

The Effect of Taxation Regime and Human Development Index on Upstream Oil and Gas Investment

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Abstract. This study aims to see the effect of the taxation regime and the human development index (HDI) on investment in the upstream oil and gas industry in eight oil and gas-producing countries for the period 2006-2018. The eight oil and gas-producing countries are the United States, United Kingdom, Canada, Norway, China, Indonesia, Peru, and Argentina. This study employs a quantitative method with panel data regression. The result shows that tax regime policy has a negative impact whereby a one per cent point increase in the tax rate will drive a decline in oil and gas upstream investment by 1.93 per cent. Meanwhile, the HDI has a positive significance on upstream oil and gas investment. An increase in the value of HDI by one per cent will increase the investment in the upstream oil and gas industry by 3.83 per cent.

Keywords: upstream oil and gas investment, taxation regime, human development index, panel regression.

1 Introduction

The oil and gas industry has a significant contribution to the economy of a country, such as Indonesia and the United States (the U.S.). In 2019, the oil, gas, and geothermal sector contributed 439.6 trillion Rupiah or 0.8 per cent to the total of Indonesia's Gross Domestic Product accounting for 52,843.4 trillion Rupiah [19]. Besides, the Ministry of Finance of the Republic of Indonesia [24] reported that non-tax state revenue (PNBP) from the natural resources sector reached 154.1 trillion Rupiah or approximately 38 per cent of the total revenue, where crude oil and oil lifting are the main pillars of this state revenue. In the case of the U.S., the contribution of the oil and gas sector reached 8 per cent of its GDP in 2017 [1]. Based on its contribution, this sector is considered crucial for the economy in a way that changes in production will significantly impact the economic growth of the two countries.

Along with increasing population growth, the demand for primary energy in various countries also increases from year to year. Oil and gas energy sources have a significant role in meeting the energy needs of a country. BP p.l.c. [3] reported that oil and gas were the first largest energy source with a contribution of 55.67 per cent of total energy sources in Indonesia.

Similarly, countries such as Argentina, Peru, China, the U.S., Canada, the United Kingdom (the U.K.), and Norway also relied on oil and gas as the main sources to meet their domestic energy needs. The existence of oil and gas has a big influence on these countries to support economic activities.

However, some countries are still experiencing a deficit in oil and gas energy sources supply (**Figure 1**). BP p.l.c. [4] reported that five oil-producing countries in the world, such as the U.K., the U.S., China, Indonesia, and Peru experienced an energy deficit which in turn could become a burden on state finance. This has become a concern for these countries to prevent and/or reduce oil and gas energy deficits. To increase energy security and reduce the state's financial burden, it is necessary to increase upstream oil and gas operations. Investment in the upstream oil and gas sector has an important role in maintaining and increasing the production of oil and natural gas that is ready to be sold nationwide. Investments are also needed to acquire large-scale national oil and gas reserves. If investment in the upstream oil and gas industry increases, oil and gas production will also incline, and vice versa.

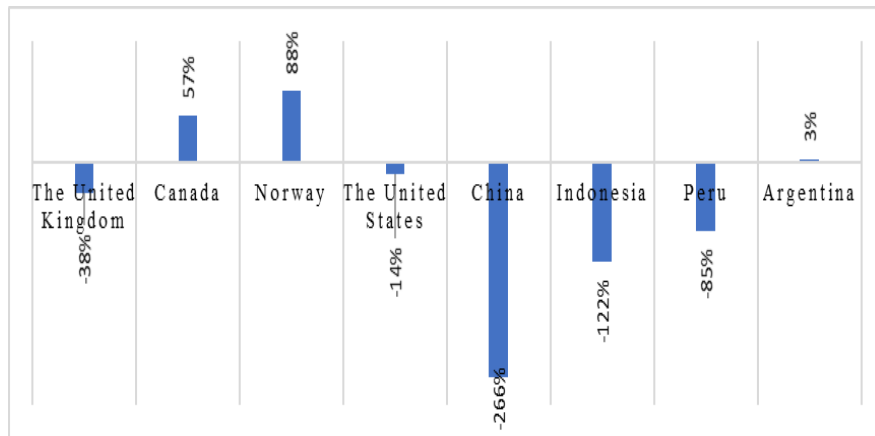


Figure 1. Energy Deficit in Eight Oil-Producing Countries in 2019 Source: BP p.l.c. (2020)

Fraser Institute [16] reported several factors that will affect upstream oil and gas investment decision-making in various oil and gas companies in the world. The survey was conducted among managers and executives with regard to oil and gas investment barriers in their company jurisdiction. The report showed fifteen factors, two of which are economic factors, namely tax regime and availability of labor skills. The tax regime factor is interesting to study considering that this variable is rarely used in previous studies. The tax regime includes personal, corporate, payroll, capital (extraction, production, and development), and other taxes, and the complexity of tax compliance [14]. Besides, along with the industrial shift towards a more sophisticated direction with the adaptation of artificial intelligence and automation in the business processes of the upstream oil and gas industry, the human development index factor is interesting to study because it is related to the availability of skilled labor in this industry.

Hurst [20] stated that the investment return rate in the oil and gas industry is determined by the price clause in the sales contract and fiscal regime (income tax, royalty, rent tax, and equity acquisition) which in turn affect the company's profits. The imposition of tax on the upstream oil and gas industry in several oil-producing countries has different schemes depending on the regulations made by the government. The extraction tax on the upstream oil and gas industry fully depends on the type of contract signed by the contractor. There are two common contracts in the upstream oil and gas industry, namely the Concessionary system and Production Sharing Contract (PSC) system.

A concessionary system is a system in which the government will transfer the ownership of oil and gas resources to its partner companies for the production process. The companies will then pay taxes and royalties. Meanwhile, in the PSC system, after the companies produce oil and gas, they will get a share of production or sales. Countries such as the U.S., the U.K., Norway, Argentina, and Canada apply the concessionary system while the PSC system is adopted by China, Peru, and Indonesia. Among the eight countries mentioned before, the U.S. imposes the lowest tax rate on the upstream oil and gas industry at 21 per cent, whilst the U.K. and Argentina are the two countries with the highest tax rate at 30 per cent.

Apart from the tax regime, the availability of skilled labor is also an investment consideration in the upstream oil and gas industry. The upstream oil and gas industry requires a high level of skill in exploration and production activities. Low quality of skills will be a cost burden for the company due to the obligation to conduct or provide additional training to enhance their staff's capacities and capabilities. The availability of skilled labor could be reflected by a country's human development index. There are three parameters to measure the human development index, such as education, health, and spending. Among the eight oil and gas-producing countries mentioned earlier, Norway had the highest human development index in 2018 with 0.954 points, while Indonesia is the country with the lowest human development index accounting for 0.707 points.

The study conducted by the Fraser Institute [16] is a subjective study in which it surveyed the managers and executives of the upstream oil and gas companies in the world related to the investment barriers rate faced by the companies in their jurisdictions. Two economic factors

such as tax regime and skilled labor were believed to impact the upstream oil and gas investment decision in several countries. The survey result should be proven and confirmed by an objective study with a scientific approach. This study, therefore, aims to prove and confirm the effect of tax regime policy represented by extraction tax and human development index on the investment decision in the eight oil-producing countries, namely the U.K., the U.S., Norway, Canada, China, Indonesia, Peru, and Argentina.

2 Research Methods

This study focuses on eight oil-producing countries in the world, namely the U.S., the U.K., Canada, Norway, Indonesia, China, Argentina, and Peru using annual data from 2006 to 2018. The parameters used in this study are upstream oil and gas investment as the dependent variable, as well as the extraction tax and human development index as independent variables. As mentioned before that the extraction tax is one part of the tax regime, this study uses the extraction tax as a tax regime parameter. In addition, this study also uses world oil prices as a control variable. The upstream oil and gas investment data is based on a total of real expenditure of exploration, production, and development process in each country in Million US\$. Meanwhile, the extraction tax in the upstream oil and gas industry is taken from the Ministry of Energy and Resource of each country. The data are acquired from BP Statistics Review 2019, United Nation Development Program, BP Statistical Review of World Energy 2019, the Central Bureau of Statistics and or Ministry of Energy and Resource of each country. This study uses data panel regression (random effect model) to find out the effect of the extraction tax, HDI, and WTI oil price on the upstream oil and gas investment. Investment in upstream oil and gas model is estimated in the following model:

$$inv_{it} = \beta_0 + \beta_1 tax_{it} + \beta_2 hdi_{it} + \beta_3 oil_{it} + u_i + e_{it} \dots \dots \dots (1)$$

where:

- inv_{it} :the natural logarithm of the real upstream oil and gas investment for country i in period t
- tax_{it} :tax rates imposed on the upstream oil and gas industry for country i in period t
- ipm_{it} :the natural logarithm of the human development index for country i in period t
- oil_{it} :the natural logarithm of the world crude oil (WTI oil type) price for country i in period t
- u_i :the specific influence of the individual
- e_{it} :effect of the error on state i in period t

3 Results and Discussion

There are several stages of testing involving the estimation of PLS, fixed effect (FE), and random effect (RE) models to determine the best model in this study. The result shows that the best estimation model in this study is RE. According to the classical assumption test, the RE model shows heteroscedasticity and autocorrelation problems. Therefore, it is necessary to overcome it by robust regression, robust standard error, and cluster to obtain a better model. The next step is to perform statistical tests on the model simultaneously or partially by involving simultaneous significance tests (F-test), partial tests (t-test), and determination coefficient tests (R^2).

Table 1. Random Effect Model Estimation

Variable	Coefficient	Prob
tax	-0.0193362	0.040**
hdi	3.826181	0.009**
oil	0.6556405	0.000**
constant	8.238059	0.000**
Prob>F		0.0000
R ²		0.2137

** significant at 5 per cent

The final regression estimation in this study is provided in **Table 1**. The result shows that at the 5 per cent significance level, all independent variables were statistically significant in this model. The table reports a negative relationship between the extraction tax and the investment, while the human development index affects the investment positively. Besides, the oil price has a positive relationship with the investment. The result is supported by the t-test, where each of the independent variables has a significant effect on the dependent variable. Besides, the F-test shows 0.0000 which means at least one variable has a significant effect on the dependent variable.

3.1 Extraction Tax and the Upstream Oil and Gas Investment

Policymakers are facing two distinct challenges regarding taxation. Taxes are important in increasing the national income to fund government activities. Corporate income and production taxes are levied by the government as income taxes from natural resources exploitation. The higher the tariff, the more revenue the government can spend on the public interest. On the other hand, taxes are a disincentive for the community since they will have a direct impact on consumption levels. The higher the tax rate imposed by the government on upstream oil and gas companies, the greater the distortions faced by the company. Eventually, it will affect the company's cash flow. For this reason, policymakers need to set efficient taxes to encourage economic activity. The tax rate is an important consideration for investors in making investment decisions. The current extraction tax for the upstream oil and gas industry in several countries is based on the type of contract or upstream tax policy in each country.

The result shows that tax regime policy has a negative significant impact with a coefficient

value of 1.93. This means if there is an increase in the tax rate by one per cent point, oil and gas upstream investment will decline by 1.93 per cent. The negative effect of the extraction tax variables on investment in the upstream oil and gas industry is also supported by Brown, Maniloff, & Manning [5] and Cox & Wright [7]. Brown et al. [5] state that oil and gas companies in the U.S. respond to changes in the extraction tax more than changes in world oil prices. Their research shows that a one per cent increase in the extraction tax led to a decline in upstream oil and gas investment. In addition, research conducted by Cox & Wright [7] shows that changes in the extraction tax in the U.S. (U.S. Corporate Federal Income Tax) have a significant influence on investor decisions to invest in the upstream oil and gas industry.

The results of this study also support a survey conducted by the Fraser Institute [15], in which the tax rate influences companies' decisions to invest in the upstream oil and gas industry. A country has a high investment attractiveness when it implements a competitive tax policy compared to other countries. On January 1, 2018, The U.S. reformed the Federal Corporate Income Tax (FCIT) from 35 to 21 per cent [15]. As the impact of the U.S. tax policy, multinational businesses tried to design the most profitable strategies by re-evaluating their investment, financing, and other activities. In other countries, policymakers were re-evaluating their business tax systems due to the U.S. reform. For example, in November 2018, Canada responded to the U.S. tax reformation by applying a temporary incentive to invest in capital, thereby effectively reducing the overall tax burden on the natural resource-producing sector, including oil and gas-producing companies. The tax reformation in Canada has a smaller impact on the natural resource sector than on the manufacturing sector. However, this response was sufficient to restore the competitive tax advantage of the U.S. tax reformation [15].

Tax reform also occurred in Indonesia. From 2006 to 2008, Indonesia imposed a material income tax for the upstream oil and gas industry of 30 per cent which then decreased in 2009 to 28 per cent and then changed to 25 per cent in 2010 [8]. According to the Directorate General of Taxes Ministry of Finance of the Republic of Indonesia [11], if comparing the average tariff in ASEAN countries (22.35 per cent) and the average rate in OECD countries (23.69 per cent), the policy to reduce tax rates at this level may not attract investors in the short term. Fraser Institute [13] stated that almost 80 per cent of respondents stated that the tax in the oil and gas industry influences investment in the oil and gas industry in Indonesia. Similar conditions occurred in several oil-producing countries, where almost 40 per cent of respondents in Peru, 38 per cent in Canada, 25 per cent in the U.S., and 20 per cent in Argentina, Norway, and the U.K. respectively, believe that the tax rate influences the investment in the oil and gas industry.

Fiscal incentives might be considered by the government to encourage oil and gas investment decision-making. The government can learn from the successful implementation of fiscal incentive policy in encouraging the development of fracking technology [18]. This policy may be applied in Indonesia which has a high level of technological challenge. Currently, Indonesia has 68 unexplored basins which are mostly based in the eastern deep-water areas of Indonesia [10]. Iswahyudi [22] stated that insufficiency of the infrastructure facilities is one of eastern Indonesia's challenges in this industry. He also argued that the government could develop the oil and gas upstream industry in these areas by designing fiscal incentive schemes that could be used for the development of extraordinary and complex extraction technologies, such as hydraulic fracturing.

3.2 Human Development Index (HDI) and the Upstream Oil and Gas Investment

In making decisions, investors in the upstream oil and gas industry also consider the human resource quality of the host country. The HDI, consisting of education, health, and income parameters, can represent the quality of human resources in a country. The lower the quality of education and health, the lower the quality of workers a host country provides. Lower quality of workers may result in suboptimal exploration and exploitation activities in the upstream oil and gas industry. One solution to overcome this problem is to provide training for workers, even though it will be an additional cost for a company. This situation is contrary to Fung, Iizaka, & Parker [17] which stated that investors will certainly invest in companies that offer low fees so that their revenue is maximized.

This study examines the effect of the HDI on the investment in the upstream oil and gas industry of eight oil and gas-producing countries during the years 2006-2018. The result depicts that the HDI factor has a significant positive effect on investment in the upstream oil and gas industry at a five per cent significance level. Every one per cent increase (decrease) in the HDI value will increase (decrease) the investment in the upstream oil and gas industry by 3.83 per cent, *ceteris paribus*. This result shares a similar conclusion with Twimukye [25], Chantasawat, Fung, Hitomi, & Alan [6], Kinoshita & Campos [23], and Fung et al. [17]. Twimukye [25] explains that literacy levels have a significant positive effect on investment decisions. This result also supports the Fraser Institute [16] study, where the availability of skilled labor can influence investors' decisions to invest in the oil and gas industry. On the contrary, according to Iskandar, Juanda & Johan [21], education has no significant impact on foreign direct investment in the upstream oil and gas industry.

Fraser Institute [13] reported that nearly 60 per cent of respondents stated that the availability of skilled labor affects investment in the oil and gas industry in Indonesia. Meanwhile, there is 50 per cent of respondents in Peru, and more than 20 per cent of respondents from Argentina, the U.S., and Canada, respectively, share similar arguments. The respondents believe that the availability of skilled labor will be one of the crucial considerations in investing in the upstream oil and gas industry. The upstream oil and gas industry is a capital and technology-intensive sector, so it is necessary for a government to increase the capacity and capability of their workforce, especially in the oil and gas industry.

According to Iswahyudi [22], from 1998 to 2003, Indonesia's petroleum industry developed its human resources relatively through expanding petroleum education and training. As an implication, during the period from 2004 to 2010, Total Factor Productivity's (TFP) contribution to oil output increased significantly compared to the previous period. Indonesia's annual petroleum output increased by an average of 0.77 per cent in which the largest contribution was TFP with 0.58 per cent, followed by capital stock and labor input factors with 0.11 per cent and 0.08 per cent respectively. This significant increase in TFP contribution was unpredictable as it occurred during the Asian Crisis.

In meeting the need for skilled workers, some foreign companies prefer to employ international or local workers [2]. The availability of local resources is considered unable to meet the needs of these companies. In 2018, Indonesia revoked the permit related to the Recommendation of Foreign Workers [9]. With this revocation, of course, the government needs to optimize the performance of Indonesian workers in the upstream oil and gas industry. If the government fails to do so, it could potentially lead to a decrease in investor interest in

investing in Indonesia.

EY & PetroLMI [12] asserted that in the next twenty years, the oil and gas industry has the potential to adopt new technologies to increase productivity and safety while reducing production costs to maximize profits, especially in facing a prolonged decline in world oil prices. In this industry, the use of automation and artificial intelligence has become widespread, where gradually over the years will replace routines and repetitive tasks. This should encourage workers in the upstream oil and gas industry to focus on higher value activities which certainly require more specialized skills.

4 Conclusion

For the last few years, investment in the upstream oil and gas industry in eight oil and gas-producing countries (i.e., Argentina, Canada, China, Indonesia, Norway, Peru, the U.K., and the U.S.) has decreased significantly. According to the Fraser Institute survey, there are two economic factors that affect companies in making decisions regarding investment in the upstream oil and gas sector, namely taxes and the availability of skilled workers. This study aims to prove the mentioned survey, by using the corporate income tax rate of upstream oil and gas (exploration and exploitation) as a proxy for the extraction tax and the human development index (HDI) represents the availability of skilled labor. The results indicate a significant effect of the extraction tax and HDI on the upstream oil and gas investment in the eight countries during the period of 2006-2018. The extraction tax has a negative effect on investment decisions in the upstream oil and gas industry. Provided the government increases the tax rate, the investment will decrease, and vice versa. On the contrary, the HDI has a positive effect on investment in the upstream oil and gas industry. The increasing value of HDI will increase investors' interest in investing in that country and vice versa.

The government must continuously evaluate the extraction tax so as not to become a negative sentiment for the investors. The competitive tax may attract investors to invest in the upstream oil and gas sector. This policy must be accompanied by the implementation of a consistent and fair tax scheme. In addition, massive improvement in the quality of human resources needs to be made by the government. Improving the quality of human resources can be focused on improving the skills of workers in the oil and gas industry in particular and also on improving the quality of education in general.

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