industries offer an opportunity for development countries to reduce poverty (The World Bank, 2005). A more skeptical outlook on the potential of exploitation of natural resources for development in developing countries is a stream within literature usually referred to as "the curse of natural resources" or "the paradox of plenty" and is mainly represented by academics (for example, Auty, 1993, 2001; Sachs, Warner, 1995;) and NGOs.

The arguments in support of mining follow the liberal discourse of the benefit of foreign direct investments which bring capital and technology to the country generating spillover effects. It argues that backward linkages, such as the increased purchasing power of workers in the mines increases demand for local products generating growth. The resources generated by the central government, if managed correctly, also offers an opportunity to improve education, health and infrastructure through investments, decreasing poverty and benefitting the entire economy (The World Bank, 2002:3).

"The curse of natural recourses" was originally related to the economic concept of the Dutch Disease hypothesis, which states that sudden income increase caused by the discovery of natural resources can reduce income due to an appreciation of the exchange rate. A later stream of theories, however, pointed to the political effects of the exploitation of natural resources in a context of weak institutions and poverty, leading to higher risks of political and social conflicts, corruption and even civil war (Brollo, et al, 2009).

So what effect has mining had in the case of Peru? A number of quantitative studies have assessed this relationship with varying results. Most of these studies follow the liberal discourse

by focusing on potential backward linkages and spillover effects due to mining. Few of them have discussed or included the role of the public institutions. Loayza, et al (2013), look at the impact of mining on a number of socioeconomic indicators on a district level using data from 2007. Their results suggest that mining has increased household consumption, decreased extreme poverty and improved literacy rates. However, mining industry has also increased economic inequality in the producing districts and their surroundings. Zegarra, et al (2006), Arágon and Rud (2009) and Macroconsult (2012) also identified a positive impact on real income and poverty reduction. However, some of the studies indicate that the positive result depends on a number of circumstantial factors. Ticci (2011) found that the effect on income depends on household level traits. She argues that the establishment of a mining industry in a community leads to a "de-agrarization" and that the rural population actually is negatively affected. A similar result of the displacement of the agrarian industry is identified by Zegarra, et al (2006). These results, however, are not confirmed in the study made by Macroconsult (2012) with data from 2010. He finds that the urban households tend to benefit more from mining but that there is no negative impact on the agricultural industry as a consequence of mining. Macroconsult also found a positive effect for health, education and human development. The only study I could find which could not identify any effects on socioeconomic indicators was Arellano-Yanguas (2010) by using department panel data for the years 2002-2008. Interestingly, this is the only study integrating both the direct effect of mining and the indirect effect it has on local government through the *canon minero* simultaneously.

When it comes to the effect of mining on access to water and sanitation on a district level, the results are more ambiguous. Loayza, et al (2013), using data from 2007 and Macroconsult (2012) using data from 2010 could not establish any relation between mining and access to water. Ticci (2011) using data from 2007 and Zegarra, et al (2006) using data from 2005 found a negative effect of mining on water access for the rural population. Del Pozo, et al (2012) looked at the impact of the *canon minero*, on the access to water and also found a negative effect for the rural population using 2011 data, they did not however account for the direct effect of mining.

Del Pozo, et al (2012) believe that the result could be a consequence of an increased competition for water resources in districts where the mining industry is active. Ticci (2011) and Zegarra, et al (2006) argued instead that the result could be related to central state prioritization in distributing means to invest in water coverage. The central state might assume that the income

generated from the mining industry are sufficient for providing basic services for its population and therefore choose not to invest more in these communities. The latter theory is not plausible, however, since local governments are responsible for providing water and sanitation services and that the inter-governmental transfer systems are pre-determined. Tax revenues are not arbitrarily distributed according to where the central state believes they are needed.

Surprisingly, only one of the studies that I have come across mentions the possibility that the reason behind the result may be due to the effect that mining presence has on the investment prioritization of local governments. Arellano-Yanguas (2010) assesses the budgetary procedure of local governmental spending of the *canon minero* and finds that the system incentivizes local governments to prioritize simpler, short-term investments, which may lead to less water and sanitation investments in *canon*-rich districts since they tend to be technically cumbersome and expensive. He does not go into the possibility that the effect may be due to the influence of the mining industry and he does not control for the presence of mining when looking at the effect of the *canon*. I will return to his findings in the next section.

An important part of "the curse of natural resources" is the theory that mining can have potentially negative effects when established in a context with weak public institutions. To understand the effects of mining it is therefore important to include the local governments to the analysis. This study intends to contribute to the research on the effects of mining by turning to the local governments and assess how their investment behavior is affected by mining. To be able to understand how mining may affect local government behavior it is important to include a discussion about the forces that govern local government decision making in Peru. The next section therefore assesses the political economy of mining on a local level in Peru.

2.5. Political Economy of Mining – direct and indirect effects of mining on local governments' investment prioritization

To understand the impact of mining on society it is necessary to include the role of the public sector, especially the local governments. This is recognized by the literature focused on understanding the underlying reasons behind social unrest connected to the mining industry (Arellano-Yanguas, 2011; Wilson, 2012; De Echave, et al, 2009). This study looks closer at the impact of mining on local governments' investments behavior to try to explain its effect on water access. But what are the forces governing public decision making on a local level in Peru? To answer that question, this section explores the subordination of the state in relation to the mining industry and the design and effects of the decentralization policies that have shaped the role of local governments in modern Peru. The purpose is to identify the direct and indirect effects that mining can have on local decision making and develop a framework that will be useful when discussing the results of the quantitative analysis in the second part of the study.

The economic liberalization policies, backed by the World Bank, that were implemented during the nineties under the presidency of Alberto Fujimori enforced the already strong influence of the private sector over the state (De Echeve, 2009:292-296). De-regularization, privatization and tax cuts were adapted to attract foreign investments, especially in mining. The reforms, in combination with favorable development of world prices, have been successful in the sense that mineral export has expanded. However, low tax rates and limited restrictions have been sustained even after mineral prices sky rocketed and profits grew (Wilson, 2012). The weakness of the state in relation to the mining industry is clear when looking at the last decade's mining regulations in Peru which has been consistently responsive to the mining industry's interests (Arellano-Yanguas, 2010:22;66).

As discussed above, the mining activities have provoked public discontent in Peru. To tackle these issues, mining companies and international institutions have promoted the need of decentralization to enhance local development and participation and, in addition, Corporate Social Responsibility (CRS) as a strategy to mitigate the risk of conflict (Arellano-Yanguas, 2010:14). Peru has embraced this local development approach by implementing a revenue-sharing transfer

system called the *canon minero* and by promoting the participation of mining companies in the local decision making through the Mining Programme of Solidarity with the People (MPSP).

2.5.1. Indirect effects of mining – the *canon minero*

In 2002, the government embarked on a decentralization reform process mainly entailing the transfer of responsibilities and fiscal resources to local and regional governments. Since then, 50% of the taxes collected from the mining companies has been transferred to the subnational governments (Wilson, 2012). The design of the transfer system is summarized in the table below. Distribution is primarily favoring the areas where the mines are located and the surrounding areas. The main purpose behind the distribution design was, hence, to mitigate social unrest by promoting fiscal participation (Arellano-Yanguas, 2010:18). However, the *canon minero* has also, in consequence, substantially increased horizontal inequality between local governments.

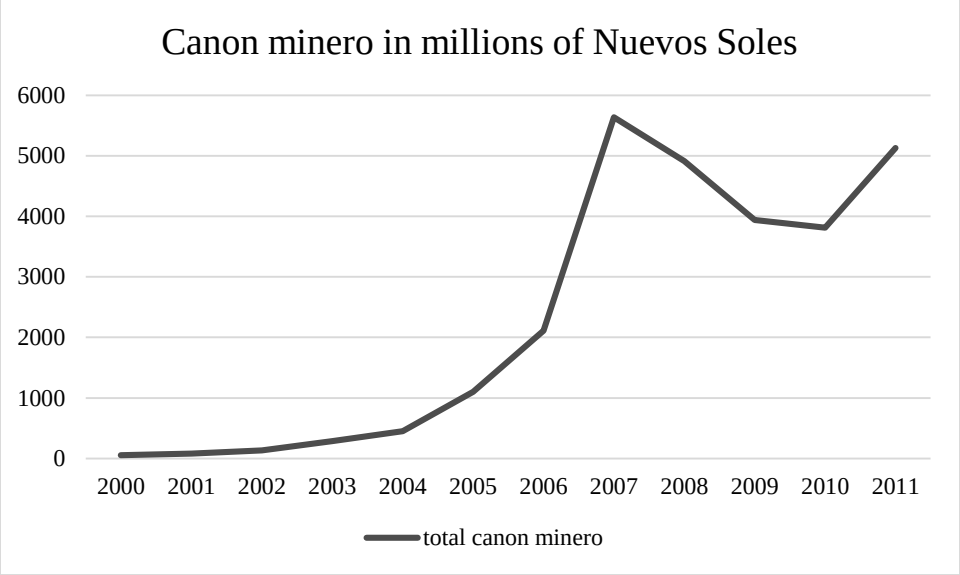
Table 2 – Distribution scheme of the canon minero

	Canon Minero (50% of corporate income tax paid by the mining companies)
To the local governments of mining district	10%
To local governments of non-mining districts within a mining province	25%
To local governments of non-mining districts within a mining department	40%
To regional governments in mining departments	20%
To universities in a mining department	5%

Source: MEF

The *canon minero* is earmarked for capital investments and is supposed of be used for investments in infrastructure, water and electricity. As a consequence of the mining boom, previously poor municipalities are now receiving millions of dollars in tax-revenues. The growth of the *canon minero* is illustrated below.

Diagram 5



Source: Macroconsult (2012)

Problems have arisen in relation to the management and execution of the *canon minero*. The funds are not being executed properly and findings indicate that they are also being spent inadequately. Less than 50% of the *canon* was executed in 2011. Lack of administrative capacity and intergovernmental coordination have been pinpointed as potential reasons behind the local governments' low execution rates (Loayza, et al, 2012). In addition, studies indicate that the revenues may lead to increased corruption of public functionaries (Maldonado, 2011). Wilson (2012) argues that the inability of subnational governments to use the *canon minero* to promote local development fuels the anti-mining sentiments of the population. This is also supported by quantitative assessment by Arellano-Yanguas (2011).

The inability to efficiently use the resources stemming from the mining industry cannot explain why mining districts have a lower access to water than the non-mining districts. A negative relation could only be explain by either the competition argument presented by Del Pozo, et al (2012); that the lack of water supply due to mining is causing limiting the local government's ability to expand the public water system; or that the local governments prioritize investments in other areas than water and that this somehow is related to the presence of mining. In the following

part, we are going to explore this last theory. What governs local governments' decision making regime?

Arellano-Yanguas (2010:170) turns away from the lack-of-capacity argument related to local spending of the *canon minero*. He argues instead that the resources are being poorly spent due to the structure of the budgetary system in Peru. This is supported by Von Hesse (2011) who observes that the *canon* is being spent without considering the immediate needs of the local population. Local government execution of capital budgets is connected to rather cumbersome administrative procedures. In addition, due to the rapid growth of the *canon*, it has been difficult for the local government to foresee how large their capital budget is going to be, making planning difficult. Since total execution rates of budgets, regardless of the quality of projects carried out, is a measurement of government capacity in Peru, this has incentivized local governments to prioritize short term; "easy" and "visible" projects. Since investments in water and sanitation have a greater technical sophistication and take a longer time to implement, these projects have been neglected in local governments receiving a large percentage of their budgets from the *canon minero*. Arellano-Yanguas (2010:181) finds support for this argument by looking at the correlation between the *canon minero* and sector specific investments. Although, in his assessment he did not account for the potential direct effect of mining on investment prioritization.

In addition to affecting the governments receiving the *canon minero*, the potential chance of receiving revenues from the *canon* in the future may affect local governments' behavior as they try to attract mining companies to come to their territory. Water resources can function as leverage in negotiation with prospect mining companies (Arellano-Yanguas, 2011:137). Even though this is not implied by Arellano-Yanguas, the leverage gained by having access to water resources could arguably attribute to why local government choose not to exploit these water resources by investing in expanding the public water system for the population. This could affect non-mining districts with proximity to mines, where the potential for mining is higher. Neighboring districts hoping to attract mining may also choose to invest in infrastructure rather than water, for the same reason.

The effect of the *canon minero* on access to water and investment prioritization of local governments can be captured by including the dependence on the *canon minero* (the percentage of the total budget made up by canon transfers). According to the discussion above, the effect may either be a no-effect due to the lack of capacity of local governments to use the resources stemming

from the *canon* or a negative effect on the propensity to invest in water and sanitation due to the complexity of these projects. In addition, my observations suggest that the effect of the *canon* may expand to the neighboring districts in mining areas whose investment behavior is affected by the incentives to attract mining companies to their territory to gain access to the *canon* revenues. Although, in that case, the effect is not captured in the canon variable, but rather in the variable related to administrative proximity to mining districts.

2.5.2. Direct effects of mining – the participation of mining companies in local development

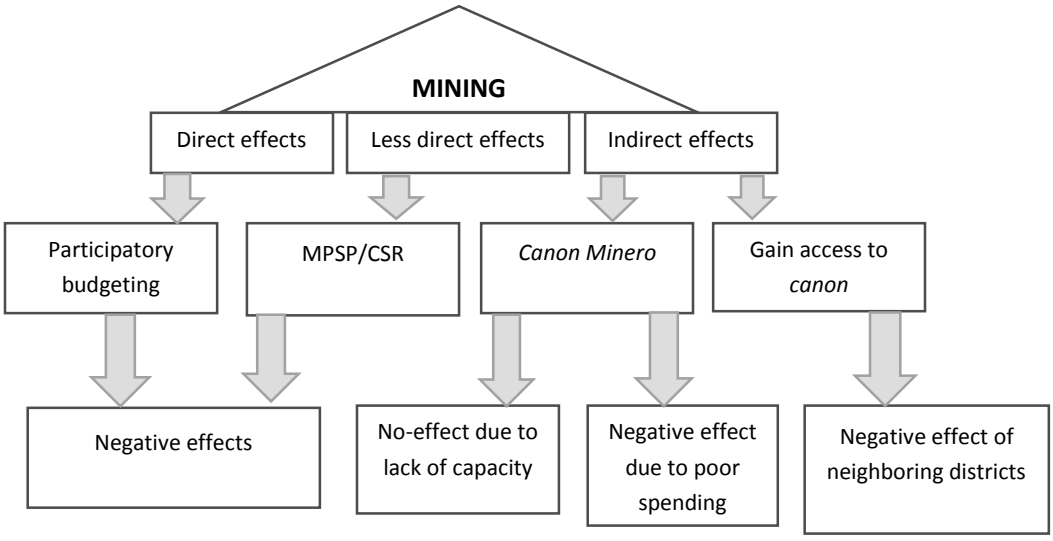
In addition to the indirect effect of mining through the *canon minero* on investment behavior, there is evidence supporting that there is a direct effect due to the presence of mining. As mentioned, the second trait of the decentralization process in Peru is related to participation. Participatory budgeting became mandatory in 2002 and one of the objectives of this reform was to "promote non-state investments through the involvement of the private sector in the budgetary process" (Arellano-Yanguas, 2010:177). Public investment projects are approved by coordinating councils and potential participants register to take part of this process through both public and private meetings with local officials. This makes the understanding of the forces at work in public investment procedures a rather complex endeavor. Field work would be needed to fully understand the importance of these channels for influencing local functionaries. However, due to the weak position of the state in Peru it is probable to assume that it may be rather easy to influence the decision making process on a local level in Peru. For example, observations such as the fact that consultants hired to propose development plans for districts often are selected by mining companies and that mining companies relatively easy can buy political support on a local level in Peru support this notion (Arellano-Yanguas, 2010:177; Arellano-Yanguas, 2011).

The mining companies also engage in local development in a direct way through the MPSP, mentioned above. As a rather criticized response to the social pressure to introduce a windfall tax on mining, the Peruvian president at the time Alan Garcia, came to an agreement with the mining companies. They would avoid paying the tax if they agreed to contribute parts of their profits, on a voluntary basis, in social development projects in the local communities surrounding the mines. The initiative clearly illustrates the weakness of the state in relation to the mining industry. The

idea was that the MPSP would encourage the mining companies to become active participants in the local decision making and "give back" to society. In consequence, the mining companies can set their own agenda and the projects, which tend to be carried out by external NGOs or consultants, are mostly short sighted and more or less coordinated with local demands (Lemieux, 2010). Based on this, it is not clear how the participation of mining in local development could affect the decision making process of local governments. It is possible that the application of the mining industry's social agenda developed by a top-down approach (using external actors) may affect the local governments own political agenda (Lemieux, 2010). Observations on mining companies' engagement in community development projects in Peru also suggest that the co-participation of state and mining in social programs is common but that the level of cooperation depends on the attitude the local governments have towards the mining industry (Echavarria; Gonzalez, 2003).

Since water tend to be scarce in areas where the mining industry is active, it is probable that mining companies themselves will not prioritize projects in water and sanitation for the population through the MPSP and other CSR initiatives. In addition, the mining industry may use formal channels to participate in the budget planning in an attempt to push the local governments to invest less in water and more in areas which would benefit the industry, such as infrastructure. Finally, the local governments themselves have incentives to meet the demands of the mining industry to maintain or gain future access to the substantial revenues received through the *canon minero*. The budgetary procedure of the *canon minero* may also push the governments to prioritize short term projects instead of the more demanding and long term water and sanitation investments. In sum, mining may affect local decision making through various indirect, semi-direct and direct channels. The simplified figure below illustrates the channels of influence discussed in this section. I refer to these channels when discussing the results.

Figure 1 – Channels through which mining potentially affects local government investment prioritization in relation to propensity to invest in water



3. Methodology and Data

In the following part, I will describe the methodology used to quantitatively assess the impact of mining on access to water on a district level and on the local governments' investment behavior. I am using two models, an OLS for the cross-sectional dataset with the percentage of households in each district with access to the public water system as a dependent variable; and a probit model using the propensity to invest in water and sanitation and infrastructure respectively as a dependent variable. Before going into more detail about the models, I will discuss the data used in the study. In the final part of this section, I will also motivate briefly the inclusion of control variables.

3.1. Data

The data used in the study is composed of public data. The main data is from 2011, which is the base year of the study. The socioeconomic variables are from the Peruvian household survey (ENAHO, 2011), administrated by the Peruvian Statistical Institute (INEI). The data is not complete since observations are missing for a number of districts. But since observations are

omitted at random, I do not believe this will affect the overall result. The pre mining boom water coverage variable is from the 1993 population census (INEI). The mining data is collected from the Ministry of Energy and Mines' (MEM) annual reports and includes the location and size of mining production. Mining data consists of silver, gold, lead, tin, iron, zinc, copper, tungsten and molybdenum mines. The mineral production is divided into large scale and small scale mines. Data includes the total monthly production in different weight units for each mineral. In this study, I did not take into account the number of mines nor the total size of production in each district and focused solely on the presence of mining within a district. I excluded the small scale and artisanal mining using MEM's definitions.

Data on public investments originate from the Ministry of Finance and Economy (MEF) and contains over 76000 local government investments. The data is administered by the national system of public investments (SNIP). The investments are categorized by SNIP in the following areas: education, water and sanitation, commerce and industry, infrastructure, energy, labor, housing and urban development, health, communication, administration and planning, agriculture and environment, defense and security. I will use their categorization as I analyze investment behavior. They were carried out between 2005 and 2013. However, I will only use the investments preceding my base year, which is 2011. Of particular interest are the investments in water and sanitation and infrastructure. The investments in water and sanitation include primarily expansions of the public water system and improvements of the existing system. Investments in infrastructure include all investments related to the expansion and improvements of roads. Only 13 of Peru's 25 departments are included in the data. Fortunately, though, these 13 departments cover most of the mining producing areas.

The socioeconomic variables and the public investment data were passed on to me by the team at Public Sector Development in Latin America and the Caribbean at the World Bank. I express my gratitude to them for kindly allowing me to use the data. With the help of these data, the following variables were constructed:

Table 3 - List of variables

Variables	**Units**	**Explanations**
Dependent variables		
Access to public water, 2011	Percentage	Households connected to the public water system, ENAHO*
Propensity to invest in water and sanitation	Dummy variable	1 if investment in w&s, 0 otherwise for public investments, using district level capital investments, 2005-2011
Propensity to invest in infrastructure	Dummy variable	1 if investment in infrastructure, 0 otherwise, 2005-2011
Control variables		
Population, 2011	Sum in logs	ENAHO*
Poverty, 2011	Percentage	Share of population in poverty, ENAHO*
Rural population, 2011	Percentage	ENAHO*
Inequality, 2009	Gini (0-1)	
Access to water and sanitation, 1993 (before the mining boom)	Percentage	Households connected to the public water system
Size of budget, 2008-2011	Sum in logs	Average size of PIM (before execution)
Dependence on income from the Canon, 2011	Percentage	District income originating from mining tax as a percentage of total budget (PIM)
Number of public employees, 2011	Sum in logs	
Local government capital budget execution rate (government efficiency), 2008-2010	Percentage	Share of capital budget executed, average 2008-2010
Provincial capital dummy	Dummy	1 if district is capital in province, 0 otherwise

* ENAHO from 2011 is a census done on a household level. Given that the sample of households is representative on a district level it is possible to estimate the total amount of each variable on a district, province and department level. In this study we assume the samples from each district are representative to make it possible to generalize the result

to a district level. It is important however to keep in mind that the data coming from the ENAHO, 2011 census are estimation and not exact figures.

3.2. Methodology

To assess the impact of mining on access to water and local government investment behavior, I use two different approaches. In the first model, the percentage of households with access to the public water system on a district level is the dependent variable and an OLS approach is applied. In the second model, I use a probit approach since the dependent variable is a binary variable indicating the propensity to invest in water and sanitation and infrastructure respectively. Before formally specifying the models, I describe the definition of a mining districts used in the study and my strategy to account for problems due to heterogeneity.

The methodology primarily draws from a study by Loayza, Mier y Teran and Rigolini (2013), which assesses the impact of mining on a number of socioeconomic indicators. To avoid issues related to heterogeneity, a common occurrence in cross-sectional studies, mining districts have to be compared to non-mining districts with institutional and geographical similarities. However, before identifying a comparable group of districts, I need to differentiate the mining districts from the non-mining districts. I used the database from the Ministry of Energy and Mining (MEM) to pin down the location and size of all mineral production in Peru during the last decade. I excluded all small and artisanal mining production, using the definition from MEM. For the first model, my base year is 2011, thus, I decided to focus on the districts with significant mining production during the years preceding that year. I defined all the district with large scale mining production between the years 2006-2010 as mining districts. This tactic is in line with Loayza, et al (2013) although their base year is 2007. For the second model, the sample is made up by local government investments and not districts. The investments are therefore matched with the presence of mining production in the district during the year in which the investment was carried out.

The districts are grouped in three categories; 1) mining districts, 2) non-mining districts in mining provinces (provinces with at least one other mining district) and 3) non-mining districts in non-mining provinces in a mining department. In this way, it is possible to assess how the effect of mining is related to "administrative distance" to the mine. It is likely that spillover effects between districts within the same province exist and by using this categorization it is possible to analyze these effects. Loayza, et al (2013) used mapping software to address the impact of

geographic proximity looking at the impact of mining on first- and second neighbors to the mining districts. The results were identical to the results using administrative proximity. I will therefore think of the administrative proximity specification used in this paper as an indication of a "neighbor effect" due to geographical as well as administrative proximity.

As can be noted in the categorization above, the non-mining departments are not included. This is a strategy to handle the mentioned heterogeneity problem and is in line with the strategy used in Loayza, et al (2013). Basically, the geographical, institutional and other systematic differences between the non-mining and mining regions could result in biases which may be cumbersome to account for by using control variables causing omitted variable biases. For this reason, the non-mining departments are excluded. In view of that, I also excluded the department of Lima, even though it has districts with mining production. Thus, for the first model, my baseline case consists of 1319 districts belonging to departments in which at least one district hosts mining production. These districts are primarily concentrated in the Andean region. I also introduced department dummies to capture additional effects caused by time invariant unobservable characteristics not picked up by the control variables.

To estimate the effect of the *canon minero,* I include a variable called dependence on *canon minero*. It is specified as the percentage of the total budget made up by income from the *canon.* Since the total budget size is included as a control variable, the variables capture both the effect of the size of the *canon* as well as the dependence on the *canon*. As discussed above, the effect of the *canon minero* is expected to be zero according to the no-effect argument stressing lack of local government capacity or negative due to the budgetary rules connected to the execution of the *canon.* The inclusion of the variable is not completely unproblematic. Since the variable is highly related to mining it may be difficult to separate the effect caused by the *canon* and the effect caused by mining. In addition, one part of the *canon* is distributed according to socioeconomic characteristics and access to basic services (including water) is included in the distribution scheme. This may cause endogeneity problems. However, the effect is minimal since a very small part of the *canon* is distributed in accordance to local needs. Because of the above mentioned issues related to the *canon minero,* I include one specification without the *canon* variable to see if this changes the results.

To isolate the effect of mining I control for a number of districts characteristics. The control variables are discussed and motivated in a separate section. Worth noting here, though, is that

while Loayza, et al (2013) used control variables from before the mining boom (1993) this study includes contemporary variables primarily from 2011. Thanks to the richness of the database at hand, more control variables have been included.

The first model assesses the impact of mining on district level access to water. It can be formally defined as follows:

(1) $$Access\ to\ public\ water\ system_{dp} = \propto + \beta_0 D_{dp}[mining\ distr.] + \beta_1 D_{dp}[non - mining\ \ distr.in\ mining\ \ prov.] + \beta_2[Dep.on\ canon\ minero]\ + \beta_3 \mathrm{Control}_{dp} + \mu_d + \upsilon_p + \varepsilon_{dp}$$

where $D_{dp}[mining\ distr.]$ is a dummy variable taking the value of one if the district is producing and zero if the district is non-producing. Thus, the parameter β_0 will give us the impact of mining on a district level. The dummy variable $D_{dp}[non - mining\ \ distr.in\ mining\ \ prov.]$ takes the value of one if the district is located within a province that at least one producing district and zero otherwise. Its parameter β_1 will, hence, indicate how the impact of mining is affected by administrative distance. The effect of the dependence on *canon minero* is given by the value of β_2. The control variables and the regional dummies are included in $\mathrm{Control}_{dp}$.

The subscription relates to the department, d, and province, p, to which each district belongs. Since there are department specific and province specific institutional traits assumed to be shared among the districts belonging to the same province and department respectively, there will be specific error terms for departments, provinces and districts, represented by μ_d, υ_p and ε_{dp}. By introducing the department fixed effects, we account for the omitted variable bias caused by the department specific traits. In this study, I am not accounting for province specific traits. Partly because the importance of the province is politically limited and the inclusion of provincial dummies would therefore not add much value to the analysis in relation to the reduction in degrees of freedom it would cause; and partly because I am including dummies indicating if a local government is a provincial capital and hence accounting for some of heterogeneity caused by the provincial administrative tier without affecting the degrees of freedom.

I use the second model to assess the impact of mining on the propensity of the local governments to invest in water and sanitation, and infrastructure respectively. Hence, two specification of the same model is included. The dependent variables in both specifications are binary and a probit model is applied. The database with public investments only includes data from

districts located in 13 of the 25 departments[2] in Peru. Hence, the results are less general in this model than in the first model but since the selection has been determined without keeping the mining industry's location in mind; the risk of a selection bias is not imminent. Fortunately for this study, the most important mining departments are included in the sample and since the non-mining departments are excluded from the sample, in line with previous discussion, the lack of data from these departments does not cause a problem.

I use investments carried out from 2005-2010 which are the years preceding the base year of the first model. I match each investment with the presence of mining in that district at the year in which the investment was carried out. I mainly use the same control variables as in the first model. These variables are primarily from 2011 and are therefore not always corresponding to the timing of investments. If the district characteristics included in the control variables have changed dramatically during 2005-2011 and especially if the development of the variables have been different for a certain group of districts, this may cause a problem. For now, however, it will be assumed that the variables for 2011 are efficient proxies for the same characteristics during the preceding years, which I believe is a reasonable assumption. The first of the two specifications of the second model focuses on the propensity to invest in water and sanitation and is formally specified as follows:

$$(2)\ Propensity\ to\ invest\ in\ water\ and\ sanitation_{dp} = \propto + \beta_0 D_{dp}[mining\ distr.] + \beta_1 D_{dp}[non-mining\ \ distr.in\ mining\ \ prov.] + \beta_2[Dep.on\ canon\ minero] + \beta_3 \text{Control}_{dp} + \mu_d + \upsilon_p + \varepsilon_{dp}$$

Where $Propensity\ to\ invest\ in\ water\ and\ sanitation$ is a binary variable taking the value of one if the investment is in water and sanitation and zero otherwise. The rest of the model is identical to regression (1). However, some of the control variables are different. For example, the water coverage which is the dependent variable in regression (1) is included as an independent in regression (2). The second specification focusing on the propensity to invest in infrastructure is included below:

[2] AMAZONAS, ANCASH, APURIMAC, AREQUIPA, AYACUCHO, CAJAMARCA, CALLAO, CUSCO, HUANCAVELICA, HUANUCO, ICA, JUNIN, LA LIBERTAD

(3) $Propensity\ to\ invest\ in\ infrastructure_{dp} = \propto + \beta_0 D_{dp}[mining\ distr.] + \beta_1 D_{dp}[non-mining\ \ distr.in\ mining\ \ prov.] + \beta_2[Dep.on\ canon\ minero] + \beta_3 \text{Control}_{dp} + \mu_d + \upsilon_p + \varepsilon_{dp}$

Where the dependent variable takes the value of one if it is an investment in infrastructure and zero otherwise. In this model, the control variables related to access to water are excluded.

3.3. Control Variables

The control variables included in the models are listed in Table 1. The variables are selected because they are believed to somehow affect the district level access to water and/or the investments behavior of local governments. The inclusion of each variable is motivated below.

Population size and poverty are included to capture differences in demand and supply (with a higher degree of rural population it could be more difficult to construct water systems due to a disperse population). Inequality could have a negative effect on access to water since it could disrupt the prioritization of investment decisions in the public sector, as seen in Urzua, (2012).

Access to public water system prior to the mining boom (1993) is included to control for any pre-boom differences between the districts (see for example Loayza, et al (2013) and Arellano-Yanguas, 2010).

The total size of the budget, the number of employees and the average execution rate 2008-2010 are included as different estimates reflecting local government capacity and efficiency.
Finally, a provincial capital dummy is included. Each province contains a "provincial district" which functions as the administrative center of the province and enjoy certain perks. A dummy is included to account for this.

4. Results

In the following section, I present the results from the quantitative assessments. The first part includes the results from the OLS model estimating the impact of mining on district level access to water. In part two, the impact of mining on the propensity to invest in water and sanitation and infrastructure respectively is assessed.

4.1. Part one – Impact of mining on local access of water

Results from regression (1) is displayed in Table 2 below. Due to missing observation 709 districts are assessed out of the 1319 in the sample. Four specifications of the model are assessed. The first two specifications accounts for the dependence on the tax income generated from the mining industry (Dependence on *canon*). In specification two and four, regional dummies have been included to account for fixed differences between regions. As previously mentioned, the result indicates that mining has a negative effect on water coverage on a district level. A direct proximity to the mining industry seems to be detrimental for access to water. An administrative proximity can, on the other hand, be positive as measured by the value of β1. According to the results, mining has a negative effect on districts directly impacted by the mines but may have a positive impact on the surrounding districts within the same province. The results remains as we introduce fixed effects with the department dummies.

The dependence of the *canon* on access to water has no effect according to the results. As I have discussed throughout the paper, the *canon* is one of the major sources of income for mining districts. As argued above, the *canon* could be expected to either have a no-effect or a negative effect. It seems as though my results are in line with the argument stressing a no-effect of the *canon* due to lack of capacity of local government, at least on the actual water coverage rate in the districts. The results suggest, instead that the mere presence of mining production (direct effect) is what affects the level of access to water observed in mining districts.

Table 4 – OLS: Impact of Mining on Access to Water on a District Level

	(1)	(2)	(3)	(4)
Mining district dummy (β_0)	-0.125**	-0.091**	-0.125**	-0.089**
	(0.054)	(0.053)	(0.053)	(0.053)
Mining province dummy (β_1)	0.028*	0.056**	0.027*	0.058**
	(0.032)	(0.032)	(0.031)	(0.032)
Dependence on *canon* (β_2)	-0.010	0.055		
	(0.084)	(0.093)		
Control variables				
Total budget	-0.072***	-0.073**	-0.074***	-0.067**

Provincial capital	0.094**	0.084**	0.095**	0.077**
Population	0.067***	0.063**	0.068***	0.061**
Rural population	-0.003***	-0.003***	-0.003***	-0.003***
Poverty rate	-0.285***	-0.381***	-0.284***	-0.380***
Water coverage 1993	-0.007	-0.047*	-0.007	-0.047
Inequality	-0.374*	-0.443*	-0.372*	-0.441*
Local gov. employees	-0.005	0.008	-0.005	0.007
Budget execution rate	-0.166*	0.000	-0.165*	-0.016
Department dummies		YES		YES
_cons	1.594***	1.607***	1.609***	1.580***
N	709	709	709	709
r2	0.188	0.294	0.188	0.294

4.2. Part two – Impact of mining on local government investment prioritization

From part one, I have concluded that mining tend to have a negative effect on access to water on a district level and a positive effect on water for the district belonging to the same province as the mining district. To see if this result can be explained by how the investment prioritization of local governments is affected by the presence of mining and the dependence on the *canon minero,* I am assessing the propensity to invest in water and sanitation and infrastructure respectively for the years preceding my base year 2011 (2005-2010).

4.2.1. Propensity to invest in water and sanitation

The results from regression (2) are presented in Table 3. Specification one and two includes the dependence of local governments on income from the *canon*. Specification two and four includes regional dummies. The results are in line with expectations. Mining seems to have a negative effect on the propensity to invest in water and sanitation. Mining also seem to have a negative effect on

the propensity to invest in water and sanitation of non-mining districts belonging to provinces with at least one mining district. When accounting for regional differences, the tendency is enforced and the negative effect become highly significant for districts. Accordingly, it seems as though the assumption that the relation between mining and water coverage works through the investment behavior of the local governments is valid.

The results also indicate the presence of a spillover effect on the districts belonging to the same province as the producing district. This spillover effect do not seem to have affected the overall effect on access to water, since mining had a positive impact on those districts according to the results from part one. It is arguable that the impact of mining on neighboring districts may be due to the effect, discussed above, about the incentives of non-mining districts in mining areas to gain access to the *canon* by attracting mining companies to their districts. They may therefore choose not to exploit the already scarce water resources by investing in water and instead prioritize investments in infrastructure (as indicated in the following assessment).

A somewhat surprising result is the positive effect of the dependence of *canon minero* observed in the results. According to the discussion in the first part of the paper, we would expect the *canon minero* to have either a no-effect or a negative effect on the propensity to invest in water. The *canon minero* seems instead to have a positive impact on the propensity to invest in water. This result provides an even stronger indication that the negative effect on water access due to mining is caused by a direct influence of the mining industry over the investment behavior of local governments and not to the indirect effect of the *canon minero*.

Not only does this result indicate that channels of influence exist between the mining industry and the local governments of hosting districts; it also provides a potential explanation to why the population of districts with mines within its boundaries tends to have a lower access to public water systems.

Table 5 – Probit: The Impact of Mining on the Local Governments' Propensity to Invest in Water and Sanitation

	(1)	(2)	(3)	(4)
Mining district dummy (β_0)	-0.027*	-0.109***	-0.036*	-0.113***
	(0.036)	(0.038)	(0.036)	(0.036)

Mining province dummy (β_1)	-0.097***	-0.061**	-0.126***	-0.078***
	(0.022)	(0.025)	(0.022)	(0.021)
Dependence on *canon* (β_2)	0.323***	0.138**		
	(0.057)	(0.068)		
Control variables				
Provincial capital	-0.025*	-0.004	0.032*	0.016
Population	-0.013*	0.019*	0.030*	0.029*
Rural population	0.467***	0.433***	0.427***	0.410***
Total budget	0.025**	0.022*	-0.026*	0.010
Local gov. employees	-0.005	-0.039**	-0.020*	-0.042**
Inequality	1.979***	2.773***	1.895***	2.688***
Budget execution rate	0.235***	0.244***	0.216***	0.263***
Water coverage 1993	0.020	0.132***	0.039*	0.135***
Water coverage 2011	-0.025*	-0.100***	-0.028*	-0.099***
Poverty rate (2009)	-0.166***	0.009	-0.146**	0.021
Department dummies		YES		YES
_cons	-1.978***	-2.442***	-1.607***	-2.388***
N	31702	31702	31702	31702

4.2.2. Propensity to invest in infrastructure

Finally, I evaluate the assumption that the local governments, under the influence of the mining industry and/or the indirect effects of the *canon minero*, may prioritize investments within infrastructure, an area which is stressed by the mining industry as being in need of expansion. As in the previous analysis, the impact of mining on the propensity to invest in infrastructure is estimated. In line with expectations, there seem to be a significantly positive effect of mining on the propensity to invest in infrastructure. After accounting for regional differences, the province dummy become positive and significant as well. In consequence, it seems as though the presence of mining affects the neighboring districts to invest in infrastructure as well. As mentioned above this may be due to the fact that districts in mining areas are trying to attract mining companies to

their districts to be able to gain access to the income from the *canon minero*. This could incentivize them to invest more in infrastructure and less in water and sanitation.

Again, the effect of the dependence of the *canon minero* displays an unexpected result. When accounting for fixed effects, the effect of the *canon* is negative. The positive impact of the influence of mining to prioritize investments in infrastructure seems, therefore, not to be related to the indirect effect of the *canon minero* but rather to the direct effect of the presence of the mining industry in the districts.

Table 6 – Probit: The Impact of Mining on the Local Governments' Propensity to Invest in Infrastructure

	(1)	(2)	(3)	(4)
Mining district dummy (β_0)	0.141***	0.132***	0.147***	0.127***
	(0.029)	(0.032)	(0.029)	(0.031)
Mining province dummy (β_1)	0.010	0.128***	0.022*	0.109***
	(0.018)	(0.022)	(0.018)	(0.021)
Dependence on *canon* (β_2)	0.152***	-0.177***		
	(0.049)	(0.059)		
Control variables				
provincial capital	-0.005	-0.037**	-0.031**	-0.011
population	0.131***	0.145***	0.115***	0.155***
rural	-0.327***	-0.376***	-0.313***	-0.394***
total budget	-0.029**	-0.089***	-0.005	-0.106***
local gov. Employees	0.016*	0.002	0.019*	0.005
inequality	-0.216*	-0.442*	-0.230*	-0.528*
execution rates	0.454***	-0.051	0.457***	-0.024
poverty rate (2009)	-0.320***	-0.349***	-0.323***	-0.347***
Department dummies		YES		YES
_cons	-1.709***	-0.242*	-1.890***	-0.138
N	38198	38198	38198	38198

In sum, the results of part two indicate that mining has a direct impact on the investment behavior of local governments. In consequence, mining districts have a lower propensity to invest in water and sanitation and a higher propensity to invest in infrastructure. The results also identified a potentially indirect effect on the neighboring districts within the same province which also seem to prioritize investments in infrastructure before water and sanitation.

As stated above, this not only indicates that the mining industry seem to have a political influence over local governments, it also provides an explanation to the peculiar fact that mining districts in Peru, although generally richer, seem to provide a lower household level access to water.

5. Conclusions

The results of this paper indicate that mining has a negative impact on access to water on a district level in Peru. The effect is significant for districts in direct connection to mining. Districts belonging to a province with mining production, however, experience a positive effect of mining. The dependence on the *canon minero* is not statistically significant. To go beyond merely establishing the relation between mining and water access, this paper tries to disentangles the nature of the impact of mining on water access by turning to the entities responsible for the provision of water and sanitation services; the local governments. By assessing the effects of mining related to the structure of budgetary procedure, the participation of mining companies in local development and the impact of the *canon minero*, potential direct and indirect channels of influence were identified and analyzed. The direct effect of mining was identified as the participation of mining in local governments' decision making process and the less direct effect of mining companies' investments in local development through the Mining Program of Solidarity with the People and other Corporate Social Responsibility projects. These channels of influence are assumed to have a negative effect on the propensity of local governments to invest in water and sanitation due to the enforcement of the incentive scheme of the mining industry upon the decision making procedure of governments. Indirect effects of mining were identified in relation to the *canon minero.* Dependence on the *canon* was assumed to either have a no-effect on investments in water due to lack of capacity to execute the resources or a negative effect due to

the prioritization of simpler projects due to the budgetary procedure connected the these recourses. The *canon* was also assumed to indirectly impact investments behavior of neighboring districts in mining areas by providing local governments with incentives to attract mining companies to access the *canon* by investing in areas benefitting the industry.

Results indicate that mining has an impact on local governments' investment behavior. Mining districts have a lower propensity to invest in water and sanitation and a higher propensity to invest in infrastructure, in line with expectations. This effect also regards districts belonging to the same province as the mining districts. The dependence on *canon minero* is displaying unexpected results and seems to have a positive impact on the propensity to invest in water and a negative impact on the propensity to invest in infrastructure. The results contradicts the findings of Arellano-Yanguas (2010) who also looked at public investment data. Since he did not account for the presence of mining, the direct effects of mining was most likely absorbed by the *canon minero*. The result indicates that the most important effects of mining are the direct effects of the physical presence of the companies in the districts.

In addition, my results indicate that there might exist an indirect effect on the neighboring districts in mining areas. The non-mining districts within provinces with mining production also experience an effect of mining on the propensity to invest in water and sanitation and infrastructure, similar to the mining districts. As argued above, this may be due to the incentive provided by the potential to obtain future revenue from the canon by trying to attract mining companies to their districts. It is possible that there are other effects at work here but it is a thesis worth exploring.

In sum, the result shows that both local governments within districts directly affected by mining and those indirectly affected by mining by administrative and geographic proximity tend to be affected by mining when prioritizing public investments. This seem to occur through direct channels of influence, such as mining companies' participatory budgeting and/or engagement in local development projects, rather than through the indirect effect of the *canon minero*. This effect may be a reason for the lower access to public water systems in mining districts, which is one of the reasons behind the social discontent of the population in mining areas.

As for future research proposals I suggest that the quantitative research should make an effort to include the role of public institutions when assessing the impact of economic change, especially in contexts of weak political institutions. On the other hand, as evident from this study, it is also

essential for research on the impact of governmental policies to include the impact of economic actors present in the political sphere. Hence, I call for a more holistic approach when assessing social issues in relation to mining. On a more concrete note, I encourage researchers to use the public database on public investments in Peru. It will prove useful not only to understand the relation between private and public actors, but could also provide valuable information on the effects of the decentralization policies in Peru. It could therefore help us gain more knowledge about how to strengthen public institutions so that resources stemming from the exploitation of natural resources can reach out to the entire population and create development for all layer of society.

6. References

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