*Indonesian Treasury Review* Vol.10, No.1, (2025), 24-38
P-ISSN: 2527-2721; E-ISSN: 2622-4399
https://itrev.kemenkeu.go.id

INDONESIAN TREASURY REVIEW
JURNAL PERBENDAHARAAN, KEUANGAN NEGARA DAN KEBIJAKAN PUBLIK

# ANALYSIS OF THE IMPACT OF GROSS SPLIT PRODUCTION SHARING CONTRACTS IN THE UPSTREAM OIL AND GAS SECTOR ON STATE REVENUE

Mohamad Nor Rizal[1*], Sri Murwani[2]
[1]Direktorat Jenderal Pajak, Kementerian Keuangan, Jakarta
[2]Badan Pendidikan dan Pelatihan Keuangan, Kementerian Keuangan, Tangerang Selatan
Email: [1]mnrizal96@gmail.com
*Corresponding author

**ABSTRACT**
**Research Originality —** Since 2017, Oil and Gas Cooperation Contract Contractors (KKKS) have had the option to use Gross Split (GS) Production Sharing Contracts (PSC) to manage oil and gas (migas) work areas (WK) as an alternative to the Cost Recovery (CR) PSC, which has been in place since the 1960s. However, despite its implementation since 2017, no research has specifically examined the impact of GS PSCs on state revenue. Most studies have instead focused on their effect on KKKS profitability.
**Research Objectives —** This study aims to provide empirical evidence on the impact of GS PSC implementation in managing oil and gas WKs, particularly in relation to state revenue.
**Research Methods —** The study employs a difference test and an impact test. The difference test utilizes data from six relatively similar WKs in 2018, while the impact test is conducted using data from 35 WKs over the period 2018–2022.
**Empirical Results —** The findings indicate that state revenue from a WK decreases after transitioning to the gross split scheme. Additionally, gross split has a significant negative impact on state revenue. Other variables significantly and negatively affecting state revenue include operating costs, lifting, and selling prices. Conversely, contractor profit has a significant positive effect on state revenue.
**Implications —** The results suggest that adopting gross split PSCs and/or increasing operating costs will reduce state revenue in the current year. Conversely, higher lifting volumes, selling prices, and contractor profits contribute to increased state revenue in the same period.

**Keywords**: Cost Recovery, Gross Split, oil and gas, Production Sharing Contract, state revenue
**JEL Classification**: H0, H2, H3
**How to Cite**: Rizal, M. N. & Murwani, S. (2025). Analysis of the impact of gross split production sharing contracts in the upstream oil and gas sector on state revenue. *Indonesian Treasury Review: Jurnal Perbendaharaan, Keuangan Negara dan Kebijakan Publik, 10*(1), 24-38. https://doi.org/10.33105/itrev.v10i1.1006

## INTRODUCTION

All countries strive to maximize economic gains from the management of oil and gas fields (Johnston, 1994). The International Energy Agency (2020) explains that the economic benefits derived from oil and gas field management can serve as a source of state revenue, which in some countries is utilized to finance education, healthcare, and job creation.

As an oil and gas-producing country, Indonesia also generates revenue from managing oil and gas fields. According to *Book II of the 2023 Financial Note*, state revenue from oil and gas work areas (WK migas), derived from Oil and Gas Income Tax (PPh Migas) and Non-Tax State Revenue (PNBP) from oil and gas natural resources (SDA Migas), reached IDR 149.46 trillion in 2021 (Republik Indonesia, 2022). In 2021, oil and gas revenue contributed 7.43% to total state revenue (Republik Indonesia, 2022).

In 2014, oil and gas revenue contributed up to 21.15% of total state revenue, amounting to IDR 304.32 trillion (Republik Indonesia, 2017). Figure 1 below illustrates the contribution of oil and gas revenue from 2014 to 2021 compared to other state revenue sources.

Figure 1 shows that the contribution of oil and gas revenue to total state revenue has declined, whereas other revenue sources have either increased or remained stable relative to total state revenue.

**APPLICATION IN PRACTICE**

- This study identifies the KBH scheme that optimizes state revenue from Indonesia's upstream oil and gas sector.
- The study aims to analyze the impact of adopting a relatively new KBH scheme, namely the gross split scheme, on state revenue.
- The findings reveal the reasons behind the continued decline in oil and gas revenue and production, despite the introduction of a new policy in 2017.
- Intense global competition and the changing conditions of Indonesia's work areas (WK) necessitate adjustments in the production-sharing mechanism (KBH) to attract investors and contractors to manage WK in Indonesia.

In addition to its declining contribution, Indonesia’s upstream oil and gas sector has also experienced a decline in performance, as indicated by the decreasing oil and gas lifting. Figure 2 presents Indonesia’s oil and gas lifting and consumption from 1995 to 2021, measured in thousand barrels of oil equivalent (MBOE).

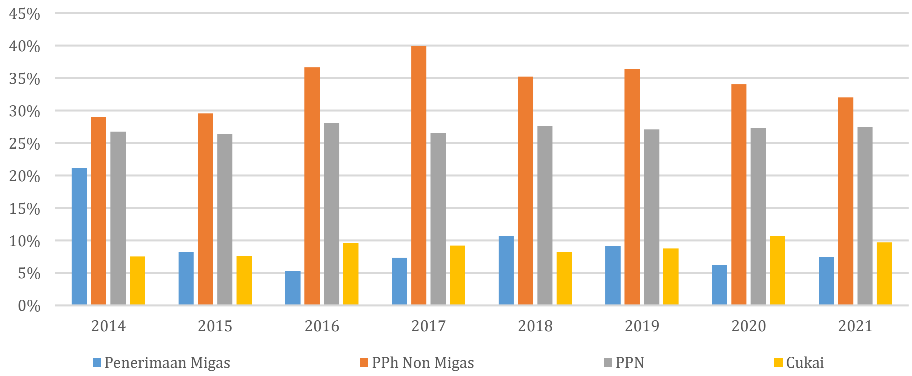
Figure 2 illustrates the ppersistent decline in Indonesia’s oil and gas production, particularly crude oil output, from 1995 to 2021. Similarly, natural gas production in 2021 decreased compared to 2010 and 2015.

In addition to depicting production trends, Figure 2 highlights the continuous rise in oil and gas consumption since 1995. Between 2005 and 2021, Indonesia’s crude oil consumption surpassed domestic production, leading to a widening supply gap. Meanwhile, although natural gas production still exceeds consumption, the surplus has gradually diminished over time.

The impact of declining production alongside rising consumption is evident in Indonesia’s trade balance. Data from the Central Bureau of Statistics (BPS) (2023) reveal that Indonesia’s oil and gas trade balance has consistently been in deficit from 2012 to 2022, whereas the non-oil and gas trade balance remained positive and steadily increased. Figure 3 presents Indonesia’s oil and gas trade balance and non-oil and gas trade balance from 2011 to 2022, measured in billion USD.

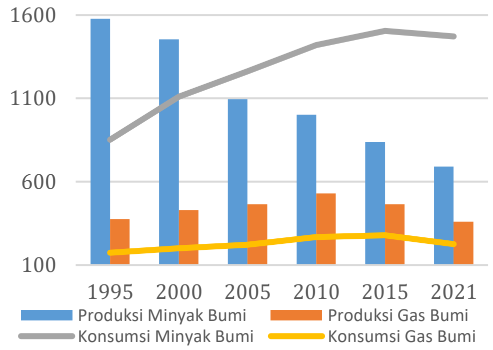
As shown in Figure 3, Indonesia’s oil and gas trade balance has exhibited a sustained downward trend, culminating in its largest recorded deficit in 2022, amounting to USD 24.4 billion. In contrast, the non-oil and gas trade balance has consistently remained positive and demonstrated continuous growth. A trade

Figure 1 Contribution of Indonesia’s Revenue Sources (2014–2021)



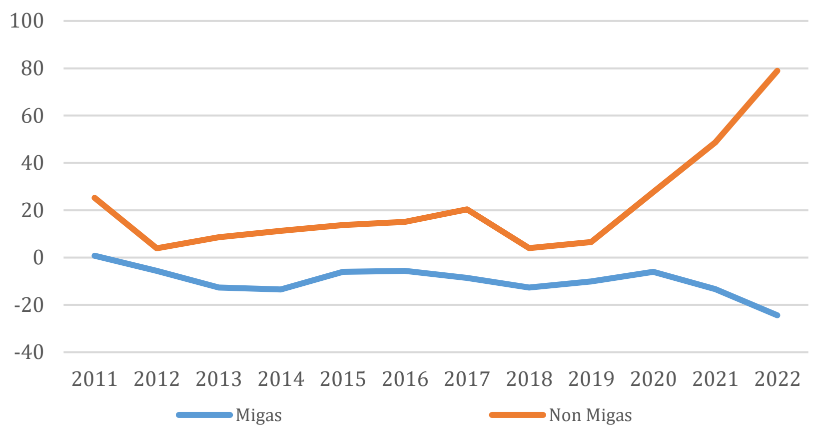

Source: Republik Indonesia (2017, 2022)

Figure 2 Indonesia’s Oil and Gas Production and Consumption (1995–2021)




Source: British Petroleum (2022)

Figure 3 Indonesia's Trade Balance (2011–2022)




Source: BPS (2023)

balance deficit can lead to currency depreciation, as Fahmi (2019) and Silitonga et al. (2019) argue that a trade deficit weakens the currency of the importing country relative to the exporting country or vice versa.

In response to declining state revenue and stagnating oil and gas exploration, the government introduced the Gross Split (GS) Production Sharing Contract (PSC) scheme through the Minister of Energy and Mineral Resources Regulation No. 8 of 2017. The GS scheme serves as an alternative contractual model to the Cost Recovery (CR) PSC rather than replacing it entirely. According to Nostalgi (2021), the GS scheme was introduced to mitigate declining state revenue, address falling production levels, and stimulate oil and gas exploration. Similarly, Giranza and Bergmann (2018) state that the gross split scheme was implemented to enhance investment and production in the oil and gas sector. By offering a simpler contractual structure and a larger profit share for upstream oil and gas contractors, the government hopes to boost investment and production, thereby reducing the trade balance deficit and mitigating currency depreciation. Additionally, revenue from the upstream oil and gas sector is expected to increase.

However, based on the data presented in Graphs 1, 2, and 3, as of 2021, the expected improvements resulting from the gross split scheme had not materialized. Graph 1 shows that the contribution of oil and gas revenue remained lower than in previous years. Graph 2 indicates a continued decline in Indonesia's oil and gas production. Graph 3 further reveals that the oil and gas trade deficit widened in 2022.

Research on Indonesia's upstream oil and gas sector has rarely examined the impact of KBH schemes on state revenue. Existing studies, such as those by Fadly (2022), Buhori (2018), and Mulikh (2017), have primarily focused on the impact of KBH schemes on contractor profitability. One study that investigated factors influencing state revenue from the upstream oil and gas sector was conducted by Metly (2022). However, this study did not analyze the effects of KBH schemes on state revenue but instead recommended that future research explore this relationship.

Based on empirical data and facts, despite the implementation of the gross split scheme since 2017, oil and gas revenue contributions have continued to decline. Moreover, Indonesia's oil and gas production has continued to fall, further exacerbating the oil and gas trade deficit. Additionally, there is a lack of research specifically examining the impact of the gross split scheme on state revenue. Therefore, this study seeks to analyze the effects of different KBH schemes on state revenue.

## LITERATURE REVIEW

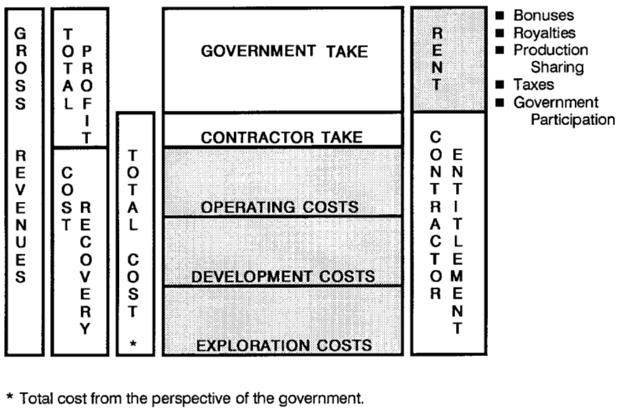
### Economic Rent

Ricardo (1911), as cited in Johnston (1994), defines rent as the portion of agricultural produce paid to a landowner for the land use with higher fertility. He explains that more fertile land commands higher rent due to its ability to yield greater harvests. The increased harvest attracts more farmers willing to pay a premium to lease the land.

Johnston (1994) applies the concept of economic rent to the upstream oil and gas sector. He explains that rent essentially represents the surplus or excess of production revenue over the required costs. The state, acting as the landowner, captures economic rent through various mechanisms, including taxes, royalties, bonuses, and production-sharing agreements. Figure 1 illustrates the revenue allocation from managing a WK migas.

Figure 4 demonstrates that rent constitutes state revenue (government take). It also shows that the contractor's take is equivalent to the contractor's net profit, which, from the state's perspective, is considered a cost that reduces the value of economic rent.

Figure 4 Revenue Allocation in Oil and Gas Field Management

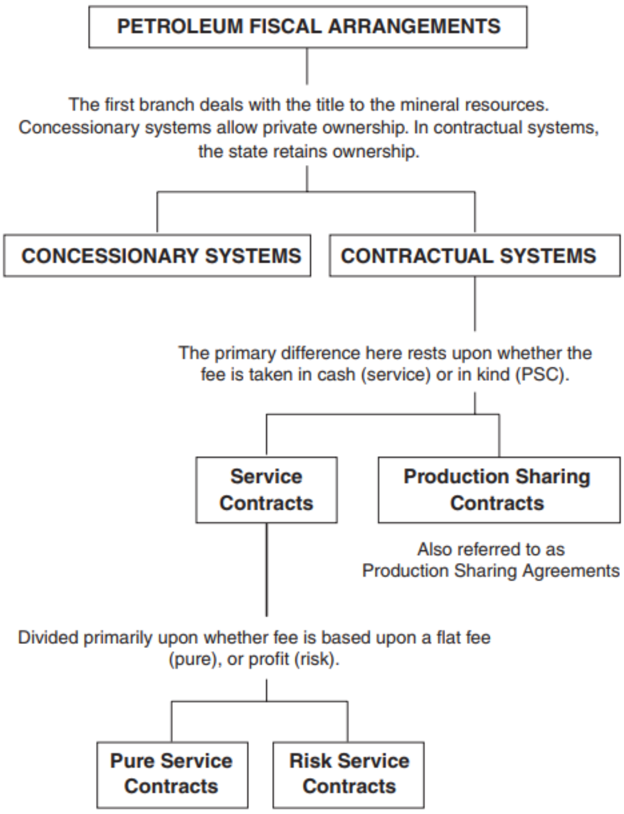



Source: Johnston (1994)

According to Pindyck and Rubinfeld (2013), economic rent represents the residual surplus in a production process. They argue that in a competitive market economy, economic rent compensates for the advantages possessed by a specific production factor. This is because land with superior productivity generates higher demand, while its supply remains perfectly inelastic, ultimately increasing its rent value and compensating the tenant's economic rent.

A key challenge related to economic rent in the upstream oil and gas sector, as described by Johnston (1994), is determining how the state can efficiently extract economic rent. Unlike agricultural land, which involves relatively low management risks, upstream oil and gas operations entail significant risks. As a result, contractors, as lessees, demand higher returns to compensate for these risks. Therefore, optimizing economic rent allocation is crucial to ensure that the state secures maximum revenue while maintaining contractor interest in managing oil and gas fields.

Figure 5 Fiscal Systems in the Upstream Oil and Gas Sector




Source: Johnston (1994)

**Indonesia's Fiscal System in the Oil and Gas Sector**

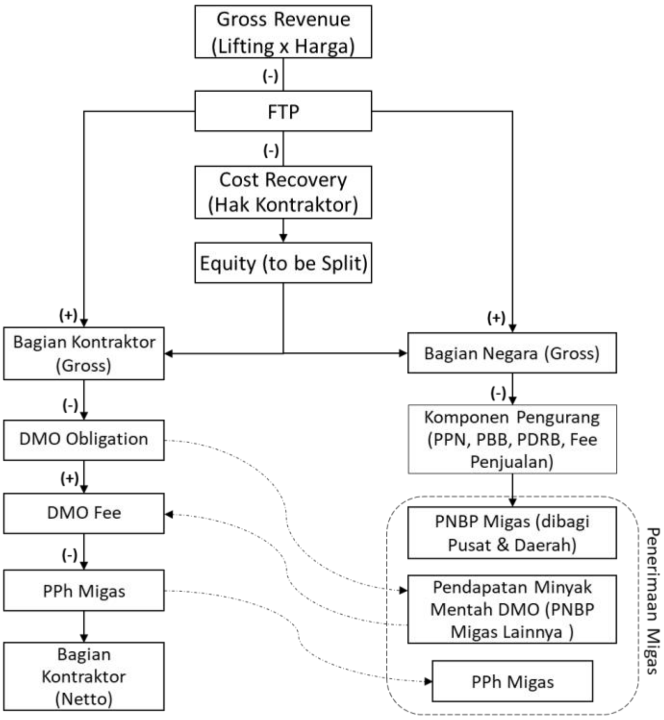
The fiscal system in the upstream oil and gas sector encompasses all contractual and fiscal aspects governing the economic cooperation framework between contractors and the state (Ariyati, 2010). Figure 5 illustrates the fiscal systems applied in the upstream oil and gas sector worldwide.

Figure 2 broadly categorizes the upstream oil and gas fiscal systems into concession-based and contract-based systems. According to Ariyati (2010), the primary distinction between these systems lies in entitlement or ownership of natural resources. Mulikh (2017) explains that under the concession system, ownership of oil and gas resources may be transferred to the contractor. In contrast, under the contractual system, ownership remains with the state.

Indonesia's policy, as stipulated in Article 33(3) of the 1945 Constitution and Articles 4(1) and 4(2) of Law No. 22 of 2001 on Oil and Gas, affirms that oil and gas resources are controlled (owned) by the state. This means that Indonesia adopts a contractual system. Specifically, Indonesia implements the PSC fiscal system, commonly referred to as the Kontrak Bagi Hasil (KBH), in national regulations (Mulikh, 2017).

According to Fadly (2022), Buhori (2018), Mulikh (2017), and Daniel (2017), since 2017, Indonesia has applied two fiscal systems in upstream oil and gas management: CR PSC and GS PSC. Darus and Asmadi (2022), Fadly (2022), and Mulikh (2017) note that the CR PSC has been in place in Indonesia since the 1960s. Over time, several modifications have been introduced, including the First Tranche Petroleum (FTP), investment credit, and Domestic Market Obligation (DMO). Despite these changes, the defining characteristic of the CR scheme remains the cost recovery mechanism (Buhori, 2018; Daniel, 2017; Darus & Asmadi, 2022; Fadly, 2022; Mulikh, 2017). Figure 6 illustrates the CR scheme.

Figure 6 CR Scheme




Source: Suliantoro (2023)

According to Wibowo (2019), cost recovery is triggered once a contractor reaches the commercial production stage. The state is not obligated to reimburse costs incurred before this stage, as cost recovery is derived from the produced oil and gas. Consequently, the recoverable amount is contingent upon the lifting volume (Wibowo, 2019).

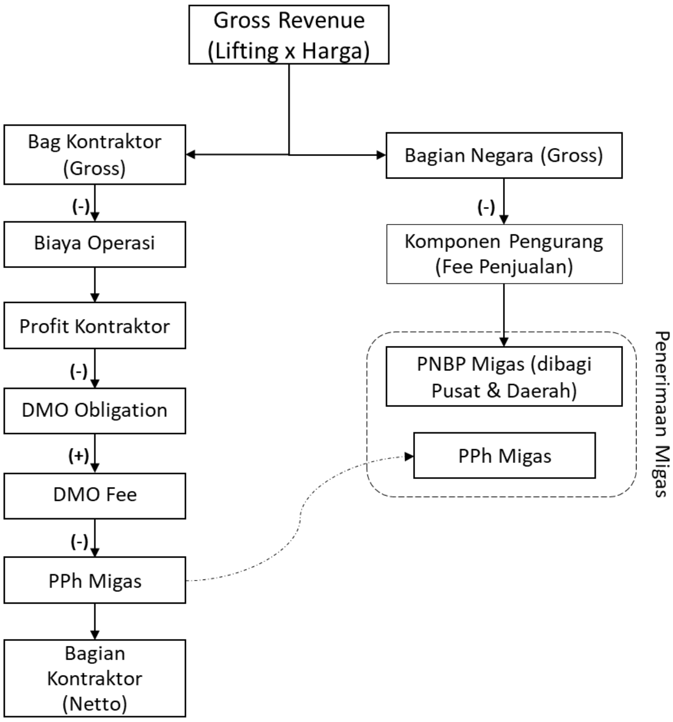
As illustrated in Figure 3, under the CR scheme, profit sharing between the state and contractors occurs through FTP and Equity to Be Split (ETBS). The ETBS represents the remaining revenue after deducting FTP and cost recovery and is often referred to as profit-sharing revenue.

Another key component of the CR scheme is the DMO. Mulikh (2017) explains that the DMO requires contractors to allocate a designated percentage of their oil and gas production to the domestic market. In return, the government compensates contractors with a DMO fee (Fadly, 2022). The difference between the DMO and the DMO fee contributes to state revenue from oil and gas.

Additionally, certain deductions reduce the state's revenue share under the CR scheme, including Value-Added Tax (VAT), Land and Building Tax (PBB), Regional Tax (PDRB), and sales costs (Allaeindo, 2016). Allaeindo (2016) further explains that these deductible components can be reimbursed through the cost recovery mechanism, ultimately reducing the state's revenue share.

Unlike the CR scheme, the GS PSC does not incorporate a cost recovery mechanism (Mulikh, 2017). Instead, profit sharing between contractors and the state occurs at the revenue stage, prior to any cost deductions (Fadly, 2022). The GS scheme determines profit-sharing based on three key components: base split, variable split, and progressive split (Fadly, 2022). Figure 7 illustrates the GS scheme.

Figure 7 GS Scheme




Source: Suliantoro (2023b)

As depicted in Figure 4, under the GS scheme, contractors bear the full cost of operations, with profit sharing determined directly from revenue (Buhori, 2018; Fadly, 2022). Unlike the CR scheme, the GS scheme does not contribute to state revenue from the DMO, as the DMO fee is aligned with market prices (ICP) rather than a predetermined rate (Mulikh, 2017). Furthermore, the GS scheme eliminates FTP and revenue-reducing factors. Mulikh (2017) argues that the absence of cost recovery, FTP, and deductible components simplifies the GS scheme significantly compared to the CR scheme.

### State Revenue from Upstream Oil and Gas

State revenue from upstream oil and gas comprises PNBP and PPh Migas (Metly, 2022). According to Minister of Finance Regulation No. 61 of 2020, oil and gas PNBP consists of Natural Resources PNBP (PNBP SDA Migas) and other oil and gas PNBP.

PNBP SDA Migas originates from the state's profit share from FTP and ETBS. Since the GS scheme does not include FTP, PNBP SDA Migas under GS is solely derived from gross revenue or ETBS. Other oil and gas PNBP includes revenue from DMO crude oil, fines, interest, and penalties related to upstream oil and gas business activities, as well as other revenue from upstream oil and gas activities. PPh Migas refers to the tax imposed on the income earned by Cooperation Contract Contractors (KKKS) from managing an oil and gas working area (Fadly, 2022).

### Previous Studies

Previous research on the impact of PSC schemes on state revenue includes a study by Mulikh (2017). According to Mulikh (2017), when a WK has achieved stable production, the state benefits more when KKKS operates under the CR scheme. However, during the development and early production stages, which require high costs, the GS scheme provides higher state revenue. If operating costs are low, CR is more advantageous for the state, and vice versa.

Mulikh (2017) further explains that state revenue from KKKS is inversely proportional to the net profit of KKKS. State revenue is optimized when a WK is managed under CR, whereas KKKS net profit is maximized under GS. Simulation results in studies by Fadly (2022), Fitri et al. (2021), and Daniel (2017) also indicate that state revenue is higher under CR, while KKKS net profit is higher under GS.

Metly (2022) identifies additional factors affecting state revenue, including lifting, oil and gas prices, and operating costs. The study found that lifting and prices significantly and positively influence state revenue through oil and gas income tax while operating costs have a significant negative impact.

Based on the previous literature, the following hypotheses are formulated.

**Differences in State Revenue After the Adoption of the GS Scheme**

Studies by Fadly (2022), Daniel (2017), and Mulikh (2017) indicate changes in state revenue when WKs transition from CR to GS. Mulikh (2017) attributes this to differences in mechanisms, such as the DMO fee, which makes CR more favorable for the state. Additionally, the higher state profit share under CR benefits the state.

H1: State revenue from KKKS decreases after WKs are managed under GS.

**Effect of Lifting on State Revenue**

Metly (2022) finds that lifting significantly and positively affects state revenue from oil and gas income tax. An increase in lifting enhances revenue and taxable income for KKKS, assuming constant operating costs.

H2: Increased lifting leads to higher state revenue.

**Effect of Oil and Gas Prices on State Revenue**

Metly (2022) also demonstrates that oil prices significantly and positively influence state revenue from oil and gas income tax. Given constant lifting and operating costs, a rise in selling prices increases revenue and taxable income, thereby raising KKKS tax payments.

H3: Higher oil and gas prices lead to increased state revenue.

**Effect of Operating Costs on State Revenue**

Aini (2015) explains that cost recovery, as part of operating costs, significantly and negatively impacts oil and gas income tax revenue. Similarly, Metly (2022) states that operating cost recovery negatively affects state revenue from oil and gas PNBP. Higher cost recovery reduces state PNBP because it decreases the shareable ETBS. Operating costs also reduce taxable income.

H4: Increased operating costs reduce state revenue.

**Effect of KKKS Net Profit on State Revenue**

Johnston (2018), Martén et al. (2015), and Rapp et al. (1999) highlight the inverse relationship between KKKS net profit and government take. In the context of PSC schemes, Mulikh (2017) also explains that when a PSC scheme increases state revenue, KKKS net profit declines, and vice versa. A higher KKKS net profit means a smaller revenue share for the state.

H5: Increased KKKS net profit reduces state revenue.

**Effect of PSC Scheme Type on State Revenue**

Mulikh (2017) finds that during stable production, CR generates higher state revenue than GS due to the more favorable DMO fee mechanism in CR. Similarly, Daniel's (2017) simulation results indicate that the state's share decreases when a WK is managed under GS.

H6: The adoption of GS reduces state revenue.

## METHODS

This study adopts a quantitative research approach incorporating difference and impact tests to examine the effect of PSC scheme transitions on state revenue.

The difference test evaluates state revenue from a working area (WK) before and after transitioning to the GS scheme. The test variable is state revenue from KKKS samples.

The impact test utilizes panel data regression incorporating a dummy variable approach. The dependent variable is state revenue, while the independent variables include oil and gas lifting, oil and gas prices, operating costs, KKKS net profit, and PSC scheme type as a dummy variable. The inclusion of independent variables other than PSC scheme type controls for other influencing factors. These variables are selected based on previous research, particularly Metly (2022).

Secondary data were obtained from the Financial Quarterly Reports (FQR) of KKKS from 2014–2022 and the Consolidated Financial Reports of KKKS (LK Gab) from 2017–2022, obtained from the Special Task Force for Upstream Oil and Gas Business Activities (SKK Migas). The study scope is restricted to state revenue from KKKS in WK management (excluding deduction factors) over the 2014–2022 period.

A purposive sampling method was employed. According to Usman and Akbar (2020), purposive sampling involves selecting sample members based on specific research objectives to ensure relevance.

The difference test samples refer to WKs that have achieved commercial production since 2014 and transitioned from CR to GS. Meanwhile, the impact test samples refer to 35 WKs with the highest lifting in Indonesia in 2022 that reached commercial production in 2017.

The dependent variable in both tests is state revenue per calendar year from KKKS in managing WKs in Indonesia, including tax and PNBP revenue in thousands of USD (from FQR/LK Gab).

The independent variables used in the impact test include several key factors. The first is oil and gas lifting. Mulikh (2017) defines lifting as gross revenue, referring to oil and gas that has been produced and is ready for sale. This study measures lifting in thousands of barrels of oil equivalent (MBOE), as reported in the FQR and LK Gab.

The second independent variable is the oil and gas selling price. This refers to the average annual selling price of oil and gas per barrel of oil equivalent (BOE), measured in USD. The next independent variable is operating costs. Operating costs represent the total expenses recognized by KKKS within a calendar year, as documented in the FQR and LK Gab. These costs are measured in USD. The fourth independent variable is the contractor's net profit. This is calculated as the difference between government take and economic profit (Johnston, 2018; Martén et al., 2015; Rapp et al., 1999). The net profit variable is measured in thousands of USD. The final independent variable is the PSC scheme type used by KKKS to manage a WK. Mulikh (2017) explains that KKKS can operate a WK under either CR or GS. To account for this, a dummy variable is used, where zero (0) represents CR and one (1) represents GS.

The difference test is conducted using a mean comparison test. If the data meet the assumption of normal distribution, a parametric test is applied, such as the dependent two-sample z-test or t-test. However, if the data are not normally distributed and the sample size is small, a nonparametric test is used (Sihombing, 2022). Therefore, a normality test is performed prior to conducting the difference test.

The impact test is carried out through regression analysis using panel data from 35 WKs managed by KKKS between 2017 and 2022. Panel data regression consists of three approaches: the common effect model (CEM), the fixed effect model (FEM), and the random effect model (REM) (Raharjo & Santosa, 2020).

The Chow test, Hausman test, and Lagrange multiplier test are first conducted to determine the most suitable panel data regression model. Once the best model is identified, classical assumption tests are performed, including tests for multicollinearity, heteroskedasticity, autocorrelation, and normality. Finally, a goodness-of-fit (GoF) test assesses how well the selected model fits the observed data.

Data analysis and hypothesis testing are performed using Microsoft Word, Microsoft Excel, and the statistical software Stata version 16.

The regression model used in this study is as follows:

$$GT_{it} = \alpha + \beta_1 Lift_{it} + \beta_2 Price_{it} + \beta_3 Cost_{it} + \beta_4 NCS_{it} + \beta_5 KBH_{it} + \varepsilon \quad \text{.........(1)}$$

where:
GT = Government revenue from a WK
$\alpha$ = Constant
$\beta_1 - \beta_5$ = Regression coefficients
Lift = Oil and gas lifting from a WK
Price = Average oil and gas selling price
Cost = Operating costs of a WK
NCS = KKKS net profit from WK management
KBH = PSC scheme type used
$\varepsilon$ = Error term

## RESULTS AND DISCUSSION

### Results

The collected data for the difference test cover the year 2018, during which eight WKs transitioned to GS, marking the highest number of WK management transitions before 2020. In 2017, only one WK underwent the transition, while in 2019, three WKs shifted to GS.

The impact test data are derived from 35 WK samples between 2017 and 2022. The year 2017 was chosen because GS was first implemented in that year, while 2022 was selected as it represents the most recent period with available data at the time of this study.

Based on the difference test data, a descriptive statistical analysis was conducted to present information on the maximum, minimum, median, standard deviation, and mean values of government revenue, which serve as the basis for the difference test. Table 1 presents the results of the descriptive statistical analysis of government revenue for the eight WK samples.

Table 1 Descriptive Statistical Analysis of Government Revenue from the Difference Test Sample (in thousand USD)

| Description | CR PSC | GS PSC |
|---|---|---|
| Maximum | 439.574,00 | 140.482,61 |
| Minimum | 16.486,25 | 2.833,30 |
| Median | 141.032,25 | 76.719,08 |
| Std. Dev. | 176.572,84 | 71.141,21 |
| Mean | 185.229,92 | 73.875,44 |

Source: Processed by the authors

Table 1 shows that the maximum and average values of government revenue from the WK sample data were higher under the CR scheme. The maximum government revenue under CR reached USD 439.57 million, whereas, under GS, the highest value was only USD 140 million. The minimum value, median, standard deviation, and mean were also higher when WKs were managed under CR.

The descriptive statistical analysis for the impact test includes government revenue, oil and gas lifting, selling prices, operating costs, and KKKS net profit, based on data from 35 WK/KKKS samples. The results are presented in Table 2.

Table 2 Descriptive Statistical Analysis of the Impact Test Data

| Description (Unit) | Government Revenue (Thousand USD) | Lifting (Thousand BOE) | Price (USD) | Production Costs (Thousand USD) | Contractor's Net Profit (Thousand USD) |
|---|---|---|---|---|---|
| Maximum | 5.006.416,84 | 94.314,60 | 106,87 | 1.971.466,38 | 3.468.606,15 |
| Minimum | 1.633,60 | 377,68 | 22,09 | 3.825,69 | -105.042,41 |
| Median | 110.406,72 | 7.616,42 | 47,98 | 150.485,31 | 66.222,94 |
| Std. Dev | 747.043,62 | 21.766,06 | 16,57 | 428.419,09 | 318.676,84 |
| Mean | 375.821,58 | 16.773,32 | 51,23 | 300.486,86 | 186.026,72 |

Source: Processed by the authors

The average government revenue in the sample was USD 375.82 million. The highest recorded revenue was USD 5 billion in 2022, while the lowest was USD 1.63 million in 2017. The median government revenue across the sample was USD 110.41 million.

The average lifting volume was 16.77 million barrels of oil equivalent (BOE). The maximum lifting volume reached 94.3 million BOE in 2017, while the minimum was 377.7 thousand BOE in 2019. The median lifting volume was 7.6 million BOE.

The average selling price per BOE was USD 51.23. The highest price, USD 106.87 per BOE, was recorded in 2022, whereas the lowest, USD 22.09 per BOE, occurred in 2020. The median price across the sample was USD 47.98 per BOE.

The average production cost in the sample was USD 300.49 million. The highest production cost, USD 1.97 billion, was observed in 2022, while the lowest, USD 3.83 million, occurred in 2019. The median production cost was USD 300.49 million.

The average contractor's net profit was USD 186.03 million, with a maximum recorded profit of USD 3.47 billion. The median contractor's net profit was USD 186.03 million.

An analysis of the eight working areas (WKs) included in the difference test revealed that government revenue per lifting unit was consistently higher under the CR scheme. The average annual government revenue under CR was USD 426.35 million, whereas under GS, it declined to USD 221.28 million.

Prior to conducting the difference test, a classical assumption test was performed, specifically a normality test, to determine the appropriate statistical method. The normality test results indicated a prob > z value of 0.00 (significant), suggesting that the data were not normally distributed. Consequently, a nonparametric test was employed to statistically examine the difference in government revenue between the CR and GS schemes.

The Wilcoxon Signed-Rank Test, a nonparametric difference test, was applied. The results yielded a prob > z value of 0.00, leading to the rejection of the null hypothesis ($H_0$). This confirms that the GS scheme does not generate government revenue at the same level as the CR scheme. Referring to Table 1, which presents the descriptive statistical analysis, the data indicate that government revenue under GS is lower than under CR. The statistically significant difference observed in the nonparametric test corroborates the conclusion that the GS scheme results in reduced government revenue.

An impact test was conducted using panel data regression analysis to assess the impact of the contract scheme on government revenue. The model selection process involved three statistical tests:

1. Chow Test – to determine whether the Fixed Effects Model (FEM) or the Pooled Ordinary Least Squares (POLS) model is more appropriate.

2. Hausman Test – to choose between the Fixed Effects Model (FEM) and the Random Effects Model (REM).
3. Lagrange Multiplier (LM) Test – to confirm whether POLS or REM is preferable.

The results of these model selection tests are summarized in Table 3.

Table 3 Best Model Selection Results

| Test | Prob value | α | Best Model |
|---|---|---|---|
| Chow Likelihood Ratio | 0 | 0,05 | FE |
| Hausman | 0,02 | 0,05 | FE |
| Lagrange Multiplier Breusch Pagan | 0 | 0,05 | RE |

Source: Processed by the authors

As presented in Table 3, the Fixed Effects Model (FEM) was identified as the most suitable model. Following this selection, a classical assumption test was conducted to assess the validity of the model, and the results are summarized in Table 4.

Table 4 Classical Assumption Test Results for the Best Model

| Test | Description | Probability Value | Test Result | Remarks |
|---|---|---|---|---|
| Normality | Prob>chi2 | 0,00 | Significant | Not Normally Distributed |
| Heteroscedasticity | Prob>chi2 | 0 | Significant | Presence of Heteroscedasticity |
| Multicollinearity | Vif | 3,17 | Not Significant | No Multicollinearity |
| Autocorrelation | Prob>F | 0 | Significant | Presence of Autocorrelation |

Source: Processed by the authors

The results indicate that the data do not follow a normal distribution. However, according to the Central Limit Theorem (CLT) Gujarati and Porter (2009), when the sample size is sufficiently large (≥100 observations), the normality assumption can be disregarded. Since this study includes 210 observations, the assumption of normality can be considered satisfied.

While the selected model does not exhibit multicollinearity, it does show signs of heteroscedasticity and autocorrelation. According to Hoechle (2007) and Stata (2023), these issues can be effectively addressed using the Feasible Generalized Least Squares (FGLS) approach. Therefore, the FGLS model (implemented using the xtgls function in Stata) was applied.

Following the selection of the best panel data model, hypothesis testing was conducted. The results are summarized in Table 5.

Table 5 Hypothesis Testing Results for the Best Model

| Indicator/Variable | Probability Value | Coefficient | Description |
|---|---|---|---|
| $R^2$ | 0,736 | - | Significant |
| Simultaneous (F-test) | 0,000 | - | Significant |
| Simultaneous ($F$-test) | 0,000 | 24,742 | Significant |
| Selling Price (t-test) | 0,000 | 5.926,777 | Significant |
| Production Costs (t-test) | 0,000 | -0,469 | Significant |
| Contractor Profit (t-test) | 0,000 | 0,467 | Significant |
| KBH yang Digunakan (Uji t) Contract Mechanism Used (t-test) | 0,000 | -177.562,50 | Significant |

Source: Processed by the author

The coefficient of determination ($R^2$) value of 0.736, as presented in Table 5, indicates that 73.6% of the variation in state revenue from the management of a WK can be explained by oil and gas lifting, selling price, total production costs, contractor net profit, and the contract mechanism employed. The remaining 26.4% is attributed to factors outside the model.

Table 5 also presents the results of the simultaneous F-test, which yielded a probability value of 0.00, significantly below the 0.05 threshold. This confirms that the independent variables, both collectively and individually, exert a statistically significant influence on state revenue.

Additionally, the t-test results in Table 5 indicate that all independent variables have a probability value of less than 5%. At a 95% confidence level, this suggests that each independent variable has a statistically significant partial (individual) effect on state revenue.

The estimated equation, derived from the Feasible Generalized Least Squares (FGLS) model using the Fixed Effects Model (FEM), is expressed as follows:

$GT_{it}$= -286.580 + 24,74$Lift_{it}$ + 5.926,77$Price_{it}$ - 0,469$Cost_{it}$ + 0,467$NCS_{it}$ - 177.562$KBH_{it}$ ...(2)

The estimated equation can be interpreted as follows:

1) Intercept (-286.580): the negative intercept suggests that if all independent variables are zero, the projected state revenue would be -286.58 million USD, indicating that revenue generation is inherently dependent on the included explanatory factors.
2) Lifting Volume ($Lift_{it}$): representing the total oil and gas lifting from a WK within a given period. This coefficient implies that for every additional 1,000 barrels of lifted oil and gas, state revenue increases by 24.74 million USD. Table 5 confirms that this variable has a significant effect both simultaneously and individually.
3) The selling price ($Price_{it}$): denoting the average oil and gas selling price per barrel. The coefficient suggests that a 1 USD increase in price raises state revenue by approximately 5,926.77 million USD. Table 5 indicates that this variable exerts a statistically significant influence on state revenue.
4) The production cost ($Cost_{it}$): representing total production expenditures incurred in managing a WK. This negative coefficient implies that each additional million USD in production costs reduces state revenue by 0.469 million USD. As indicated in Table 5, this variable exerts a statistically significant simultaneous and individual effect on state revenue.
5) The contractor's net profit ($NCS_{it}$): representing the total profit earned by the contractor (KKKS) within a given period. This coefficient suggests that for every additional million USD in contractor profit, state revenue increases by 0.467 million USD. Table 5 confirms that this variable has a significant effect both collectively and individually.
6) The contract mechanism used ($KBH_{it}$): representing the contract scheme employed by the contractor (Cost Recovery vs. Gross Split). This coefficient indicates that transitioning from CR to GS is associated with a reduction of approximately 177.56 million USD in state revenue. As demonstrated in Table 5, the contract mechanism exerts a statistically significant simultaneous and individual effect on state revenue.

**Discussion**

Statistical testing using the difference-in-means test confirms a significant disparity in state revenue when a WK is managed under the CR mechanism compared to the GS mechanism. The sample data indicate that out of 24 tested cases, 21 experienced a decline in state revenue following the transition to GS, while only three showed an increase. The average state revenue under CR was 185.23 million USD, whereas under GS, it declined sharply to 73.88 million USD. This statistically verified difference suggests that the observed reduction in state revenue is directly attributable to the GS mechanism, which generates lower fiscal returns compared to CR.

The influence test further confirms that the GS mechanism has a significant negative impact on state revenue. The results indicate that GS consistently reduces state revenue compared to CR.

These findings align with prior research by Fadly (2022), Fitri et al. (2021), Mulikh (2017), and Daniel (2017), which utilized qualitative comparative analyses and concluded that CR yields higher state revenue than GS. According to Mulikh (2017), several factors contribute to CR's superior revenue performance:

1) The state's revenue share under CR is higher than under GS.
2) The DMO fee under CR is lower, meaning the government only pays a fraction of the crude oil price for domestic use. In contrast, under GS, crude oil designated for domestic consumption must be purchased at full market price, as determined by the Indonesian Crude Price (ICP).
3) CR is more beneficial to state revenue when operating costs are relatively low, whereas GS only becomes advantageous when operating costs are high. However, as observed by Buhori (2018) and Daniel (2017), operating costs tend to be low during most contract periods, making CR the more favorable scheme for state revenue.

The negative impact of GS on state revenue can also be attributed to high investment risks, which discourage contractors (KKKS) from adopting the scheme (Fitri et al., 2021). Putra and Tiresnofa (2022) explain that KKKS are reluctant to operate under GS because, despite assuming higher financial risks, their potential returns remain relatively unchanged. This hesitation ultimately results in lower lifting volumes, leading to a decline in PNBP and oil and PPh Migas.

Empirical data from Indonesia up to Q3 of 2023 further corroborate these findings. As reported by Benny Lubiantara, SKK Migas Deputy for Exploration, Development, and Regional Management, (cited in Wahyudi (2023a), several KKKS managing WKs under GS have expressed a preference to revert to the CR scheme.

Lubiantara explains that while some KKKS find GS economically viable during the exploitation phase, the scheme becomes financially unsustainable when new drilling and development are required (Wahyudi, 2023a). For instance, Pertamina Hulu Energi (PHE) has indicated that to maintain production requires additional financial incentives or a transition back to CR (Wahyudi, 2023a).

Similarly, Minister of Energy and Mineral Resources (ESDM) Arifin Tasrif (2019–2024) has noted that several KKKS currently operating under GS seek to return to CR to support their WK development programs (Wahyudi, 2023b). Notably, PHE and PT Medco Energi Internasional have officially requested a contract modification to CR to offset high operational costs and ensure long-term production sustainability (Wahyudi, 2023b).

The decline in state revenue and oil and gas lifting has also been linked to reduced upstream oil and gas investments due to KKKS reluctance to operate under GS. Minister Arifin Tasrif stated that some KKKS have been postponing upstream sector investments due to the economic limitations of GS (Wahyudi, 2023b). SKK Migas has further cautioned that investment reductions or delays could jeopardize production output and hinder Indonesia's 2030 national oil and gas targets (Wahyudi, 2023a).

Beyond the choice of contract scheme (KBH), the economic feasibility of oil and gas projects in Indonesia is also heavily influenced by WK conditions. Iskandar et al. (2016) report that unexplored oil and gas reserves are predominantly located in eastern Indonesia, where operational risks are considerably high. These regions face significant challenges due to their offshore locations and lack of infrastructure, including roads and electricity. Such adverse conditions result in substantially higher operational costs, which in turn reduce both the net profit margin (NPM) and internal rate of return (IRR) compared to WKs in more accessible locations.

Difficult WK conditions are not unique to Indonesia. Bridge and Billon (2017) argue that the most easily accessible and cost-effective WKs worldwide have already been exploited, leaving only technically complex fields—such as those in deep-sea environments. In addition to their geographical challenges, modern oil and gas production increasingly relies on advanced extraction technologies, such as hydraulic fracturing (fracking), to tap into unconventional reserves. This is a stark contrast to earlier periods when oil could be extracted through simple pumping methods or even surfaced naturally (Bridge & Billon, 2017).

Another independent variable in this study, lifting, aligns with the findings of Metly (2022), demonstrating a significant and positive impact on state oil and gas revenue. This indicates that an increase in lifting correlates with higher state revenue, whereas a decline in lifting results in reduced revenue. The findings of this study, in conjunction with statements from Lubiantara (2023) and Tasrif (2023), as well as the research conducted by Fitri et al. (2021) and Putra and Tiresnofa (2022), reinforce the argument that the GS scheme has the potential to reduce lifting. This is primarily due to the lack of investment interest and reluctance among KKKS to advance production under the GS framework. The WK conditions described by Iskandar et al. (2016) further substantiate this issue, explaining why the GS scheme negatively impacts state revenue in the upstream oil and gas sector.

Metly (2022) also highlights that challenging WK conditions, which reduce net profit margins (NPM), combined with the GS scheme's uneconomical nature for drilling and new resource development, contribute to its significant negative effect on state revenue. Furthermore, Metly (2022) explains that increased lifting enhances state revenue because, assuming a stable selling price, higher production volumes directly elevate income from WK management. If total production costs remain unchanged, greater revenue translates into a higher state profit share and increased PPh Migas payments from KKKS due to higher taxable income.

In addition to lifting, the selling price of oil and gas is another crucial variable that exhibits a significant positive correlation with state revenue. This finding is consistent with Metly (2022), who asserts that both lifting and selling prices have a strong and positive impact on upstream oil and gas revenue. Similarly, Mulikh (2017) emphasizes the role of selling price in shaping state revenue, explaining that when production levels remain constant, a price increase boosts WK revenue. As a result, assuming stable production costs, higher revenue leads to an increased state profit share and greater PPh Migas payments.

Higher oil and gas prices can also stimulate greater upstream sector activity, ultimately driving up lifting volumes. According to Mulikh (2017) and Allaeindo (2016), rising oil prices provide a strong incentive for KKKS to increase production and lifting. State revenue is further enhanced when both selling prices and production levels rise, provided that production costs remain stable.

Beyond direct fiscal benefits, heightened activity in the upstream oil and gas sector can yield broader economic advantages, including increased tax revenues. Paramita (2022) highlights that expansion in upstream oil and gas operations contributes to national economic growth, which in turn strengthens state tax revenues. Dewi and Wijaya (2023) and Syairozi and Fatah (2017) further support this perspective, demonstrating a significant positive relationship between economic growth and tax revenue. Their findings suggest that increased upstream oil and gas activities can stimulate overall economic growth, ultimately leading to higher state tax revenues.

Another key determinant of state revenue is KKKS profitability. According to SKK Migas (2023a), higher net profits among KKKS positively impact state revenue, as greater profitability results in higher taxable income and/or overall revenue, assuming constant tax rates and operational costs. Consequently, an increase in KKKS net profit translates into greater tax contributions and a larger state profit share.

Putra and Tiresnofa (2022), Fadly (2022), and Buhori (2018) argue that higher net profit margins make WKs more attractive to KKKS, thereby encouraging greater investment in upstream oil and gas projects. Putra and Tiresnofa (2022) further elaborate that increased returns on investment can help offset the financial risks borne by KKKS, making them more willing to undertake high-risk investments. Similarly, Fadly (2022) and Buhori (2018) note that KKKS are more inclined to manage WKs that offer relatively high returns.

Based on the International Energy Agency (2020) and Johnston (1994), countries worldwide, particularly developing nations, compete to attract investment in the upstream oil and gas sector as a means of securing their energy supplies. This competition reduces the bargaining power of states as resource owners, given the intense rivalry between nations seeking investment. To remain competitive, some governments offer higher returns or incentives to KKKS to encourage the development of newly established and technically challenging WKs.

Findings related to operating costs are also in line with the study by Metly (2022), which highlights their negative impact on state revenue. Operating costs significantly and adversely affect state revenue, particularly within the context of the profit-sharing mechanism in the CR scheme and the taxable income calculation in both CR and GS schemes. Metly (2022) explains that under the CR framework, higher operating costs lead to greater reimbursement claims for cost recovery, thereby reducing or even eliminating the Equity to Be Split (ETBS) allocated to the government.

Furthermore, operating costs in both the CR and GS schemes diminish the taxable income of KKKS. If revenue remains constant, rising operating costs directly reduce taxable income, lowering state tax revenues. This finding underscores the importance of cost efficiency in maximizing state revenue from the upstream oil and gas sector.

## CONCLUSION

The findings of this study indicate that the GS scheme yields lower state revenue than the CR scheme. This conclusion is supported by the difference-in-means test, which revealed a decline in state revenue following the transition from the CR to the GS scheme. The average state revenue from the analyzed sample decreased after implementing the GS scheme.

Furthermore, the impact analysis confirms that the GS scheme significantly and negatively affects state revenue. Other variables that also exert a significant negative influence include operating costs, whereas lifting, selling prices, and KKKS profits positively and significantly contribute to state revenue.

The lower state revenue under the GS scheme can be attributed to the CR scheme's more favorable revenue-sharing mechanism for the government. The CR scheme grants the state a larger share of profits and incorporates DMO fees at reduced prices for specific crude oil types. Additionally, the majority of WKs in Indonesia exhibit a low ratio of operating costs to revenue, further enhancing the state's financial advantage when these WKs are managed under the CR scheme.

Another critical factor is the reluctance of KKKS to operate under the GS scheme, which ultimately leads to lower lifting volumes and reduced oil and gas revenues. KKKS is particularly hesitant to engage in drilling and developing new reserves under the GS scheme due to its lower economic viability. Moreover, unexplored and undeveloped oil and gas reserves are predominantly located in high-risk, technically challenging regions. This increases operational costs and diminishes both the Net Profit Margin (NPM) and Internal Rate of Return (IRR) for WK operators, particularly compared to more accessible and currently exploited WKs.

Given these findings, policymakers may consider revising the regulatory framework governing the GS scheme to enhance state revenue. Key areas for reassessment include the profit-sharing structure and mechanisms, ensuring that state interests remain safeguarded while maintaining an investment climate that remains attractive to KKKS. Such regulatory refinements could drive increased oil and gas production in Indonesia, help achieve national production targets, optimize state revenue from the upstream oil and gas sector, and stimulate greater KKKS participation in developing and managing WKs.

## LIMITATIONS

This study is subject to several limitations. The analysis relies on panel data regression, with state revenue from KKKS as the dependent variable and oil and gas lifting, selling prices, production costs, contractor profits, and the KBH scheme type as independent variables. The results may not remain consistent if alternative estimation methods are employed. Therefore, future research should adopt a more comprehensive approach, incorporating sensitivity analysis to enhance the robustness of the findings. Additionally, further studies could expand the scope of analysis by including a broader set of variables to gain deeper insights into the determinants of state revenue in the upstream oil and gas sector.

## REFERENCES


Aini, R. N. (2015). *Analisis pengaruh cost recovery, lifting, serta harga minyak dan gas bumi terhadap penerimaan pajak penghasilan minyak dan gas bumi* [Skripsi]. PKN STAN.

Allaeindo, R. (2016). *Analisis penerimaan negara dari sektor migas pada kontraktor kontrak kerja sama production sharing contract tahun 2010-2014* [Skripsi]. Universitas Indonesia.

Ariyati, E. S. (2010). *Analisis ketentuan-ketentuan di production sharing contract indonesia dalam kaitannya dengan penerimaan negara minyak dan gas bumi* [Thesis]. Universitas Indonesia.

BPS. (2023). *Nilai neraca perdagangan*. Badan Pusat Statistik. https://www.bps.go.id/subject/8/ekspor-impor.html#subjekViewTab5.html

Bridge, G., & Billon, P. Le. (2017). *Oil* (Second Edition). Polity Press.

British Petroleum. (2022). Statistical review of world energy – all data, 1965-2021. In *British Petroleum*. British Petroleum. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/xlsx/energy-economics/statistical-review/bp-stats-review-2022-all-data.xlsx

Buhori, A. (2018). *Perbandingan keekonomian antara skema kontrak bagi hasil cost recovery dengan skema gross split* [Thesis]. Universitas Indonesia.

Daniel, H. (2017). Indonesian milestone in production-sharing contract in perspective of government take, contractor take, cost recovery and production target. *Government Entitlement*, 17–19.

Darus, M. L. H., & Asmadi, E. (2022). *Hukum kontrak migas Indonesia (Lintas ruang dan waktu)* (I. Koto, Ed.; 1st ed.). UMSU Press.

Dewi, I. R., & Wijaya, S. (2023). Liberalisasi perdagangan, penanaman modal asing, dan pengaruhnya terhadap penerimaan pajak pada emerging asia dengan moderasi pertumbuhan ekonomi. *Jurnalku*, *3*(2).

Fadly, M. (2022). *Analisis perbandingan sistem kontrak PSC cost recovery dan gross split pada keekonomian lapangan CBM X* [Tugas Akhir]. Universitas Islam Riau.

Fahmi, A. (2019). Pengaruh capital inflow, inflasi, suku bunga, ekspor, dan impor terhadap nilai tukar Rupiah. *Jurnal Kinerja*, *16*(1), 40–50. http://journal.feb.unmul.ac.id/index.php/KINERJA

Fitri, Z. C., Wahono, B., & Millanintyas, R. (2021). Strategi kebijakan fiskal pada industri minyak dan gas bumi dengan pendekatan kebijakan rezim gross split dan rezim production sharing contract cost recovery (Studi Kasus pada PT. Apexindo Pratama Duta Tbk.). *E–Jurnal Riset Manajemen*, 39–46. www.fe.unisma.ac.id

Giranza, M. J., & Bergmann, A. (2018). Indonesia's new gross split PSC: Is it more superior than the previous standard PSC? *Journal of Economics, Business and Management*, *6*(2), 51–55. https://doi.org/10.18178/joebm.2018.6.2.549

Gujarati, D. N., & Porter, D. C. (2009). *Basic econometric* (5th ed.). Mc Graw Hill.

Hoechle, D. (2007). Robust standard errors for panel regressions with cross-sectional dependence. *The Stata Journal*, *7*(3), 281–312.

International Energy Agency. (2020). *The oil and gas industry in energy transitions*.

Iskandar, Y., Juanda, B., & Johan, S. (2016). Determinan FDI industri hulu migas di Indonesia serta dampaknya periode tahun 2003-2013. *Jurnal Aplikasi Bisnis dan Manajemen*, *2*(1), 53–63. https://doi.org/10.17358/JABM.2.1.53

Johnston, D. (1994). *Petroleum fiscal systems and production sharing contracts petroleum fiscal systems*. PennWell Corporation.

Johnston, D. (2018). Government take. *Journal of World Energy Law and Business*, *11*(6), 506–540. https://doi.org/10.1093/jwelb/jwy028

Martén, I., Whittaker, P., & Martínez De Bourio, Á. (2015). *Government take in upstream oil and gas: Framing a more balanced dialogue*.

Metly, R. P. (2022). Faktor-faktor yang memengaruhi penerimaan pajak penghasilan minyak bumi dan gas alam. *Bina Ekonomi*, *26*(2), 133.

Mulikh, R. I. (2017). *Analisis mekanisme bagi hasil produksi cost recovery dan gross split dalam kegiatan usaha hulu minyak dan gas bumi di Indonesia (Studi Kasus PT. XYZ pada Wilayah Kerja ABC)* [Laporan Magang]. Universitas Indonesia.

Nostalgi, B. (2021). Kepastian hukum pengelolaan sektor hulu migas dengan kontrak bagi hasil split yang bersifat lintas sektor dan implementasinya terhadap pertumbuhan investasi disektor hulu migas. *Dharmasisya*, *1*(1), 69–85. https://scholarhub.ui.ac.id/dharmasisyaAvailableat:https://scholarhub.ui.ac.id/dharmasisya/vol1/iss1/22

Paramita, R. (2022). Permasalahan dan tantangan peningkatan investasi industri hulu migas. *Jurnal Budget*, *7*(2).

Pindyck, R. S., & Rubinfeld, D. L. (2013). *Microeconomics* (8th ed.). Pearson.

Putra, I. S., & Tiresnofa, I. (2022). Comparative study: PSC-Gross Split and PSC-Cost recovery's net contractor share. Should the government of Indonesia gives more incentives? *Proceedings, Indonesian Petroleum Association*.

Raharjo, D. S., & Santosa, A. D. (2020). *STATA 14 untuk Penelitian* (1st ed.). Kepel Press.

Rapp, W. J., Litvak, B. L., Kokolis, G. P., & Wang, B. (1999). Utilizing discounted government take analysis for comparison of international oil and gas E&P fiscal regimes. *Society of Petroleum Engineers*.

Republik Indonesia. (2017). *Buku II Nota Keuangan Tahun Anggaran 2018*.

Republik Indonesia. (2022). *Buku II Nota Keuangan Tahun Anggaran 2023*.

Sihombing, P. R. (2022). *Aplikasi STATA untuk statistisi pemula* (P. Sahuri, Ed.; 1st ed.). Gemala. https://www.researchgate.net/publication/358460661

Silitonga, R. B., Ishak, Z., & Mukhlis. (2019). Pengaruh ekspor, impor, dan inflasi terhadap nilai tukar rupiah di Indonesia. *Jurnal Ekonomi Pembangunan*, *15*(1), 53–59. https://doi.org/10.29259/jep.v15i1.8821

SKK Migas. (2023). *Dukungan yang diharapkan melalui pemberian insentif untuk kegiatan hulu migas dalam peningkatan produksi di era energi transisi*.

Stata. (2023). *XTGLS-GLS linear model with heteroskedastic and correlated errors* (17). Stata.com.

Suliantoro, I. (2023a, June 6). *Kontrak bagi hasil migas model cost recovery*. BPPK. https://klc2.kemenkeu.go.id/kms/knowledge/kontrak-bagi-hasil-migas-model-cost-recovery-1f7e67df/detail/

Suliantoro, I. (2023b, June 6). *Kontrak bagi hasil migas model gross split*. BPPK. https://klc2.kemenkeu.go.id/kms/knowledge/kontrak-bagi-hasil-migas-model-gross-split-66953050/detail/

Syairozi, M. I., & Fatah, A. (2017). Analisis pajak dan variabel makroekonomi terhadap penerimaan pajak pernghasilan. *Seminar Nasional Sistem Informasi 2017*.

Usman, H., & Akbar, R. P. S. (2020). *Pengantar statistika: Cara mudah memahami statistika* (R. A. Kusumaningtyas, Ed.; 3rd ed.). PT Bumi Aksara. https://www.google.co.id/books/edition/Pengantar_Statistika_Edisi_Ketiga/imf5DwAAQBAJ?hl=en&gbpv=1

Wahyudi, N. A. (2023a, September 22). Skema lama "Jerat" KKKS. *Bisnis Indonesia*, 4–4.

Wahyudi, N. A. (2023b, September 25). Aral menantang target produksi. *Bisnis Indonesia*, 5–5.

Wibowo, P. (2019). Menuju kebijakan akuntansi yang paripurna: Studi kasus penerimaan negara bukan pajak sektor hulu migas. *Balance Vocation Accounting Journal*, *3*(1).