Oil Industry in the Northern Ecuadorian Amazon:
Are locals getting the jobs?

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List of Acronyms

DHS	Demographic and Health Surveys
ENAHO	National Household Survey
ENEMDU	National Survey of Employment, Unemployment and Underemployment
INEC	National Institute of Statistics and Census
ILO	International Labour Organization
IIRSA	Initiative for the Integration of the Regional Infrastructure of South America
ISCO	International Standard Classification of Occupations
ISIC	International Standard Industrial Classification
EAP	Economically Active Population
OECD	Organisation for Economic Co-operation and Development
PCA	Principal Component Analysis
OPEC	Organization of Petroleum Oil Countries
SOTE	Trans-Ecuadorian Oil Pipeline System
USAID	United State Agency for International Development

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Abstract

This paper assesses the impact oil companies in the Northern Ecuadorian Amazon have on the local communities in the form of direct employment generation. For such objective, the study analyses the level of employment as well as the characteristics as oil workers from the communities through the use of a household survey conducted in 60 rural localities of Sucumbios and Orellana in 2016. The data is complemented with the National Survey of Employment of Unemployment and Underemployment from the same year.

The results of the survey show that only 6.4% of the working-age population in the local communities worked for oil companies, mainly performing unskilled tasked. Of them, only 12.1% were women and 5.1% indigenous. There is evidence of higher levels of unemployment in these communities in comparison to other rural areas of the same provinces. Furthermore, the results of a logit model on employability in the oil sector suggest that education does not play a role in increasing the probability of employment in an oil company.

Relevance to Development Studies

Ecuador has been dependent on petroleum extracted from the Amazon for over forty-five years, making this region the most important for the national economy. Yet, despite the relevance of the region and the presence of oil companies, historically, it has been isolated. Research on the socioeconomic effects the oil sector has in the Amazonian communities is still very limited. So far, the focus has been put on health and environmental issues or in specific indigenous groups. However, extractive industries tend to attract migration and there is little understanding about the livelihood of the different ethnic groups. For this reason, it is relevant to have a better picture of the communities neighbouring oil operations and whether they have benefited from the presence of oil companies in their backyard.

Keywords
Oil industry, employment, poverty, Ecuador, extractivism, resource curse

Chapter 1
Introduction

1.1 Background

On 26 June 1972, the first barrel of oil extracted in the Ecuadorian Amazon was filled in Esmeraldas after travelling from Lago Agrio through the Trans-Ecuadorian Oil Pipeline System (SOTE) for the first time. The bishop of Esmeraldas blessed the facilities, while the president of Ecuador (Guillermo Rodriguez Lara), the manager of Texaco, and the Mayor of Esmeraldas addressed the public in commemoration of the occasion. In his speech, President Lara mentioned that oil would "help us solve the problems the country is suffering, and particularly those of the Ecuadorian people" (Cuesta 1972). People lined up to get their hands stained with oil, and they also watched with joy when the same barrel was taken through the streets of Quito in a parade. During the celebration in the capital, a settler of *Oriente* (the way in which Ecuadorians refer to the Ecuadorian Amazon) thanked the Ecuadorian government as well as the Texaco-Gulf consortium for the construction of SOTE (Cuesta, 1972). It was a time to celebrate; Ecuador was becoming an oil exporting country, which meant a brighter future for Ecuadorians.

During the forty-eight years since the establishment of the SOTE, the Ecuadorian economy has been largely dependent on the oil industry, living the booms and bursts of the sector. Poverty and inequality are still serious concerns, and while the urban areas of the country might have benefited during the boom periods, the Amazonian region—the actual location of oil extraction—has not. Despite the importance of *Oriente* for the national economy, historically, this region has been economically isolated from the rest of the country.

The focus of this research is on analysing the impact of the oil sector on the local communities in terms of direct employment by oil companies. A total of 60 communities from Sucumbios and Orellana, the two most important provinces for the oil sector, are studied and compared to the rest of the rural Ecuadorian Amazon. Are residents of oil production areas employed by oil companies? If they are, what functions are they tasked with? Since the regions with oil operations have attracted migrants (Larrea et al. 2009), the study will explore the employability of locals and migrants. Chapter 2 will provide an overview of the history of oil in Ecuador and its role in the national economy. The literature on extractivism and its impact on local communities constitutes Chapter 3. The methodology and results will be discussed in Chapters 4 and 5, respectively, while Chapter 6 contains the conclusions and limitations of the study.

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Commented [t2]: Adding the name here creates ambiguity as the positions "manager of Texaco" and Mayor of Esmeraldas can refer to the name stated.

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1.2 Problem and Justification

In May 2018, the Ecuadorian National Assembly approved the Amazonian Law which is considered a triumph by the residents of the Amazonian region. It not only calls for investment in health, education and infrastructure, but also requires that at least 70% of employees of companies operating in the area are local. Before its approval, the president had partially vetoed the law, partly due to the lack of a technical study that could provide support for this percentage (Puente 2018).

Although several studies conducted in Ecuador report on the impact of the oil sector, the majority of the quantitative studies either focus on the economic impact at the national level, or the environmental and health impact of the operations at the community level[1]. Throughout the years, many claims have been made, both in favour and against oil extraction in the Amazon as a means for development, without much empirical evidence. The paucity of studies analysing the socioeconomic impact of the oil industry in the Ecuadorian Amazonian could be the result of the limited statistics available for the region and the difficulty of data collection given its geography. While studies in other resource-dependent nations show mixed results (Van der Ploeg 2011), there is not sufficient quantitative literature to generate a thorough understanding of the impact at the local level in Ecuador. The aim of this research paper is to narrow the gap in the literature, specifically in terms of employment in the local communities, and to provide a source of statistical information previous to the application of the new Amazonian law.

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The analysis is based on the answering of the following research questions:

- What is the level of employment of the members of the local communities who live in the vicinity of oil operations in the provinces Sucumbios and Orellana in the Ecuadorian Amazon?
- What percentage of members of these community work for oil companies and what are their characteristics?
- What is the welfare effect of the presence of oil companies for those who work for the oil sector?

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To answer these questions, the objectives of the research are to examine the characteristics of the community members who work for oil companies and explore the differences between locals and migrants, women and men, and ethnic identifications, in the communities.

[1] Some examples are Sierra 1999; Gachet et al. 2017; Cori 2015; Hurtig and San Sebastian 2002; and Moolgavkar et al. 2014.

Chapter 2
The Oil Sector

2.1 The Ecuadorian Economy and its Oil Sector

Historically, Ecuador has been a country dependent on natural resources – either agricultural products or petroleum. In 1972, Ecuador became an oil exporter and ever since, this natural resource has been the most important factor driving the economy of the country. In 2014, petroleum and oil derivatives represented 51.7% of total exports (ICEX 2015; Blondeel et al. 2016). In four decades, few products, especially shrimp and flowers, contributed a substantial share to the group of exports, while there has been no significant change in manufacturing (Larrea 2013).

Commented [t12]: Agricultural products are not natural resources, but natural resources are consumed in agriculture.

According to Larrea (2013), the era of petroleum in Ecuador can be separated into three phases: the oil boom, the neoliberal period, and the post-neoliberal period. The initial oil boom in Ecuador occurred between 1972 and 1982, with the Ecuadorian state having 80% of participation in oil revenues. The affluence, combined with heavy borrowing, allowed for the growth of the public sector and real wages. This in turn pushed the domestic demand upward, which became the most important driver for growth (Larrea 2013). The government lacked control over public spending, and constantly presented deficits over the current account. Public and military expenditure increased, as well as subsidies for food and fuel. Despite gains in education, infrastructure and healthcare, the impact on poverty reduction was small due to the capital-intensive type of industry that developed (Gelb 1988).

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The Ecuadorian economy presented strong symptoms of the Dutch Disease as import demand increased (Ponce and Vos 2014). The performance of the manufacturing sector was weak, with little diversification, and remained concentrated in the largest cities while job creation was not significant. At the time, Ecuador had a large deficit in its current accounts, which was caused among other things by weak fiscal control and political instability, and was addressed by accruing more debt. The government had unobstructed access to credit from commercial banks due to its status as an oil exporter (Gelb 1988).

The neoliberal period, from 1983 to 2003, started when the debt that had been accumulating during the previous decade resulted in an economic crisis, which affected wages and domestic demand. The policies to deal with the situation included fiscal austerity, less social investment, relaxed labour laws, and a dramatic decrease of state intervention in the economy. Policies promoted the liberalization of trade and the financial sector, and growth was led by exports, mainly of oil and shrimp. The economy was further affected several times during the neoliberal period due to falling oil prices and El Niño floods. In 1999 the greatest shock was caused by the bankruptcy of private banks, which led to the dollarization of the economy the following year (Larrea 2013).

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The increase of the oil exports was a response to the low international prices (especially in 1986 and 1998) and the result of the construction of a new oil pipeline. Despite the increase in oil extraction, the government's participation in revenues was small, and most of it was directed towards the payment of foreign debt (Ponce and Vos 2014). At the beginning of the 2000s, the price of oil started to recover as a result of growing Chinese demand. This paved the way to the third and last stage.

In November 2003 the new Heavy-Oil Pipeline (OCP) was commissioned, enabling the transportation capacity to double. During this period, the Ecuadorian exports of oil had its largest expansion as a result of higher prices and increased volume. Block 15 of the Occidental oil fields was nationalized in 2005. Following an alteration in legislation, the relationship with companies changed as they shifted towards becoming service providers. With these changes, participation of the state in oil revenues decreased to 75%. This neo-liberal period is also known as the period of neoextractivism (Larrea 2013).

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2.2 Neoextractivism

Ecuador's current relationship with oil could be classified as one of neoextractivism. To illustrate the implications for Ecuador, it is required first to carefully examine what 'neoextractivism' refers to and the role it has played in Latin America during the past decade.

One could separate extractivism[2] in Latin America into two themes: conventional and progressive extractivism. The former refers to the type of natural resource extraction where transnational companies predominate. In the latter, contemporarily referred to as neoextractivism, the government is the main actor (Cielo et al. 2016). 'Neoextractivism' was first introduced by Eduardo Gudynas in 2009 to describe the phenomenon that emerged in several Latin American countries by the beginning of the 21st century. The governments in power, which identified themselves as progressive or leftist, began to change their relationship with the extractive industries, seeing them as the means to finance development programs improving living conditions. The state assumed a more active role through the nationalization of the extraction of natural resources, especially non-renewable, or through the renegotiation of contracts. This contrasts with the neoliberal period of the 1980s and 1990s, when the mining and oil companies in Latin America had great financial liberty and operated under flexible labour and environmental laws (Gudynas 2009).

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[2] Extractivism refers to the extraction and exporting, with little to no processing, of large numbers of natural resources including crops, oil and other minerals (Acosta, 2011). Gudynas (2013) defines it as:

> "A particular type of extraction of natural resources, in large amounts or high intensity, of which 50% or more are intended for export, as unprocessed raw materials or with minimal processing. It includes the exploitation stages as well as the preceding stages of exploration, discovery, etc., and also the subsequent stages, such as closure and abandonment of the appropriation sites"
> (Gudynas, 2013).

The operations of government-owned oil companies have expanded, and the renegotiated contracts have facilitated governments to increase revenue from taxes and royalties. Since the development model is financed through the use of natural resources, all extractive operations are politically legitimized, as it is believed to be in the interest of the general population (Burchardt and Dietz 2014). It is common for criticism to be ignored while the communities and NGOs fighting against extractivism are accused of preventing progress. The impact on the local communities is seen as a side effect that has to be accepted in favour of the general wellbeing of the nation. The environmental and social impacts are perceived as sacrifices to reach a greater good (Gudynas 2009).

In Ecuador, the former government set an agenda of neoextractivism with the purpose of alleviating the country's dependence on oil by exploiting the same resource to finance the transition (Cielo et al. 2016). Since the beginning of his term, ex-president Rafael Correa (2007-2017) greatly increased public expenditure from 21% of the GDP in 2006 to 44% in 2013. He was determined to follow a development model funded by mining and oil extraction and would often remind the country of the importance of the oil industry to break away from neoliberalism. The infrastructure projects of the Ecuadorian government follow the model of the Initiative for the Integration of the Regional Infrastructure of South America (IIRSA), which encourages the construction of accessways to increase the extraction of natural resources, including oil, mineral mining, biofuel, and timber (Morley 2017).

The human capital and infrastructure investments depended on the revenues obtained from natural resources, mainly oil and mineral mining (Larrea 2013). In 2015 ex-president Correa declared that as long as he remained in power, he would make sure every last drop or grain of natural resource would be used to escape poverty. The government continually used the term 'production matrix' which is "the national network of economic structures and relations that both shapes dynamics of production internally and connects Ecuadorian products to global flows of capital" (Cielo et al. 2016), to refer to the goal of diversifying the economy away from non-renewable natural resources. Critics believe that the implemented policies have not been successful in diversifying the manufacturing sector (Larrea 2013).

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2.3 Oil in the Amazon

The evolution of *Oriente* cannot be detached from the evolution of oil operations. Even though the drilling of the first oil well took place in the coastal region in 1911, ten years later the first explorations started in the Amazon. They were performed by the Leonard Exploration Company, who built the road Ambato-Mera, one of the first connections of the region to the rest of the country. In 1937, Shell signed a contract with the state for the exploration of 100,000 km^2, nearly the total area of the region. However, the company ended its operations in 1948 after stating that it had been unable to find oil (Larrea et al. 2009).

Everything changed when Texaco-Gulf drilled its first oil well in Lago Agrio in 1967, three years after signing a contract with the government for the concession of operations in the northern Amazonian region. Five years later, with the conclusion of the construction of

the SOTE pipeline, which transports the oil to Balao Port in Esmeraldas, Ecuador became an oil-exporting country and a member of OPEC the following year[3], giving way to the era of petroleum (Larrea et al. 2009).

While the Amazonian region represents 45% of the Ecuador territory (123,000 km^2), at the moment of the last census in 2010, it accounted for 5.1% of the population with 739,814 inhabitants (Villacis and Carrillo 2012). Although the region has higher fertility rates in comparison to the rest of the country[4], most of its population growth is the result of migration. In the decades after the defeat and loss of approximately half of the Amazonian territory to Peru during the 1941-1942 war, the Ecuadorian government incentivized the colonization of the region in an attempt to increase national security through the use of 'live borders.'

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The discovery of oil in the north of the Amazonian region in 1967 increased the process with the construction of roads to reach the oil fields (Larrea et al. 2009). Roads were built almost exclusively according to the needs of oil companies in order to reach oil wells, and to transport materials and machinery. They were also the main access for colonization (Little et al. 1992). Given that the first oil operations in *Oriente* took place in Sucumbios, it is the Amazonian province with the highest road density (López et al. 2013). In summary, migration to the northern and central part of *Oriente* after the 1960s was the result of oil operations, the roads built to reach the oil fields, and the two Agrarian Reform Laws in 1964 and 1972 that encouraged the colonization of the region (Torres et al. 2018).

2.3.1 Relationship with the local communities

The Amazonian region is seen as an area of the extraction of natural resources, where the process of colonization has had a negative impact on the lives of its native inhabitants as well as on the environment (Larrea et al. 2009). Since the discovery of oil in the northern part of the Amazonian region, the landscape has suffered a deep transformation. Despite the size of Ecuador, in the western Amazon it is the country "with the largest absolute area covered by oil blocks in extraction" (Morley 2017). From 1964 to 1992, Texaco operations led to the opening of hundreds of oil wells and pollution to the soil as well as to surface and subterranean water sources due to inappropriate waste disposal practices. Consequently, local communities suffered from serious diseases (Sawyer 2004; Olsen 2002).

The Amazonian territories rich in oil are also areas high in biodiversity and the home of many indigenous communities. Around 65% of the region is considered ancestral land where indigenous populations live (Collen and UNDP 2016). In the Ecuadorian Constitution of 2008, the concept of 'good living', '*sumak kawsay*' in Kichwa, played a central role. It was

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[3] Ecuador was a member of OPEC from 1973 to 1992 and is a member again since 2007 (OPEC 2018).
[4] In 2010 the national average fertility rate was 2.79% while the average for the Amazonian region was 3.9% (INEC 2016).

meant to represent more participatory inclusion of the indigenous communities as well as more attention to their demands for alternative means of development (Cielo et al. 2016).

In the 1992 publication "Cuyabeno Political Ecology the non-sustainable development of the Amazon", Little et al. (1992) described how the majority of locals employed by oil companies performed unskilled tasks and their salaries were only slightly above the minimum established by the law. A few members of the communities had better-paying jobs in technical positions, but the authors considered them the exception. The authors provided a detailed characterization of employees in oil companies operating in the Ecuadorian Amazon. The top category was the management team – a very small group of employees with the highest salary in the company. Their offices were located in Quito and they rarely had the need to visit the oil operations in the Amazon. The second group was the team of experts, formed by engineers, technicians and scientists. Members of this group stayed in the company's camp where amenities and services, such as room cleaning and laundry, were provided. Instead of having weekend off, this group usually worked for a longer number of days and had enough free days to travel to their hometowns (e.g. 8 days of work and 8 free days). In the majority of cases their travel expenses were covered by the company (Little et al. 1992).

The two top categories represented around 25% of employees. Employees in the bottom groups enjoyed no extra benefits and they usually got a very low salary. The third group were employees performing supportive administrative jobs (e.g. secretaries and accountants), those whose services were not directly related to the oil operation (gardeners, cooks, laundresses and waiters), drivers and those performing maintenance. The last category was formed by all labourers in the oil fields. The shifts of labourers from other regions were similar to that of experts; however, they had larger shifts (e.g. 24 days of work and 6 free days) and needed to cover their own travel expenses. It was in this last group were the authors found members of the local communities and not in the other three (Little et al. 1992).

When PetroAmazonas began processes to extract oil in Cuyabeno in 2008, after one year of exploration the company met with mobilizations from members of the community Playas del Cuyabeno that obstructed the transport of machinery. The purpose of the local community was not to prevent operations, but to negotiate better compensation agreements. Officials tried to convince members of the community that the operations were necessary for national development while the impact on the environment would be small[5] (Cielo et al. 2016).

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[5] Those manifestations let to the proposal of the government of the construction of the Cuyabeno city of the Millennium whose construction began in 2011, a year after PetroAmazonas started operations in the area. The city was inaugurated in 2013 and according to Correa, its creation, done with oil revenues, demonstrated his commitment to the communities living close to oil fields. For the first five years services such as electricity are subsidized by the state but after that period the community needs to find the means to pay for them. The oil operations however, did not translate into jobs for most of the community, since only a few members got jobs as guards, drivers or assistant operators (Cielo et al. 2016).

In 2014, an Attaché of the Chinese Embassy in Ecuador reported that in their Ecuadorian facilities Andes Petroleum and PetroOriental, both Chinese state-owned oil companies, would only hire workers who spoke fluent English. This policy translated into an impossibility of locals being hired. Over the years, both companies have faced several conflicts with the local communities due to the lack of job opportunities. Three hundred residents of the local communities stopped operations of Andean Petroleum in November 2006, not long after the company had started operations, demanding 400 jobs for locals. The same year, and in 2007, residents of Dayuma, Orellana, protested and blockaded roads into PetroOriental and PetroEcuador demanding more jobs for locals and the utilization of local transportation providers (Ray and Chimienti 2017)[6]. The Ecuadorian Law of Hydrocarbons calls for PetroEcuador, contractors and partners to hire a minimum percentage of Ecuadorians: 95% of labourers, 90% of the administrative personnel, and 75% of the technical staff, unless there were not enough Ecuadorian experts for specific positions (SHE and MRNNR 2011). However, it does not assign any percentage of jobs to town/village/region specific locals.

2.3.2 Amazonian Law

The Amazonian Law sets major objectives for the region and its application has important implications for the oil industry. The representatives of the people and communities of the Ecuadorian Amazon worked for the last two years on the passing of a law that would benefit the residents of the region[7]. Although the Amazonian law[8] had been partially vetoed by the executive power, on 13 May 2018 the Ecuadorian National Assembly approved it. The law applies to the residents of all the six provinces of the Amazonian region and has the purpose of improving their living standard. It has statutes on planning, education, health, environmental and economic growth. Article 41, the right to preferential employment, is among those that have gained the most attention. The article states:

> "All natural and legal persons, public, private, mixed and community companies, with national or foreign capital, that carry out their activities in the jurisdiction of the Special Amazon Territorial Circumscription, will contract residents of such territorial circumscription, no less than 70%, for the execution of activities within the Circumscription, with the exception of those for which there is not the required qualified workforce in the Circumscription."
> (Asamblea Nacional 2018).

The law also calls for the creation of public universities in every province of the Amazonian region, prioritizing Sucumbios, Orellana, Morona Santiago and Zamora Chinchipe (Asamblea Nacional, 2018) in no more than two years and access to credit for entrepreneurs. The

[6] The protests ended once an agreement was reached with the community for the creation of a social fund which included the creation of local jobs and credit programs (Ray and Chimienti 2017).

[7] According to the law, Amazonian residents are all individuals that belong to the Amazonian indigenous nationalities, those that are born in the circumscription, those that have resided in it for at least six years or have been registered in the circumscription for the last three electoral processes (Asamblea Nacional 2018).

[8] The full name of the law is 'Ley Orgánica para la Planificación de la Circunscripción Territorial Especial Amazónica' whose literal translation in English is 'Organic Law for the Planning of the Special Territorial Amazonian Circumscription' (Asamblea Nacional 2018).

Fund for the Amazonia Development, already in place, will double to USD2 on 2019 and will be 4% of the price of oil barrel starting in 2020 (El Universo, 2018).

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Chapter 3 Literature

3.1 Resource Curse

Resource-rich developing countries look for export-led growth based on primary products (Andreucci and Kallis 2017), but whether the presence and extraction of a natural resource is beneficial or detrimental for the economy and development of a country has been the topic of extensive debate. The belief that countries rich in natural resources can use it in order to reach continuous economic growth can be traced back to Adam Smith and David Ricardo. The view that developing countries could use their natural resources to transition to industrialized nations was widely supported until the 1970s (Badeeb et al. 2017). Supporters believe that the extraction of minerals is what allows countries to grow, by enabling them to finance imports which were fundamental for the creation of demand of intermediate inputs, capital goods and services such as transportation (Gelb 1988).

However, since the 1980s economists adopted an increasingly pessimistic view and ceased to view natural resources as a blessing. The role minerals played in countries like Australia and the United States two centuries ago is not considered to currently be the same in African and Latin American countries, where per capita income and life quality are lower (Badeeb et al. 2017). There seems to be a negative correlation between the presence of natural wealth and economic growth, with countries rich in natural resources performing worse than countries less well-endowed. The fastest growing economies of the last decades seem to be the ones without natural resources to exploit (e.g. the Asian Tigers), while countries abundant in these resources remain among the poorest (e.g. Angola and Sierra Leone) (Boschini et al. 2007).

The term 'Dutch Disease', coined by Alan Gelb in 1988 while analysing oil rents and their effect on the economy, preceded the 'Resource Curse' which in turn was first introduced by Richard Auty. He used it to describe how developing countries struggle to use the income from natural resource extraction for economic growth (Badeeb et al. 2017). With the Dutch Disease, factors of production are reallocated following positive shocks, either from the price increase of a commodity or the discovery of a resource. The effects of spending rather than saving the newly generated income cause resource movement effects and spending effects. The former refers to how the factors of production are focused in a thriving sector and removed from other economic activities. The latter refers to the movement of the factors of production away from traded commodity manufacture and replaced by imports, into non-traded sectors (Gelb 1988).

Oil in particular, also has important characteristics – its depletability and price volatility which generate boom-bust cycles (Karl 2007). Oil booms can be very harmful for the economy of oil-exporting countries since they seem to be accompanied by a slowdown of economic growth. Even when investments were larger than in other nations, oil exporters had lower economic growth. Extractive industries tend to be capital intensive and operate with

close links to multinationals. Usually, their wages are higher than those of the rest of the economy, and they operate at large scale (Gelb 1988).

According to some authors, the problem lies in the strength and quality of the institutions, not in the actual presence of resources. The type of resource interacts with the quality of institutions present in the country to influence the outcome. According to Boschini et al. (2007), this would explain the difference between Norway and Venezuela, both rich in oil but very different in terms of wealth, as well as the difference between Australia and Liberia, both rich in diamonds. Institutions in combination with the type of resource will influence how easy it is to reap the benefits. Of proven oil reserves, only about four percent are located in developed countries while the rest are located in nations where institutions tend to be feeble, increasing the probability of a resource curse (Karl 2007).

3.2 Subnational Resource Curse

In 2013, Fleming and Measham presented an unconventional definition of the Resource Curse, describing it as

> "The whole set of unintended consequences that originate from resource extraction activity and trade that can end up negatively affecting the economic development of regions hosting the resources extraction industry or the entire country"
> (Fleming and Measham 2013)

Their idea was to call the attention to the impacts of natural resource extraction being ignored at the local level. Only recently did literature on the resource curse, which in the past focused on the national level, expand in different directions. If classified according to the geographic level of analysis, the literature could be separated into macro (country), meso (subnational) and micro (community) levels of analysis (Gilberthorpe and Papyrakis 2015).

In the case of the meso level, researchers examine whether there is a resource curse at countries' broad regions rich in natural resources while the local or community level has mainly been explored by anthropologists focusing on the development impact. These studies examine the effect of extractivism on "individual agency and community relationships", gender inequality, social fragmentation and the cultural aspect of the conflicts between the extractive sector and the local population (Gilberthorpe and Papyrakis 2015).

Regions where the oil operations are actually located tend to be disproportionately affected. They usually have lower per capita incomes, lower economic growth and higher levels of conflict. This is the result of macroeconomic problems in the country as well as local negative effects (Badeeb et al. 2017). The oil sector does not offer sustainable employment and at the same time it tends to disrupt the usual patterns of production of the communities. Because of the expropriation of land and the pollution of the environment, subsistence agriculture tends to decrease. The operation of extractive industries can even lead to internal conflict in the communities since their leaders act as negotiators with the companies and the

state with many disapproving the decisions taken. This can also be the cause of social disruption due to the new forms of employment available and the presence of outsiders. Migrants depend on the local communities in order to get food from fishing, hunting and agriculture, and on the oil companies for employment. Occasionally, this close relationship has resulted in poor communities with social issues such as alcoholism and prostitution (Fontaine 2003).

Either as part of their corporate social responsibility programs, for legal reasons, or to gain acceptance, some companies do offer employment, health services and cash payments to the communities that live in the area of operation. However, these tend to end as soon as the company stops operations in the area. At the community level, extractive activities have an impact on the access of its members to employment and physical capital, human capital (health and education), social capital (social relationships) and natural capital (access to water, land and other natural resources) (Bozigar et al. 2016).

The presence of extractive industries could lead to inequality within a region. It can result in vertical inequality as few citizens benefit, for example if only a group of individuals find employment in a company. Horizontal inequality could be caused by the higher fiscal revenues obtained only by the jurisdictions where extraction takes place and there is evidence of it leading to conflict (Gamu et al. 2015).

3.3 Extractive industries and employment

According to Auty (1993), the underperformance of mineral economies can be explained by three factors: the production function of the mining sector[9] (the ratio of capital to labour), linkages at the domestic level, and the use of rents from the sector. Mineral extraction is a capital intense industry that operates with large amounts of foreign investment while generating relatively few jobs. For this reason, they tend to generate enclaves. Production linkages at the local level are modest as only a small number of factories are needed to process the minerals before exporting it.

After a resource boom, there are high expectations for the creation of jobs as well as higher revenues in the local communities (Cust and Viale 2016). New oil activities also seem to attract migrants who are seeking employment which in turn inflate local prices[10]. However, given that non-renewable natural resources such as oil and gas do not need to be processed before exporting, natural resource wealth can take place "independently of other economic processes and does little to create employment" (Badeeb et al. 2017). Employment could

[9] The author uses the word mineral to group hydrocarbons and hard minerals (Auty 1993).

[10] According to Gelb (1988), it is common for resource-endowed developing countries to neglect their agricultural sector. This leads to internal migration to urban areas or to areas of extraction as individuals look for employment and access to public services (Gelb 1988).

have intergenerational benefits when the parents' earnings allow children to stay in school rather than participating in economic activities to support the family (Gamu et al. 2015).

However, for oil operations, the ratio of job creation to the units of capital investment tends to be small. The majority of available jobs tend to disappear once the required infrastructure has been constructed; more permanent jobs frequently require skills that the unemployed do not possess. Few locals are hired directly by the companies while the industrialization of technology and the need for downstream processing industries also tend to be limited (Karl 2007).

3.4 Empirical literature

When studying the subnational resource curse and the impact of extractivism at the subnational level in Latin America research tends to focus on the mining sector. Albeit that the effects are not the same, even though there are many similarities, the approach of the studies can also be applied to the oil sector. In view of the above, the following sections concern both the mining and oil sectors.

One of the studies that reflected on direct employment was performed by Stanley (1990) in Nigeria. Through the use of questionnaires, members of the local communities were asked about their view on the presence of oil companies. A large majority of respondents were not pleased mainly due to the lack of jobs offered to them and the presence of migrants who were employed by the companies. Responses showed that locals found money compensation to be more important than then environmental damage. Other studies analyse indirect employment and socioeconomic impacts. Petkova et al. (2009) and Ivanova (2014) studied economic linkages in Australia's mining-dependent regions. It was found that economic impact mainly occurred through indirect linkages which mostly benefited metropolitan areas. Research was also performed in the United States to study the effects of the extraction of natural resources. Weber (2012) analysed the impact on employment of a natural gas boom and found that despite the large increase in production job creation was modest. For every million dollars in production, 2.35 were created in the county, leading to a 1,5% annual increase in jobs in comparison to the preboom.

For the Latin American case, the literature on local employment (both direct and indirect) in extractive industries is still limited. The studies present the effects of the extractive industry at the local level from different angles and not necessarily focusing on employment creation.

3.4.1 Empirical studies in Latin America

Mining Sector

Haslam and Tanimoune (2016) examined the causes of social conflict in mining communities in five Latin American countries (Argentina, Brazil, Chile, Mexico and Peru) through the use of geo-located property level data[11]. According to their results, in all five countries conflict between the firms and the communities was the result of the insufficient amount of economic opportunities, "other things being equal, a community with fewer agriculture opportunities, lower income, and worse state services is more prone to conflict." (Haslam and Tanimoune 2016). As the community is more economically active or the level of poverty decreases, the occurrence of social conflict diminishes. While the majority of the issues resulted from the scarcity of arable land, it was also caused by mining operations in protected land.

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Toscani (2017) studied the impact of natural resource extraction of both hydrocarbons (natural gas) and mining at the local level in Bolivia. The study used data at the municipality level from the population census of 2001 and 2012 in order to build a difference-in-difference model. The results showed that municipalities with large gas fields received larger fiscal windfalls than municipalities with mining operations. In both, municipalities with natural gas and mining, there was a movement from subsistence agriculture towards manufacturing and construction. However, because mining is more labour intensive, those municipalities had larger positive spillovers to other sectors in the form of employment and migration. Mining employed around 20% of workers in mining municipalities, and the production of natural gas employed around 3% of workers in municipalities with gas.

These last three studies analysed the impact of the mining sector in Peru. In the first study, Zegarra et al. (2007) did an impact evaluation of the mining sector on the communities located in the area in the Peruvian highlands between 1993 and 2003[12]. The study separated communities between urban and rural and through the contrafactual groups simulated households with the same characteristics of those who live in mining areas but that were not subject to the impact of the mining sector. The authors found a positive correlation between the mining sector and both the income and expenses of families in urban areas, but no correlation in rural areas. However, they did find that in rural areas the presence of mining decreased the incidence of poverty but increased the probability of chronic illness. They also found that the level of education of the head of the household was of great importance as this could translate into a null or negative effect for the family, even when there was a positive effect in the region.

[11] The dataset was constructed between 2011 and 2013 and included information on 640 geo-located mining properties (Haslam and Tanimoune 2016).

[12] The main source of information was ENAHO (Encuesta Nacional de Hogares), the Peruvian national household survey. Other sources were used for the creation of the contrafactual groups (Zegarra et al. 2007).

In another study, Loayza et al. (2013) analysed the socioeconomic impact of mining activities at the district level in Peru, separating districts according to their vicinity to operations. The study used data on government transfers as well as on mining extraction from 2007. The results showed a positive effect on household consumption, literacy rate and lower levels of poverty. However, the positive impact faded rapidly with distance from the mines while the level of income inequality grew larger for both producing and neighbouring districts. The authors found little effect of fiscal windfall on poverty.

Lastly, using household data from 1997 to 2006, Aragon and Rud (2013) analysed the economic impact at the local level of Yanacocha, the second largest gold mine in the world, located in the north of Peru. The authors used a difference-in-difference model comparing the living standards of households living in Cajamarca, a city close to the mine where most workers live, to those living further away. The study found a positive impact on living standards mostly driven by the backward linkages of the mine. This was the result of greater production combined with a corporate policy adopted in 2000, the purpose of which was to increase local employment and local procurement of supplies[13]. The presence of the mine resulted in an increase in household income and housing prices in the city as well as in nearby municipalities, but not in municipalities located further away.

Oil Sector

Caselli and Michaels (2013) examined the impact for Brazil of fiscal windfall on oil producing municipalities since by law they are entitled to royalties. The purpose of the study was to analyse the effects on living standards, and the public provision of goods and services[14]. The study found that while the presence of oil companies translated into an increase in revenues for the municipalities, the reported spending did not equal the actual flow of goods and services received by the population and the increase in household income was minimal. According to the authors, the missing money suggested embezzlement (Orta-Martínez and Finer 2010).

The following three studies focused on the Ecuadorian Amazon. Through the use of multiple regression, Larrea et al. (2009) explored the relationship between employment and population growth from 1990 to 2001[15] in the areas of the Ecuadorian Amazon that attracted

[13] According to the corporate policy, local suppliers and workers should be given priority in competitive bids. The policy also encourages suppliers to hire locals (Aragón and Rud 2013).

[14] The level of analysis used were the Brazilian minimum comparable areas (AMCs for their name in Portuguese) (Caselli and Michaels 2013).

[15] The authors compared the data between the national census of 1990 and 2001.

the highest number of immigrants. While the independent variables were employment related[16], the dependent variable was the annual rate of population growth as a proxy for immigration (the authors assumed a relatively stable rate of natural increase during the period of study). They found a direct positive relationship between migration and the share of oil in the economically active population. However, oil activities represented only 2.8% of the jobs in the region (the highest percentage was in Sucumbios, 5.9%, and the lowest in Napo, 0.9%). For this reason, they concluded that the impact of oil on employment was mostly indirect, caused by the construction of highways and infrastructure, which in turn acted as a driver for the growth of agriculture and oil-related activities.

Eliscovich (2016) explored the socioeconomic impact[17] of oil exploration for locals and immigrants in 'high oil' areas of the Ecuadorian Amazon (that is, where the presence of oil companies is strong). The study reports on linear probability models for discrete outcomes and OLS with data coming from the last four census rounds[18]. Eliscovich concluded that although locals seemed to have better education when living in high oil vs. low oil areas of the Amazon, they were less likely to be healthy and have a skilled job. Oil companies seemed to attract skilled immigrants, leaving unskilled positions to be filled by the locals. Furthermore, immigrants were more likely to be self-employed and have higher standards of living while exhibiting no effect on their health.

Bozigar et al. (2016) studied the impact of oil operations on the livelihood of 32 indigenous communities, belonging to five ethnicities, in the northern Ecuadorian Amazon. The study used a longitudinal survey applied in 2001 and 2012 and focused on the effects on ownership of consumer goods and participation in agriculture, hunting, fishing, and off-farm employment. According to the results, around 50% of households participated in off-farm activities, of which 30% to 50% worked for oil companies. While households believed the environment was polluted because of the oil companies, in the second survey their self-reported health was much better. The results also showed that consumer assets were mostly influenced by the presence of oil assistance programs and not by the number of individuals working for oil companies, which did not have a significant impact.

[16] The independent variables in the study were the following: the EAP (economically active population), share of agriculture, manufacturing, oil, services, trade and transportation, percentage of workers, percentage of women, percentage of agricultural workers in the agricultural EAP, and schooling (Larrea et al. 2009).

[17] Eliscovich separately analyzed the impact of oil extraction on education, health, employment and access to infrastructure (Eliscovich 2016).

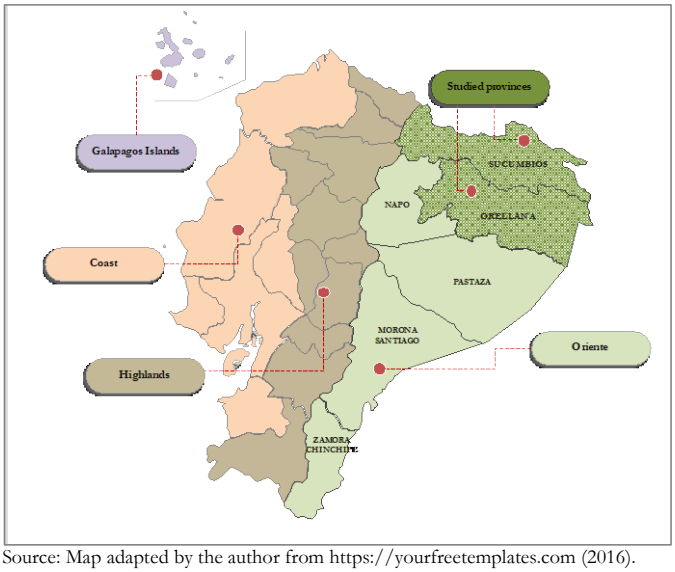
[18] 1982, 1990, 2001 and 2010.

Chapter 4
Methodology

4.1 Data

The data used in this research comes from a primary and secondary sources. The primary source is the Ecuadorian National Survey of Employment, Unemployment and Underemployment (ENEMDU), which will be used to compare the surveyed localities with all rural communities in Sucumbios and Orellana, and with all rural communities in the Amazonian region.

Map 1
Political Map of Ecuador



Source: Map adapted by the author from https://yourfreetemplates.com (2016).

The primary data comes from a household survey that took place in 2016 in Sucumbios and Orellana, the two provinces of the Ecuadorian Amazon where oil production is concentrated. Although the majority of the Ecuadorian Amazon region is divided in oil blocks, the greatest percentage of them are located in these two provinces, with 100% in Sucumbios and 96% in Orellana already assigned[19] (López et al. 2013). The household survey was conducted as part of a project whose purpose was to evaluate the improvement in water quality after an

[19] This is followed by Napo (67%) while the oil blocks not licensed yet are located in Pastaza and Morona Santiago (López et al. 2013).

intervention. Ninety localities were first pre-selected as clusters[20], of which 60 were randomly selected. These two provinces were chosen for the study given that the initial goal was an intervention on oil-related contamination; however, it was then switched to biological contamination. While the optimal comparison would be done between the surveyed localities and communities not directly affected by oil operations, this analysis is not possible with the available data. The lowest geographic desegregation in ENEMDU is a parish, which could be both rural and urban. Rural parishes can include more than 20 communities[21] which make it impossible to define them as either treatment and control given than, as it was just mentioned, the entirety of Sucumbios and most of Orellana have operating blocks[22].

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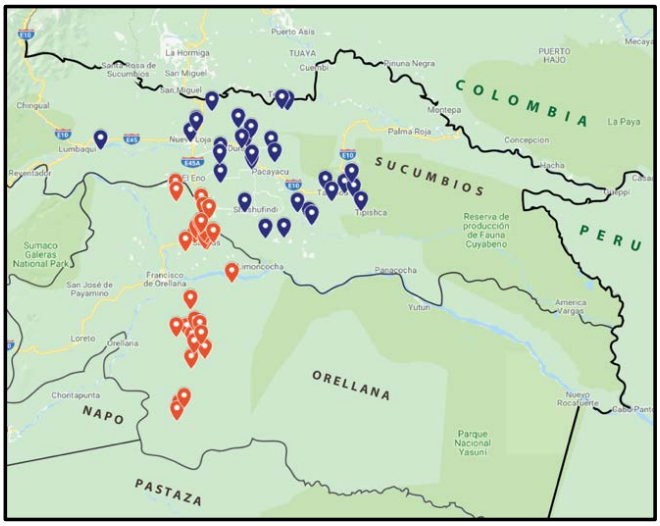
Map 2
Location of the Surveyed Communities



Communities are color-coded according to the province where they are located.
Source: Map elaborated by the author in Google Maps according to the coordinates registered by the enumerators during the survey process.

For the evaluation, two rounds of surveys were conducted. One round was conducted before the intervention in June-July 2016, and another in October-November 2017. The key questions of the surveys were related to the quality and handling of water. However, the

[20] The criteria for selection was: to have a minimum of 20 households, to be more than 5 kilometers away from the border with Colombia (for security purposes) and that the local population has no access to information on water quality.

[21] As an example, Dayuma (Orellana), which is one of the rural parishes in the study, is formed by 5 consolidated villages and 62 scattered villages (GADPD 2015).

[22] In her classification of parishes as 'high oil' and 'low oil', Eliscovich (2016) defined all parishes in Sucumbios and Orellana as high-oil.

baseline survey contained an extended list on socioeconomic questions including employment and asset-ownership related questions rendering it suitable for analysing employment in the oil sector.

The questionnaire was based on:

- The demographic and health surveys (DHS) which are designed by the United States Agency for International Development with questions on characteristics of the household and the dwelling, and demographic composition;
- ENEMDU; and
- The 7th Ecuadorian National Census of Population and the 6th National Census of Dwellings conducted in 2010.

Within the selected localities, the local leader showed the enumerators the limits of the community with one enumerator starting the survey with households on each extreme. When the survey could not be administered to 20 households, which occurred in 17 localities, they were conducted on households in neighbouring communities that were not part of the 60 selected locations. In total 1,177 households were surveyed (Appendix 8 and Appendix 9) with a total of 5,286 observations.

The secondary data comes from the 2016 annual dataset of ENEMDU. It is a survey conducted by the National Institute of Statistics and Census (INEC) and has the purpose of providing information about the economically active population of Ecuador, the labour market, poverty, and inequality (INEC, 2015). ENEMDU uses a two-stage probabilistic sample selection (census area and houses) with geographic stratification. The primary sampling units are census areas, while the secondary sampling units are the houses that form each primary sampling unit. Since September 2013, the sampling frame is based on the 7th Ecuadorian National Census of Population and the 6th National Census of Dwellings from 2010 (Unidad de Diseño Muestral INEC 2014a). Data is collected quarterly and the sample includes all private homes while excluding collective homes and all types of floating houses. Its sample representativeness is national, by province, urban-rural, geographic domain, and the five main cities (Quito, Guayaquil, Cuenca, Machala and Ambato) (Unidad de Diseño Muestral INEC, 2014b). Since 2014, the survey has territorial representativeness for all six Amazonian provinces; however, the lowest level of disaggregation is parishes (INEC 2016).

Given that the analysis focuses on rural localities, the dataset from ENEMDU was filtered in order to keep only observations from the rural Amazon. INEC makes the distinction between urban and rural parishes according to population with a threshold of 2,000 inhabitants (Unidad de Diseño Muestral INEC n.d.). The dataset includes the classification, easing the separation process.

A subsection of people of 15 years or older is specified since the focus is on employment. This threshold was set since it is the one used for defining individuals as part of the

economically active population as well as part of the working age population. Different definitions exist for 'Working Age' (e.g. the OECD sets a range from ages 15 to 64), and for INEC it is all individuals aged 15 or older. INEC defines 'Employed Population' as all individuals of working age who worked at least for one hour during a reference week, making goods or providing a service in exchange for benefits or remuneration. It includes individuals who do work but were temporally absent during that timeframe (INEC 2015).

Both surveys used the International Standard Industrial Classification (ISIC) and the International Standard Classification of Occupations (ISCO) when classifying employment and productive activities. ISIC classifies business activities into 21 broad categories (Department of Economic and Social Affairs 2008):

a. Agriculture, forestry and fishing
b. Mining and quarrying
c. Manufacturing
d. Electricity, gas, steam and air conditioning supply
e. Water supply; sewerage, waste management and remediation activities
f. Construction
g. Wholesale and retail trade; repair of motor vehicles and motorcycles
h. Transportation and storage
i. Accommodation and food service activities
j. Information and communication
k. Financial and insurance activities
l. Real estate activities
m. Professional, scientific and technical activities
n. Administrative and support service activities
o. Public administration and defence; compulsory social security
p. Education
q. Human health and social work activities
r. Arts, entertainment and recreation
s. Other service activities
t. Activities of households as employers; undifferentiated goods-and-services-producing activities of households for own use
u. Activities of extraterritorial organizations and bodies

ISCO-08, the latest version published in 2008 by ILO, the International Labour Organization, classifies occupations in 10 major groups, the broadest classification, and 436 minor groups, the most detailed. The 10 major groups are (Department of Economic and Social Affairs 2008):

- Managers
- Professionals
- Technicians and Associate Professionals
- Clerical Support Workers
- Services and Sales Workers
- Skilled Agricultural, Forestry and Fishery Workers
- Craft and Related Trades Workers

- Plant and Machine Operators, and Assemblers
- Elementary Occupations
- Armed Forces Occupations

The majority of individuals involved in agriculture are part of "Skilled Agricultural, Forestry and Fishery Workers", including those involved in subsistence agriculture, hunting and gathering. However, "Agricultural, Forestry and Fishery Labourers" are part of Elementary Occupations (ILO 2012). In order to make sure there are no mistakes in the survey, both categories will be considered as one.

Both surveys allow for the separation of locals from migrants based on place of birth (in the locality, in another part of the country, in another country) and whether they have always lived in the locality or elsewhere (in another part of the country, in another country). However, there will be differences between a person who was born in another city and moved into the locality 20 years ago from another who has lived in the area for only two years. For this reason, in order to make a clear distinction I will separate individuals into residents and non-residents using the definition given by the Amazonian Law, as well as between migrants and locals (individuals born in the locality). That is, for the purpose of the research, residents will be all individuals who were born in the locality or who have lived there for six or more years.

While ISIC makes it possible to compare business activities between the two surveys, it does not allow for an analysis of the oil sector. All 'mining and quarrying' activities in the 60 localities are indeed distinguished from the activities of oil companies. However, environmental remediation is included in 'water supply; sewerage, waste management and remediation activities', even though some are performed by the oil companies themselves (e.g. project Amazonia Viva of PetroAmazonas). For this reason, when analysing the oil sector in particular the ISIC classification is not applicable. The variable *worked_lastweek* registers all individuals who worked the previous week for at least one hour and *works* also registers those individuals who did not work but have an occupation to return to (e.g. they were absent due to illness or vacation).

4.1.1 Asset Index

The household survey did not include questions regarding profits, income or consumption expenditures. However, as mentioned earlier, it was partially based on Demographic and Health Surveys (DHS) and includes so-called 'asset indicators', that is, data on asset ownership and characteristics of the dwelling (Appendix 10). These variables allow for the construction of an asset index, which proxy for wealth through the application of Principal Component Analysis or PCA. PCA is a statistical technique that extracts 'from a set of variables those few orthogonal linear combinations of the variables that capture the common information most successfully' (Filmer and Pritchett 2001).

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Poverty is traditionally measured against a threshold determined by the expenses necessary in order to consume a specific list of goods. This approach does not permit such calculation. Instead, through the use of PCA, an index ranks the surveyed households or individuals within the distribution and creates a relative measure (Filmer and Pritchett 2001), which will be separated into quintiles. All variables included in the calculation were binary (e.g. whether a family owns or not a bicycle). A usual concern is the tendency of asset indices to rank rural households lower than urban households. Given that this research includes, and compares, only rural households, this issue is not present. However, I do perform two different asset indexes, one including and another excluding farm animals.

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4.2 Empirical Model

To analyse the employability in the oil sector and determine the predictors variables, I make use of a Logit model. The empirical model, which employs basic characteristics of members of the communities, is as follows:

$$\Pr(Oil = 1) = F(\beta_0 + \beta_1 Male + \beta_2 Hh_{head} + \beta_3 Age + \beta_4 Local + \beta_5 Resident + \beta_6 Eth_{identities} + \beta_7 Education + \beta_8 Land$$

Where the dependent variable ***Oil***, takes the value of 1 for individual employed in the oil industry, both for oil extraction and environmental remediation. ***Male*** controls for gender, ***Hh_head*** is a dummy variable which takes the value of 1 if the person is head of his household. ***Age*** is a continuous variable which reports the age of an individual in years. ***Local*** and ***Resident*** are dummy variables that take the value of 1 if an individual was born in the locality (0=born elsewhere) and if he has lived there for at least 6 years (0=has lived in the locality for 5 years or less), respectively. ***Eth_identities*** and ***Education*** are both categorical variables. The first controls for the ethnic identities (i.e. mestizo, indigenous, Afro-Ecuadorian or Montubio, and white) while the second contains the levels of education[23]. The model is run twice, with and without controlling for ***Land***, which is a numerical variable that control for the number of hectares owned.

The model uses unbalanced data, given that of all observations in the subsample of working-age population (3374) and people with a job (2183) only 215 work for oil companies. The literature talks about 'rare events' – the class of interest is tens to hundreds of times smaller than the majority class which is the 'non-events' class (Van der Paal 2014). According to Allison (2012), there can be a small-sample bias when doing a maximum likelihood estimation, which calls for other methods[24]. However, "the degree of bias is strongly dependent on the number of cases in the less frequent of the two categories" (Allison 2012) and the

[23] When running the model preschool, literacy center and superior non-university are excluded given the lack of observations for oil workers.

[24] Two of these methods are comparative log-log and the Firth method (Van der Paal 2014). When running a model controlling only for gender [$\Pr(Oil = 1) = F(\beta_0 + \beta_1 Male)$] I got similar results while using the Firth method (command firthlogit in Stata) and a Logit model.

number of events used in the model for oil employment is large enough to use a logit model. The results of the regression are presented in the following chapter.

Chapter 5
Findings and Analysis

5.1 Working-age Population

To avoid any confusion, I will refer to the data as a) 'ENEMDU' for the national household survey and b) as 'surveyed localities' for the household survey conducted in the 60 communities. There are 3374 observations in the dataset for the surveyed localities once all individuals under 15 years old are removed. Tables 1 to 4 display the frequencies and percentages for the following locations: (1) rural Amazon, (2) rural areas of the other 4 provinces (that is, the Amazonian provinces excluding Sucumbios and Orellana), (3) rural areas of Sucumbios and Orellana (the provinces where the surveyed took place) and (4) the surveyed localities. Since the analysis is performed for categorical variables, I tested whether the differences between geographic location are statistically significant by using the Pearson's chi square test (Appendix 1 to 4).

Table 1
Characteristics of the Working-age Population

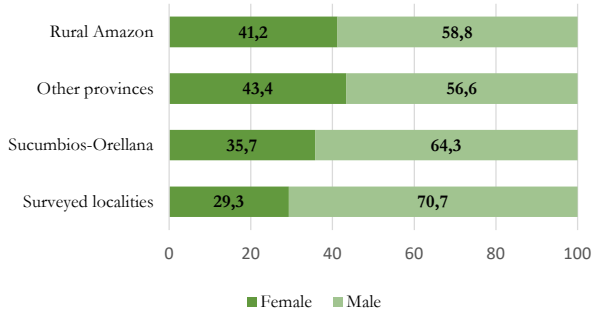
	ENEMDU - Rural Amazon						Primary data	
	(1)		(2)		(3)		(4)	
	Total		Other provinces		Sucumbios-Orellana		Surveyed localities	
	N	%	N	%	N	%	N	%
Gender								
Women	4137	48.8*	2939	49.7*	1198	46.8	1573	46.6
Men	4343	51.2*	2980	50.4*	1363	53.2*	1801	53.4
Ethnic Group								
Mestizo	4511	53.2*	2893	48.9*	1618	63.2*	2657	78.8
Indigenous	3712	43.8*	2862	48.4*	850	33.2*	595	17.6
White	137	1.6	74	1.3*	63	2.5	60	1.8
Afro-Ecuadorian	101	1.2	80	1.4	21	0.8*	50	1.5
Montubio	19	0.2	10	0.2	9	0.4	12	0.4
Level of Education								
None	446	5.3	296	5.0	150	5.9	168	5.0
Literacy center	47	0.6	36	0.6	11	0.4	16	0.5
Preschool	0	0.0	0	0.0	0	0.0	2	0.1
Primary	2974	35.1*	2004	33.9*	970	37.9	1284	38.1
Secondary	4423	52.2	3118	52.7	1305	51.0	1765	52.3
Superior non-university	123	1.5*	105	1.8*	18	0.7*	5	0.2
Superior university	444	5.2*	340	5.7*	104	4.1	134	4.0
Postgraduate	23	0.3	20	0.3	3	0.1	0	0.0
The person works								
Yes	5995	70.7*	4261	72.0*	1734	67.7*	2197	65.1*
No	2485	29.3*	1658	28.0*	827	32.3*	1177	34.9*
	8480		5919		2561		3374	

* The difference between this value and that of the surveyed localities is statistically significant.
Source: Household Survey 2016; ENEMDU 2016.

Table 1 presents the characteristics of the working-age population according to their gender, ethnic group, level of education and employment status. In the surveyed localities, 53.4% of the working-age population are men which is slightly higher than in the rural areas of 'other provinces' but very similar to the average of the rural area of the Sucumbios and Orellana. What is very particular of the surveyed localities, is the ethnic groups of the inhabitants. The survey shows that only 17.6% of the population there are indigenous while 78.8% are mestizo. This is a very low rate considering that ENEMDU shows that 44% of the indigenous population live in the Amazonian region, of which 86% live in rural areas (Appendix 5). Given that Sucumbios and Orellana were the first provinces to receive a large inflow of immigrants it is not surprising that they have a larger percentage of mestizos; however, this shows that in the communities in the vicinity of oil operations the concentration is even larger.

Table 1 also shows that about 4% of the population in rural Sucumbios-Orellana and in the surveyed areas had attended university compared to 5.7% in the remaining Amazonian provinces. The percentage of the population who has attended up to high school is very similar for the four geographic classifications; however, in the surveyed localities the percentage of people who only studied up to primary school is larger than the average of these two provinces. The percentage of individual who either attended superior university, non-university or a postgraduate program, is only 4.9% in Sucumbios and Orellana (4.1% in the surveyed localities) and 7.9% in the other four provinces. The same table presents the results for the level of employment. The percentage of people who work is smaller in the rural areas of Sucumbios and Orellana (67.7%), especially in the surveyed localities (65.1%), when compared to the remaining provinces (72%).

Figure 1
Workforce participation by gender



The differences between the three geographic areas and the surveyed localities are statistically significant.
Constructed by the author.
Source: Household Survey 2016; ENEMDU 2016.

Table 2 presents the classifications between migrants-locals and residents-non-residents, and the number of years immigrants have lived there. The percentage of migrants is much lower in 'other provinces' (36.4%) than in Sucumbios and Orellana where the largest percentage of the population were not born there (59.3%). The share of migrants in the surveyed localities is 3 percentage points smaller which means that there are other areas in the two provinces that are more attractive to migration. However, the percentage of non-residents across all locations is very small, being the highest for the surveyed localities (7.2%). This is because in the last 10 years the inflow of migration (for individuals who remained in the location) to Sucumbios and Orellana, is actually smaller than in previous decades. The opposite occurs with 'other provinces' which seems to be attracting more migration.

Table 2
Migration in the Rural Amazon

	ENEMDU - Rural Amazon						Primary data	
	(1) Total		(2) Other provinces		(3) Sucumbios-Orellana		(4) Surveyed localities	
	N	%	N	%	N	%	N	%
Migration								
Born in the locality	4810	56.7*	3767	63.6*	1043	40.7*	1476	43.8
Migrated from elsewhere	3670	43.3*	2152	36.4*	1518	59.3*	1898	56.3
Years in the locality†								
0-10	940	25.6*	585	27.2*	355	23.4	431	22.7
11-20	950	25.9	541	25.1*	409	26.9	529	27.9
21-30	802	21.9*	405	18.8*	397	26.2	549	28.9
31-40	536	14.6*	295	13.7*	241	15.9	336	17.7
41-50	380	10.4*	278	12.9*	102	6.7*	48	2.5
51+	62	1.7*	48	2.2*	14	0.9*	5	0.3
Residential status								
Resident	7931	93.5	5541	93.6	2390	93.3	3130	92.8
Non-resident	549	6.5	378	6.4	171	6.7	244	7.2
	8480		5919		2561		3374	

† For individuals who were not born in the locality.
* The difference between this value and that of the surveyed localities is statistically significant
Source: Household Survey 2016; ENEMDU 2016.

The characteristics of the labour market are presented in Figure 1 as well as in Table 3 and Table 4. Figure 1 separates the labour force participation according to gender. In the surveyed localities women only represent 29.3% of all workers while the average for rural Amazon is 41.2%. In rural Sucumbios and Orellana women participation is 35.7%. As for occupations, which are presented in Table 3, the percentage of individuals involved in agricultural activities, forestry, fishery and elementary occupations is smaller in the surveyed area (72.9%) than in the rest of the rural areas of the two provinces (77.1%); however, it still constitutes about 7 out of every 10 jobs. While the share is below the provincial average, it is very similar to that of the other 4 provinces (72.8%).

A distinguishing characteristic of the surveyed localities is the percentage of the surveyed population who worked as plant and machine operators and assemblers – about 7.6% of employed individuals. This percentage is twice as large as in the rest of the rural Amazon. There is also a higher percentage of "craft and related trade workers" (4.1%), that is, individuals working in construction, carpenters and mechanics than in the rural area of Orellana and Sucumbios (3.3%); however, this difference is not statistically significant.

Table 3
Share of employment according to the type of occupation

	ENEMDU - Rural Amazon						Primary data	
	(1)		(2)		(3)		(4)	
	Total		Other provinces		Sucumbios-Orellana		Surveyed localities	
Classification of occupations	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Skilled agricultural, forestry, fishers and elementary occupations	4437	74.0	3101	72.8	1336	77.1*	1602	72.9
Service and sales workers	573	9.6	418	9.8	155	8.9	196	8.9
Craft and related trades workers	283	4.7	226	5.3*	57	3.3	91	4.1
Professionals	242	4.0	179	4.2*	62	3.6	69	3.1
Plant and machine operators, and assemblers	241	4.0*	175	4.1*	67	3.9*	164	7.5
Clerical support workers	90	1.5	64	1.5	26	1.5	34	1.6
Technicians and associate professionals	80	1.3	55	1.3	25	1.4	25	1.1
Managers	31	0.5	25	0.6	6	0.4	16	0.7
Armed Forces Occupations	18	0.3	18	0.4	0	0.0	0	0.0
	5995		4261		1734		2197	

* The difference between this value and that of the surveyed localities is statistically significant.
Source: Household Survey 2016; ENEMDU 2016.

The classification of employment according to the type of economic activity in the different geographic areas is presented in Table 4. The most frequent economic activities are those related to "Agriculture, forestry and fishing". Their importance is the largest in rural Sucumbios and Orellana (70.5%) whereas in the surveyed localities and the rural Amazon in general, this group of activities has about 65% of participation. The surveyed areas present some differences with the rest of the rural Amazon. There, mining and quarrying is the second largest employer[25], although only representing 7.9% of jobs while the percentage of employees in administrative and support service activities, even though small, is three times larger than in the other areas (3.7% vs. 1.2%). Accommodation and food services, which includes hotels and restaurants, only represents about 1.8% of employment in the surveyed localities while in 'other provinces' it is 3.9%. Public administration and defence represent

[25] This group classification includes both mining and oil activities; however, in the surveyed localities no individual reported working in mining, therefore all observations correspond to oil.

only 2.2% of jobs in the surveyed areas and 2.8% in Sucumbios and Orellana, while in the other four provinces it provides 5% of jobs.

Table 4
Share of employment according to the type of economic activity

	ENEMDU - Rural Amazon						Primary data	
	(1)		(2)		(3)		(4)	
	Total		Other provinces		Sucumbios-Orellana		Surveyed localities	
	N	%	N	%	N	%	N	%
	Total		Other provinces		Sucumbios - Orellana		Surveyed localities	
ISIC - International Standard Industrial Classification	N	%	N	%	N	%	N	%
A. Agriculture, forestry and fishing	3974	66.3	2751	64.6	1223	70.5*	1449	66.0
B. Mining and quarrying	193	3.2	126	3.0*	67	3.9*	174	7.9
C. Manufacturing	173	2.9*	135	3.2*	38	2.2	46	2.1
D. Electricity, gas, steam and a/c suppliers	12	0.2*	5	0.1*	7	0.4	11	0.5
E. Water supply, sewage, waste management	13	0.2*	7	0.2*	6	0.4	35	1.6
F. Construction	230	3.8*	182	4.3*	48	2.8	57	2.6
G. Wholesale and retail trade, repair	309	5.2	223	5.2	86	5.0	111	5.1
H. Transportation and storage	119	2.0	83	2.0	36	2.1	35	1.6
I. Accommodation and food service activities	206	3.4*	167	3.9*	39	2.3	39	1.8
J. Information and communication	17	0.3	11	0.3	6	0.4	5	0.2
K. Financial and insurance activities	5	0.1	4	0.1	1	0.1	3	0.1
M. Professional, scientific and technic	11	0.2	10	0.2	1	0.1	3	0.1
N. Adm. and support service activities	72	1.2*	49	1.2*	23	1.3*	81	3.7
O. Public Adm. and defense	262	4.4*	214	5.0*	48	2.8	49	2.2
P. Education	207	3.5*	143	3.4	64	3.7*	56	2.6
Q. Human health and social work activities	68	1.1*	55	1.3*	13	0.8	13	0.6
R. Arts, entertainment and recreation	22	0.4	17	0.4	5	0.3	5	0.2
S. Other service activities	46	0.8	35	0.8	11	0.6	12	0.6
T. Activities of households as employer	56	0.9	44	1.0	12	0.7	13	0.6
	5995		4261		1734		2197	

* The difference between this value and that of the surveyed localities is statistically significant.
Source: Household Survey 2016; ENEMDU 2016.

5.2 Oil workers

The descriptive statistics for the logit model are presented in Table 5, separated into the working-age population and oil workers (tables with classifications by gender and ethnic identification are included in the appendix[26]). Since the characteristics of the general population have already been discussed while comparing the surveyed localities with the rural Amazon, I do not go through them again and focus only on the employees of oil companies. In

[26] Appendix 6 and Appendix 7

the surveyed localities only 215 individuals work for the oil sector, which represents 6.4% of the working-age population. The participation of women in the labour force of these communities is even lower in the oil sector – of all workers only 12.1% are female. Another characteristic of oil workers in the surveyed areas is that 91.6% are mestizo while only 5.1% of them are indigenous and 3.3% are from the other three ethnic self-identifications. In terms of migration, 62.3% of oil workers were not born in the same locality but 93.5% were residents, or in other words, have lived in the community for at least six years. Twenty-two percent of oil workers who are migrants arrived at the community 16 to 20 years ago (Figure 3). There is not a large difference between the average number of hectares of land possessed by the general working-age population (7.1 ha.) in comparison to oil workers (8.2 ha.); however, there is a large variation within each group). Figure 2 shows the type of occupations of these oil workers. According to the survey about half of them (50.7%) are plant and machine operators and 31.6% have elementary occupations. Of the remaining employees, the two largest groups work with crafts (6%) or are technicians and associate professionals (5.1%).

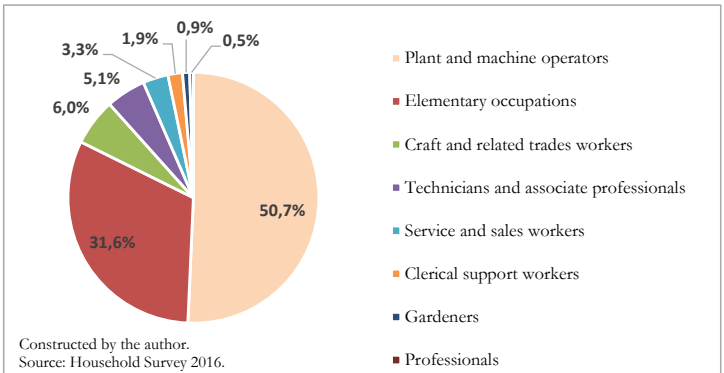
Two asset indexes were constructed through the use of PCA (Table 6), to account for the possession of farm animals. According to both indexes, 32.6% of individuals working for oil companies belong to the fifth or richest quintile of the population while there is a difference for the poorest quintiles. When farm animals are included in the wealth index 24.6% of employees from oil companies belong to the 1st and 2nd quintiles (20.7% when farm animals are excluded).

Table 5
Descriptive Statistics

	Working-age Population		**Oil Workers**	
	Mean	**St. Dev.**	**Mean**	**St. Dev.**
Oil jobs	0.064	0.244		
Male	0.534	0.499	0.879	0.327
Head of household	0.350	0.477	0.623	0.486
Age (years)	35.383	16.644	34.828	11.862
Local	0.437	0.496	0.307	0.462
Resident	0.928	0.259	0.935	0.247
Ethnic identities				
Mestizo	0.787	0.409	0.916	0.278
Indigenous	0.176	0.381	0.051	0.221
White	0.018	0.132	0.009	0.096
Afro-Ecuadorian or Montubio	0.018	0.134	0.023	0.151
Level of Education				
No education	0.050	0.218	0.028	0.165
Primary school	0.381	0.486	0.326	0.470
Secondary School	0.523	0.500	0.591	0.493
University	0.040	0.195	0.056	0.230
Hectares of land (ha.)	7.074	11.837	8.163	13.315
N	3374		215	

Note: All variables except for Age are binary (yes=1)
Source: Household Survey 2016.

Figure 2
Employment activities of oil workers in the surveyed localities



Constructed by the author.
Source: Household Survey 2016.

Table 6
Asset Index of Oil Workers

	Farm Animals included in the index		Farm animals excluded from index	
	Frequency	**%**	**Frequency**	**%**
1st Quintile	22	10.2	20	9.3
2nd Quintile	31	14.4	25	11.6
3th Quintile	42	19.5	42	19.5
4th Quintile	50	23.3	58	27.0
5th Quintile	70	32.6	70	32.6
N	215		215	

Note: Asset Index constructed through the use of Principal Component Analysis
Source: Household Survey 2016; ENEMDU 2016.

The results of the two logit models, which are presented in Table 7, shows similar results when the possession of land is included or not in the model. For this reason, I will only refer to (1). The regression shows that a man is 8.8% more likely than a woman to be employed in the oil sector while a person who is a household head is 5.5% more likely to have that job than other members of the household. Both results are statistically significant at the 1% level. Although the effect of age is also statistically significant, it is very small. In terms of migration, the model indicates that locals are 3.9% less likely to be hired by an oil company than individuals who are not born in the locality. Residents, however, are 3.3% more likely to

work in the sector than people who have been in the locality for five years or less. People with ethnic self-identification other than mestizo are less likely to be employed by an oil company – indigenous and white individual are 6.9% and 5.4% less likely to work for an oil company respectively; nonetheless only for the first group the results are statistically significant. In the model, the effects of education are not statistically significant while the effect of land possession are significant at the 10% level but very small.

Table 7
Logit Model for Employment in the Oil Sector

	(1) Model controls for land		(2) Land excluded from the model	
	Coefficients	Marginal effects	Coefficients	Marginal effects
Male	1.579***	0.088***	1.608***	0.089***
	(0.228)	(0.013)	(0.227)	(0.013)
Household head	0.995***	0.055***	0.933***	0.052***
	(0.194)	(0.011)	(0.190)	(0.011)
Age	-0.0281***	-0.002***	-0.0264***	-0.001***
	(0.007)	(0.000)	(0.007)	(0.000)
Local	-0.701***	-0.039***	-0.699***	-0.039***
	(0.195)	(0.011)	(0.194)	(0.011)
Resident	0.592*	0.033**	0.618**	0.034**
	(0.306)	(0.017)	(0.305)	(0.017)
Indigenous	-1.243***	-0.069***	-1.268***	-0.071***
	(0.327)	(0.018)	(0.326)	(0.018)
White	-0.968	-0.054	-0.926	-0.051
	(0.735)	(0.041)	(0.734)	(0.041)
Afro-Ecuadorian or Montubio	-0.0526	-0.003	-0.0422	-0.002
	(0.490)	(0.027)	(0.488)	(0.027)
Primary Education	0.0555	0.003	0.0876	0.005
	(0.450)	(0.025)	(0.450)	(0.025)
Secondary Education	0.414	0.023	0.433	0.0240
	(0.461)	(0.026)	(0.461)	(0.026)
University	0.714	0.040	0.744	0.041
	(0.551)	(0.031)	(0.550)	(0.049)
Hectares of land	0.00972*	0.001*		
	(0.006)	(0.000)		
Constant	-3.824***		-3.846***	
	(0.608)		(0.609)	
	N = 3374 Log likelihood = -692.852 Pseudo R2 = 0.1322		N = 3374 Log likelihood = -694.229 Pseudo R2 = 0.1322	

*P<0.1, **P<0.05, ***P<0.01
Values in parenthesis are Standard deviations.

5.2 Discussion

Gudynas (2009) states that in the Amazon extractive industries produce enclaves that connect to the rest of the country through the network of roads that were built for these operations. According to him in the eighties and nineties, the progressive and leftists' political currents criticized extractivism for generating these enclaves and contributing to poverty and inequality. However, the data suggest that the situation remains the same, as most of the local population performs unskilled tasks and remains uneducated.

The findings from the survey suggest that the oil sector in the Northern Ecuadorian Amazon generates little employment for the local communities, and it mostly employs male mestizos who represent 8 out of 10 oil workers while very few women and indigenous are employed. Only 6.4% of surveyed individuals in the working-age population were employed by an oil company. This result is only 1.3 percentage points higher than the one presented by Larrea et al. (2009) who, using data from 2001, found that oil activities in Sucumbios and Orellana employed around 5.1% of the working-age population[27]. The small difference suggests that despite the nationalization of oil operations and higher control from the government, the use of local labour has not been incentivized.

Unlike the results presented by Eliscovich (2016), the study found no evidence of higher levels of education in areas of oil operations. For high school attendance, the household survey shows no difference between the surveyed localities and the average of the rural Amazon; neither in comparison with the average of the rural areas of the Sucumbios and Orellana. For university enrolment, there was no difference with the average of the two provinces; and on the contrary, these percentages were lower than in other Amazonian provinces. The results of the logit model suggest that education does not play an important role in terms of employability in the oil sector, given that the effect of these variables is not statistically significant. More education does not seem to increase the probabilities of been hired given than locals are chosen to perform unskilled tasks. However, it is unclear whether no skilled job positions are taken by locals due to the lack of professionals in the communities, or whether there is a lack of incentive to pursue tertiary education given the historic type of jobs oil companies offer to them. In any case, twenty percent of the surveyed professionals are school teachers while around 10% are salesmen or perform unskilled jobs.

Areas of oil operations in the Northern Ecuadorian Amazon do not seem to attract as much migration as they did in previous decades. An interesting finding is that among the migrants who work for oil companies, only 26.9% arrived in the last 15 years while 56.4% have lived in the community since the late 1980s or 1990s. The majority of them perform elementary operations or work as plant and machine operators. The type of tasks performed in oil companies by locals as well as by migrants who live the communities suggests that the hierarchy of employment described by Little et al. (1992) remains valid – it implies that skilled

[27] 5.9% for Sucumbios and 4.3% for Orellana. The authors did not distinguish between urban and rural areas (Larrea et al. 2009).

jobs are performed almost entirely by outsiders who live in the companies' camps. The localities are home for unskilled migrants who probably arrived looking for a job. Due to the lack of information in regard to migration out of the localities (from both migrants and locals), it is only possible to know the characteristics of those who stayed.

Even though the face of neo-extractivism in Ecuador was former president Rafael Correa, the current government of Lenin Moreno maintains the same economic policy and plans to increase oil operations in the upcoming months and years. In November 2018, new operations were announced for Parahuacu and Drago, both in Sucumbios, representing 59 new oil wells. These new operations are expected to gradually increase their production during the next ten years (PetroAmazonas EP 2018). Ray and Chimienti (2017) analysed employment creation of the oil sector in Ecuador at the national level and reported that from 2008 to 2012 for every million dollars in exports, extraction generated around 16 indirect jobs and less than one direct job. In comparison, for the same export value, manufacturing created 25 direct and 21 indirect jobs while agriculture generated 100 direct and 33 indirect jobs. With this in mind, it is plausible that the new oil wells will not make a large difference in employment creation, especially direct, not at the national level and even less so for the local communities. According to the Amazonian Law, oil companies can hire less Amazonian residents than the required 70% when the qualified workforce cannot be found in the local communities. Because of the current level of education of residents of these communities, it is possible that this article from the law will easily be bent and will not make a significant difference in direct employment creation; unless not in the near future. It may be the case that the Amazonian Law will generate a more positive impact through the creation of indirect jobs given that it also mandates 70% of service providers to be local.

Chapter 6
Conclusion

The aim of this paper is to analyse direct employment generation of the oil sector in the Northern Ecuadorian Amazon. It does so through the use of a household survey conducted in 60 communities in Sucumbios and Orellana in 2016. The study found that the oil sector employs very few members of the local communities. Only 6.4% of the working-age population from the surveyed localities are employed by oil companies, mostly performing unskilled labour. Very few of the workers are women or indigenous. Although in the surveyed localities 56.3% of the working-age population is formed by migrants, they are not better educated, nor do they obtain more skilled jobs than locals. The results suggest that the local communities act only as a source of unskilled labour, while the qualified workforce is formed by outsiders who live the companies' camps.

Even thought for the oil industry backward and, especially, forward linkages tend to be modest, most employment creation is indirect. However, the data does not allow for such analysis. Another limitation of the study is the lack of information on income. The use of an asset index makes it possible to understand the wealth distribution within the surveyed localities, but it is unclear how these communities perform in comparison to other parts of the Amazon or the country average. Future research could analyse economic linkages in local communities of the Ecuadorian Amazon, which would provide a better understanding of the labour market in the region. In addition, a better understanding of the local impact of oil operations could be provided by a study which compares these localities with the ones farther away from oil operations (given that parishes are ENEMDU's lowest geographic desegregation which contain large number of villages from both comparison groups, it is not possible with the data currently available to make such analysis).

The results of the study suggest that the Amazonian Law, which was passed in May 2018 and mandates oil companies to hire at least 70% of their workforce from the Amazon, will not have a strong impact in direct job creation in the local communities. The requirement can be bent when the skills needed are not found in the area. Locals would need training programs to be hired for jobs which have been given through the decades to outsiders.

Appendices

Appendices 1 to 4 test, through the use of Pearson's chi square, whether the differences between the surveyed localities and: (1) the Rural Amazon, (2) Other Provinces and (3) Sucumbios and Orellana are statistically significant.

Appendix 1
Pearson's Chi Square – Characteristics of the Working-age Population

	p-value		
	(1) Rural Amazon	**(2) Other provinces**	**(3) Sucumbios-Orellana**
Gender (Women/Men)	0.033	0.005	0.904
Ethnic Group	0.000	0.000	0.000
Mestizo	0.000	0.000	0.000
Indigenous	0.000	0.000	0.000
White	0.532	0.040	0.068
Afro-Ecuadorian	0.203	0.607	0.020
Montubio	0.206	0.075	0.978
Level of Education	0.000	0.000	0.006
None	0.535	0.963	0.137
Literacy center	0.589	0.405	0.800
Preschool	-	-	-
Primary	0.002	0.000	0.888
Secondary	0.880	0.734	0.301
Superior non-university	0.000	0.000	0.001
Superior university	0.004	0.000	0.862
Postgraduate	-	-	-
The person works (Yes /No)	0.000	0.000	0.036
N	8480	5919	2561

H_0: The surveyed localities and the particular geographic location (1), (2) or (3) are not statistically significantly different.
Observations in surveyed localities: 3374

Appendix 2

Pearson's Chi Square – Migration within the Working Age Population

	p-value		
	(1) Rural Amazon	**(2) Other provinces**	**(3) Sucumbios-Orellana**
Migration (Born in the locality/Migrated from elsewhere)	0.000	0.000	0.020
0-10	0.017	0.001	0.640
11-20	0.112	0.049	0.546
21-30	0.000	0.000	0.072
31-40	0.003	0.000	0.157
41-50	0.000	0.000	0.000
51+	0.000	0.000	0.010
Residential status (Resident/Non-resident)	0.136	0.117	0.407
N	8480	5919	2561

H_0: The surveyed localities and the particular geographic location are not statistically significantly different.
Observations in surveyed localities: 3374

Appendix 3

Pearson's Chi Square – Share of employment for type of occupations and gender

	p-value		
	(1) Rural Amazon	**(2) Other provinces**	**(3) Sucumbios-Orellana**
Classification of occupations	0.000	0.000	0.000
Skilled agricultural, forestry, fishers and elementary occupations	0.319	0.904	0.003
Service and sales workers	0.381	0.249	0.985
Craft and related trades workers	0.266	0.041	0.162
Professionals	0.065	0.036	0.451
Plant and machine operators, and assemblers	0.000	0.000	0.000
Clerical support workers	0.879	0.887	0.903
Technicians and associate professionals	0.484	0.599	0.399
Managers	0.262	0.497	0.111
Armed Forces Occupations	-	-	-
Gender (Male/female)	0.000	0.000	0.000
	5995	4261	1734

H_0: The surveyed localities and the particular geographic location are not statistically significantly different.
Observations in surveyed localities: 2197

Appendix 4

Pearson's Chi Square – Share of employment for type of industry

	p-value		
	(1) Rural Amazon	**(2) Other provinces**	**(3) Sucumbios-Orellana**
Classification of economic activities	0.000	0.000	0.000
A. Agriculture, forestry and fishing	0.776	0.267	0.002
B. Mining and quarrying	0.000	0.000	0.000
C. Manufacturing	0.049	0.013	0.833
D. Electricity, gas, steam and a/c suppliers	0.023	0.003	0.655
E. Water supply, sewage, waste management	0.000	0.000	0.000
F. Construction	0.007	0.001	0.737
G. Wholesale and retail trade, repair	0.853	0.755	0.895
H. Transportation and storage	0.247	0.313	0.259
I. Accommodation and food service activities	0.000	0.000	0.290
J. Information and communication	0.664	0.815	0.485
N. Adm. and support service activities	0.000	0.000	0.000
O. Public Adm. and defence	0.000	0.000	0.280
P. Education	0.040	0.075	0.039
Q. Human health and social work activities	0.028	0.009	0.544
S. Other service activities	0.290	0.218	0.719
T. Activities of households as employer	0.133	0.073	0.694
	5995	4261	1734

Appendix 5

Indigenous Population per region

Region	Urban area		Rural area		Total	
Coast	202	56%	158	44%	360	4%
Highlands	997	19%	4,136	81%	5,133	52%
Amazon	591	14%	3,712	86%	4,303	44%
Total	1,790	18%	8,006	82%	9,796	100%

Elaborated by the author
Source: ENEMDU 2016.

Appendix 6

Survey Results: Employment Activities of Oil Workers by Gender

	Male	Female	Total
Local			
Yes	59	7	66
No	130	19	149
Resident			
Yes	178	23	201
No	3	11	14
Ethnic identities			
Mestizo	175	22	197
Indigenous	8	3	11
White	2	0	2
Afro-Ecuadorian or Montubio	4	1	5
Level of Education			
No education	6	0	6
Primary school	62	8	70
Secondary School	110	17	127
University	11	1	12
Type of job			
Plant and machine operators	95	14	109
Elementary occupations	60	8	68
Craft and related trades workers	12	1	13
Technicians and associate professionals	10	1	11
Service and sales workers	7	0	7
Clerical support workers	3	1	4
Gardeners	2	0	2
Professionals	0	1	1
N	189	26	215

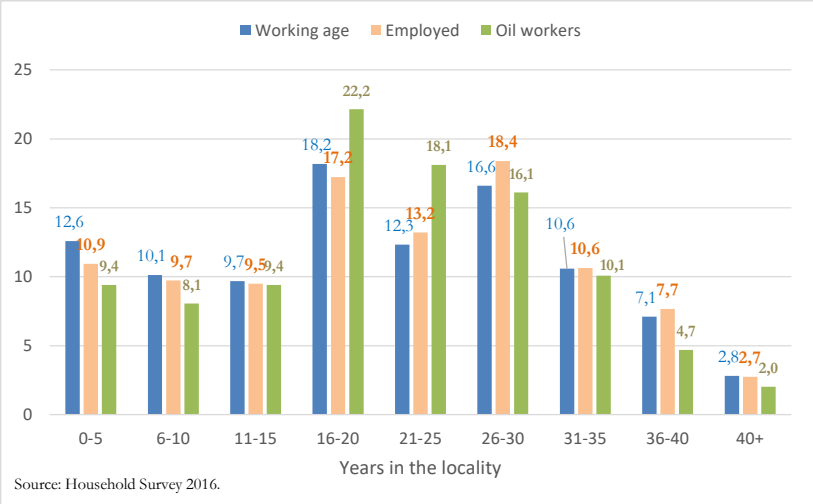
Results of the household survey in the 60 communities
Source: Household Survey 2016.

Appendix 7
Survey Results: Employment Activities of Oil Workers by Ethnic Identity

	Mestizo	Indigenous	White	Afro-Ecuadorian or Montubio	Total
Gender					
Male	175	8	2	4	189
Female	22	3	0	1	26
Local					
Yes	57	7	1	1	66
No	140	4	1	4	149
Resident					
Yes	184	11	2	4	201
No	13	0	0	1	14
Level of Education					
No education	4	0	0	2	6
Primary school	63	6	0	1	70
Secondary School	118	5	2	2	127
University	12	0	0	0	12
Type of job					
Plant and machine operators	104	1	2	2	109
Elementary occupations	57	8	0	3	68
Craft and related trades workers	12	1	0	0	13
Technicians and associate professionals	11	0	0	0	11
Service and sales workers	6	1	0	0	7
Clerical support workers	4	0	0	0	4
Gardeners	2	0	0	0	2
Professionals	1	0	0	0	1
N	197	11	2	5	215

Results of the household survey in the 60 communities
Source: Household Survey 2016.

Figure 3
Years in the locality of the migrant population



Source: Household Survey 2016.

Appendix 8 List of Surveyed Communities in Sucumbios		
Study location	**Surveyed households**	**Surveyed population**
12 de Octubre	20	87
13 de Marzo	22	97
16 de Abril	20	99
28 de Marzo	20	88
Aguas Negras	20	76
Bellavista	20	129
Chone 1	20	84
Cofán Dureno	20	111
Echeandía	20	86
El Naranjal	20	77
El Triunfo (Cantón El Eno)	20	67
Flor de Mayo	20	83
Las Palmas	20	82
Los Olivos	20	84
Marian 4	20	77
Patria Nueva	20	99
Recinto Bermejo	20	89
Rey de los Andes	20	99
San Andrés	20	103
San Vicente (Cantón Pacayacu)	18	83
San Vicente (Cantón San Roque)	20	91
Santa Marianita 1 - La Victoria Km 3 1/2	22	85

Santa Marianita 2	20	75
Siona Abokewira	16	78
Siona Sotosiaya	16	103
Tres Palmas	20	81
Unión Bolivarense	16	64
Unión, Paz Y Progreso	20	89
Virgen de Baños	20	86
Virgen del Rosario (Cantón Pacayacu)	17	82
Virgen del Rosario (Cantón Tarapoa)	17	74
Total	**604**	**2708**

Source: Behavioral Responses to Information on Contaminated Drinking Water: Randomized Evidence from the Ecuadorian Amazon – First Report - (Blondeel et al. 2016).

Appendix 9
List of Surveyed Communities in Orellana

Study location	Surveyed households	Surveyed population
2 de Septiembre	20	83
25 de Diciembre (Cantón 3 de Noviembre)	22	114
Barrio 25 de Diciembre (Cantón Joya de los Sachas)	18	72
Conga	19	70
Dayuma central	20	78
El Esfuerzo	20	88
El Puma	20	89
Km 26 - El Cóndor	20	79
La Andina	20	92
La Florida	20	86
La Parker	20	92
La Ponderosa	20	85
Las Palmeras	20	79
Loma del Tigre	20	109
Los Angeles	20	96
Los Leones- Auca Este	18	107
Nueva Joya	16	86
Pamigua	20	115
Pimampiro	20	87
Rumipamba	20	96
Saar Entsa	20	103
San Agustín	20	102
San Antonio	20	94

San Francisco	20	70
Santa Rosa	20	75
Shiripuno	20	79
Sultana del Oriente	20	91
Tiputini	20	76
Unión Chimboracense	20	85
Total	**573**	**2578**

Source: Behavioral Responses to Information on Contaminated Drinking Water: Randomized Evidence from the Ecuadorian Amazon – First Report - (Blondeel et al. 2016).

Appendix 10
Variables included in the Asset Index PCA

Variable	Component Score	
	Animals Included from Index	Animals Excluded from Index
Binary variables		
The house has electricity	0.1960	0.2534
The house has its own kitchen	0.0784	0.0910
Cooking is done with gas/electricity	0.1659	0.2092
Clock	0.1626	0.1959
Mobile	0.2113	0.2384
Bike	0.1731	0.2144
Motorcycle	0.2080	0.2014
Cart	0.0555	0.0547
Car	0.1850	0.1892
Canoe	-0.0670	-0.0767
Motorcanoe	-0.1106	-0.1283
Chainsaw	0.2069	0.1188
Tablet	0.1314	0.1463
radio	0.1456	0.1734
tv	0.2897	0.3532
phone	0.1211	0.1798
computer	0.2062	0.2506
fridge	0.2681	0.3191
washer	0.2327	0.2952
dryer	0.1254	0.1203
sattv	0.2282	0.2873
agr_car	0.0893	0.0850
Numerical variables		
Bedrooms	0.2766	0.2478
Land (hectars)	0.1572	0.0270
Cows	0.2082	
Other cattle	0.1843	
Horses	0.1521	
Pig	0.1921	

Poultry	0.1856
Rabbit	0.0978
Fish	0.1511

* The variables were taken to a scale of 0 to 4

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