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NOTES

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Thomas Baunsgaard and Nate Vernon
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Commodity prices for coal, oil, and natural gas have increased sharply during 2022, although prices have retreated somewhat more recently. The increase stems from a combination of factors, including a mismatch between energy demand and supply during the economic recovery from COVID-19, further amplified by the Russian war in Ukraine.

The surge in fossil fuel prices has generated substantial windfall profits in the energy sector. This has benefited mainly firms that extract fossil fuels, but, in some cases, profits have increased elsewhere in the energy sector, such as for oil refineries and renewable-energy-based electricity generators. Meanwhile, countries face fiscal pressures to support the post-COVID economic recovery and alleviate the strain on vulnerable households and firms arising from the high energy prices. Looming over all of this is the need to contain inflation, maintain energy security, and transition to renewable energy.

This raises a key tax policy question: whether and, if so, how to tax windfall profits realized by energy companies. The answer is particular to each country and energy segment, but the following guidelines are recommended:

- Introduce a permanent tax on windfall profits from fossil fuel extraction, if an adequate fiscal instrument is not already in place. The tax should be imposed on a share of economic rents (that is, excess profits) because rent-targeting taxes raise revenue without reducing investment or increasing inflation. Economic rents generally arise from fossil fuel extraction as a result of the fixed supply and diverse quality of natural resource deposits, rather than from other segments of the energy value chain.
- Use caution when it comes to temporary taxes on windfall profits: these tend to increase investor risk, may be more distortionary (especially if poorly designed or timed), and do not provide revenue benefits above those of a permanent tax on economic rents. Investors prefer a stable, predictable tax regime over the risk of future temporary taxes when prices rise.
- Encourage the switch to renewable energy, given the need for decarbonization in energy generation. It is counterintuitive to introduce exceptional taxes on renewable energy-based electricity generation, especially if these are poorly designed. Such taxes may deter future investment by increasing investor perception of risk. Moreover, transitioning to renewable energy improves energy security.
- Still, apply the following design principles if political pressure makes it necessary to tax windfall profits from electricity generation: The tax should apply to a clear measure of excess profit (for example, profit above a specified return on capital) that avoids arbitrary references to specific price levels or time periods. The tax should not apply to revenue (as this can be inflationary and is more likely to reduce investment). The tax should allow for carryforward of losses to ensure symmetrical treatment of losses and profits. The tax can be permanent if excess profits are expected to be persistent.
- Consider future reforms to market mechanisms that may unnecessarily result in windfall profits for electricity generators and fossil fuel refiners. For example, electricity generators may earn windfall profits because of the design of electricity tariffs or because market access is restricted.

Introduction

Fossil fuel prices have surged during 2022, boosting profits for many energy companies but also increasing pressure on households and businesses. The need to raise revenue to support fiscal measures to alleviate the associated pressure from higher fuel prices has sparked renewed policy interest in the taxation of windfall profits in the energy sector, and some countries have introduced exceptional tax measures in response. This note provides guidance for policymakers on options for taxing windfall profits and presents an overview of the current practice for taxing windfall profits—or more generally, economic rents—originating from the extraction of fossil fuels.

The extraction of natural resources, such as minerals and petroleum, has the potential to generate economic rents.[1] Economic rents may materialize when a factor of production is in limited supply, for natural resources reflecting the fixity of resource endowments and the diverse quality of deposits (see Boadway and Keen in Daniel and others 2010). Rents are commonly considered to originate at the upstream point of extraction, whereas mid- and downstream segments are more akin to processing and transportation activities. Economic rents are commonly defined as the return on an investment above the minimum threshold needed for the investment to be undertaken, with both location-specific (reflecting geological and cost differences across projects) and cyclical components (reflecting changes over time in demand or supply).[2] A well-designed tax on economic rents can therefore provide government with additional revenue from more profitable projects without distorting investment and production decisions.

Windfall profits in the case of natural resources can be inseparable from the cyclical component of economic rents. It is intuitive that windfall profits arise from an unanticipated event unaffected by the actions or decisions of an investor. An obvious example is a surge in commodity prices benefiting a project after an investment decision has been made. The fact that realized profits turn out to be higher than anticipated at the time of the investment decision comes down partly to luck. In practice, there is no easy way to distinguish between windfall profits arising from commodity price surges and underlying economic rents.[3] However, a tax system designed to capture a portion of economic rents effectively taxes windfall profits as well.

Fossil fuel prices have increased significantly since the Russian invasion of Ukraine. This has amplified the price rebound associated with the economic recovery from COVID-19 and reduced fossil fuel investment, partly because of adjustments in anticipation of the energy transition and increasing competitiveness of low-carbon alternatives (Figure 1). The increase in commodity prices is driving higher profits in fossil fuel-producing countries and extractive companies (see Annexes 1 and 2). Natural gas prices have increased most sharply in Europe, which in turn has driven up electricity prices.

This note is structured as follows: The next section provides policy guidance for taxing windfall profits arising from fossil fuel extraction and extends this guidance to address instances in which windfall profits may originate temporarily from other segments of the energy sector. The subsequent section gives an overview and analysis of current petroleum fiscal regimes and existing fiscal mechanisms aimed at capturing a portion of the economic

[1] This note focuses on fossil fuels, although the principles generally carry over to minerals—some fiscal instruments, however, such as production sharing, are not common in the mining sector.

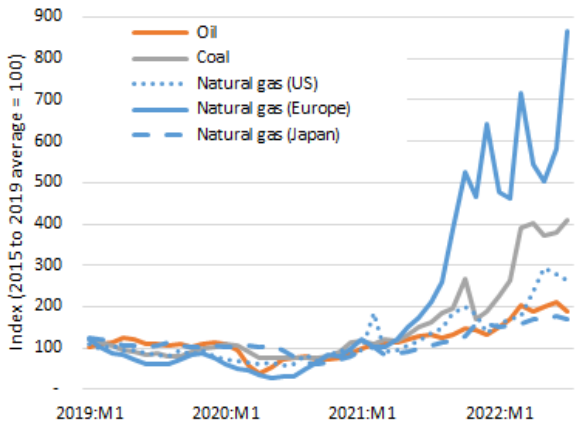
[2] There may also be firm-specific rents (for example, arising from a patent or from know-how). For extractive industries, these tend to be smaller than location-specific rents, although there are clearly cases in which new technology enables innovative companies initially to earn high returns.

[3] In theory, windfall profits can be defined as profits from commodity prices exceeding their expected price over the course of an investment. Practically, it is difficult to design a policy that targets such profits, since the size of profits depends on investor-specific assumptions (for example, the expected commodity price). More important, a policy targeting windfall profits does not provide advantages over those targeting economic rents.

rents. This also provides an overview of recent tax measures targeting the energy sector more broadly in some European countries.

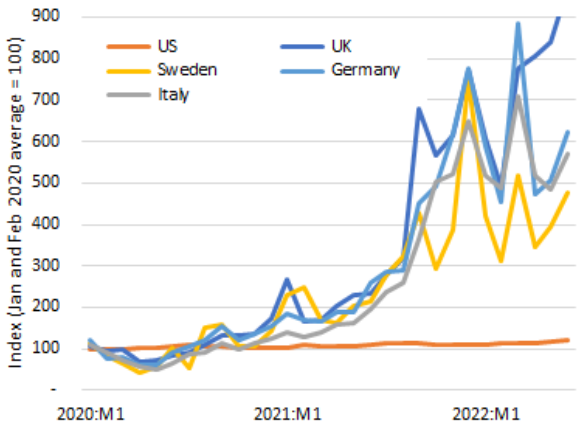
Figure 1. Fossil Fuel and Electricity Price Indices

1. Fossil fuel prices, since 2019



Source: IMF, Primary Commodity Prices database. Note: prices are through the end of July 2022.

2. Electricity prices, since 2020



Source: Statista, US Bureau of Labor Statistics, UK Ofgem. Note: prices are through the end of June 2022.

Tax Policy Advice

Natural resource tax policy design should generally consider efficiency, ease of collection, equity, and revenue-raising ability. Taxes on economic rents are efficient since they do not reduce investment (because the tax applies only to returns above what is required to invest) and can raise substantial revenue in sectors with persistent rents. They can also foster a sense of fairness by ensuring that more profitable projects pay more tax. In contrast, ordinary corporate income taxes apply to both rents and the normal return on (equity) investment, so they can reduce investment/supply but not as much as taxes on production (for example, royalties), which do not consider a firm's costs.

Tax policy advice should be tailored to different stages in the energy value chain. The key reason is that economic rents generally originate from extraction activities (that is, upstream) rather than from fossil fuel processing, distribution, and retailing and electricity generation (see Annex 2 for information on producer profits).[4] However, there may also be instances of temporary windfall profits generated by mid- and downstream companies that benefit from fossil fuel price increases (for example, low-carbon electricity producers with sales at the market price, rather than at a fixed price).

Taxing Windfall Profits from Upstream Extraction

It is best practice to include a fiscal instrument targeting economic rents in the fiscal regime for natural resource upstream extraction. This will complement other fiscal instruments that provide relatively more certain and stable revenue (for example, royalties and corporate income tax) and will, in principle, take effect only when a project realizes economic rents (See Daniel and others 2010 and Wen 2018 for a fuller discussion). In countries that rely more on rent-targeting fiscal instruments, fiscal revenue may be more volatile, which in turn

[4] The economic rationale is that location-specific rents lead to excess profits for lower-cost producers and from commodity price surges benefiting primarily producers.

requires a macro-fiscal framework for revenue management that saves a higher share of windfall revenue gains to promote intergenerational equity from an exhaustible and nonrenewable resource.

There is a menu of options for rent-sharing fiscal instruments differing in how well they target rents. A tax that applies to project cash flow after a minimum investment return has been realized is the least distortive, but its more precise targeting often requires a more complex design that can complicate revenue administration. Common rent-sharing instruments are listed below in the order of how well each targets rents.

- Cumulative-rate-of-return-based cash flow tax: This tax is assessed on the cash flow generated by a project and will apply only after a minimum "normal" rate of return (either before or after corporate income tax) has been realized. In doing so, it taxes only the excess return on the investment. This neutrality is in practice achieved by uplifting the negative cash flow by the threshold rate of return (in principle, a similar effect could be achieved by refunding the tax value of losses when cash flows are negative, although this would increase the risk to the government if an investment is unsuccessful). The tax is ring-fenced at the project level to effectively target the rents generated by the investment. The tax can be more challenging to administer and requires transition rules if introduced after project development has begun.

- Project-level tax with uplift on capital expenditure: This is a simpler variant of the rate-of-return-based tax designed by applying a percentage uplift to qualifying capital expenditure over a specified time period. This ensures that the minimum return on investment is not taxed.

- R-factor–based progressive profit oil sharing: This is a common design in production-sharing contracts[5] whereby the profit-oil sharing follows a progressive rate structure linked to the ratio between cumulative net revenue and investment (the so-called R-factor); when the R-factor exceeds one, the investment cost has been recouped. The R-factor does not directly measure rents because it does not incorporate the time value of money, but this can be approximated by setting the bottom R-factor threshold above one.

- A supplementary tax on corporate profits when a certain profitability threshold is met: This is relatively easy to apply and does not require ring-fencing at the project level but is not as well targeted at rents. The targeting at windfall profits by the supplementary tax could be further refined by a progressive rate structure linked to a measure of profitability (for example, return on assets) or proxied by commodity prices.

- A variable royalty rate linked to commodity prices: This is easy to apply but is less well targeted at economic rents and can reduce supply since the tax increases the variable cost of production.

Country-level decisions on the appropriate rent-capturing instrument should balance the ability to target rents versus the administrative complexity (Table 1). Taxes that are less well targeted at rents, such as variable royalty rates or taxes imposed at the corporate level, could diminish supply increases in response to rising prices and deter new investment. Administrative complexity may be binding in underresourced and low-capacity tax administrations—if this is the case, improving capacity should be prioritized since it is crucial to implementing an efficient fiscal regime, but the immediate tax policy responses may assume existing capacity constraints. In addition, the ease of a progressive instrument's application to existing projects should be considered: some tax designs require complex transitional rules and access to project-level information on past costs and revenue or may be constrained by contracts' existing fiscal stability clauses.

[5] Production-sharing contracts set out fiscal and operational responsibilities for oil and gas investors and are common, especially in developing countries. The investor (that is, the contractor) receives a share of production to recover costs, while production allocated to profit is shared between the investor and the government.

Table 1. Overview of Rent-Targeting Fiscal Instruments Applied to Fossil Fuel Extraction

Tax type	Ability to target rents	Administrative complexity	Scope
Cumulative-rate-of-return-based cash flow tax	**High,** taxes only rents (i.e., investment-neutral) if the uplift rate is at or above the investor's required return. The cash flow tax delays payments until rent is realized, making it slightly more efficient than the uplift-on-capital-expenditure option	**Medium,** requires oversight and auditing of project-level revenues and costs; uplift rate is contentious. The uplift-on-capital-expenditure option requires determination of which capital cost categories qualify for uplift	**Project level,** difficult to apply to existing projects
Project-level tax with uplift on capital expenditure			**Project level,** more easily applied to existing projects
R-factor–based progressive "profit oil" sharing	**Medium,** the R-factor does not take into account the time value of money so is not a direct measure of rents and makes setting the minimum threshold more difficult		**Project level,** difficult to apply to existing projects
Supplementary tax rate on corporate profits	**Low to medium,** loss-making and non-extraction activities remove a portion of project-level rents from the tax base	**Low**, calculated and audited using existing corporate income tax return information	**Corporate level,** applies to existing projects
Variable royalty rate linked to commodity prices	**Low,** does not take into account the project's cost structure and increases the variable cost of production so can trigger early project cutoff	**Low,** calculated and audited using existing royalty information	**Project level,** easy to apply to existing projects

It is best to have a rent-targeting instrument in the fiscal regime from the beginning rather than introducing new taxes after a natural resource investment has been made. This allows a potential investor to assess the impact of the tax under varying profitability assumptions before reaching an investment decision. An intriguing argument in favor of rent-taxing instruments is that they give investors more certainty ex ante: the more progressive fiscal regime reduces political pressure on the government to subsequently introduce ad hoc fiscal instruments if a windfall profit materializes.

Many fossil-fuel-producing countries already have a progressive instrument that captures a portion of the economic rents generated by a commodity price surge. For these countries (especially those with relatively high effective tax rates) it makes little sense to introduce fiscal regime changes in response to a short-term price surge—see the next section on country practices for examples of countries with progressive instruments and high effective tax rates.

The trickier question is how countries without a rent-targeting mechanism should respond to an event that leads to windfall profits. Faced with a surge in commodity prices, perhaps expected to be transient rather than permanent, policymakers understandably may consider introducing an exceptional temporary tax measure. But a temporary tax measure can be distortionary and increase investor uncertainty, especially if the tax is not well targeted at rents or if the timing of its introduction or removal is ill-judged. In addition, to counteract the negative impact on investor uncertainty, there may be pressure to include generous investment incentives in temporary windfall taxes (for example, the UK energy profit levy, with an 80 percent investment allowance)—such policies could promote short-term investment in the fossil fuel sector since the tax benefit of investment in extractives is relatively high.

A better response for countries with room in their existing fiscal regime is a permanent, well-designed rent-targeting mechanism. This determination is country-specific and should take into account both the overall level of taxation in the upstream sector and its response to changes in profitability.[6] The fossil fuel industry will still play an important role in the transition to a carbon-free energy future, and the increased certainty a well-designed progressive tax provides may promote long-term investment, including in transitional fuels such as natural gas.

[6] In addition, in many countries, fiscal stability clauses in contracts may also limit the impact of policy changes on existing projects; these are not, however, relevant for large advanced producers (for example, Norway, United Kingdom, United States).

Fiscal regime design should also prioritize reducing direct greenhouse gas emissions from fossil fuel production (commonly called Scope 1 emissions). A mixture of regulatory and price measures can be used to incentivize a switch to less emitting production methods and reservoirs during the energy transition.[7] The case of Norway illustrates how a carbon and methane tax can be integrated into a petroleum fiscal regime while still achieving an overall high level of progressivity without discouraging investment (see section on country practices for more).

Windfall profits are likely concentrated in specific fossil fuel-producing countries rather than in importers. This may lead to political pressure in countries that are net importers of fossil fuel or where large energy multinationals are headquartered to seek to capture rents generated in producing countries, partly as a way to finance support for affected households and firms. However, there are few tax policy options for taxing fossil fuel imports that do not further drive up consumer prices.[8]

Tax Policy Advice for Electricity Generators and Refineries

Increases in pump prices are the visible sign of a commodity price surge, but significant rents usually do not originate from petroleum refining and distribution. However, there can be instances in which demand and supply imbalances in the petroleum product value chain can lead to temporary windfall profits. An example is the current constraints in petroleum refinery capacity in the United States and some other countries, which has led to a surge in refiner profits, known as the "crack spread" between the price of crude oil and wholesale fuel products (especially diesel). A comparison of the increase in the tax-free pump price with the increase in the relevant international oil price indicates that mid- and downstream companies are receiving a portion of the windfall, under the assumption that non-crude oil business cost increases do not fully offset the increase in spreads (see **Error! Reference source not found.** for an analysis of the United States and European countries). In many other countries, pump prices are regulated, further strengthening the argument for focusing rent-targeting mechanisms on the upstream segment.

In addition, electricity producers with fixed cost structures may profit as electricity prices increase. In Europe higher natural gas prices have pushed up electricity tariffs, providing windfalls to renewable and nuclear power electricity producers and fossil fuel-based electricity producers with contractually fixed natural gas and coal purchase prices. Although profitable companies will pay more in corporate income tax, some EU countries have introduced temporary taxes in response; these are, nevertheless, somewhat arbitrary (discussed in the next section).

The political pressure to raise revenue from segments of the energy sector that may enjoy temporary windfalls is understandable, but the case for rent-targeting taxes in the electricity sector is not strong. At a time when the key priority should be to incentivize energy diversification away from fossil fuels, the signaling effect of a tax targeting renewable energy producers is especially mixed. Introducing a temporary windfall profit tax reduces future investment because prospective investors will internalize the likelihood of potential taxes when making investment decisions. Moreover, in many cases, taxes in response to price surges may suffer from design problems—given their expedited and political nature. This exacerbates the harm to investment and could curtail existing supplies—for instance, taxes on gross revenue are especially distortive and can exacerbate inflation if they increase marginal costs for a large set of suppliers.

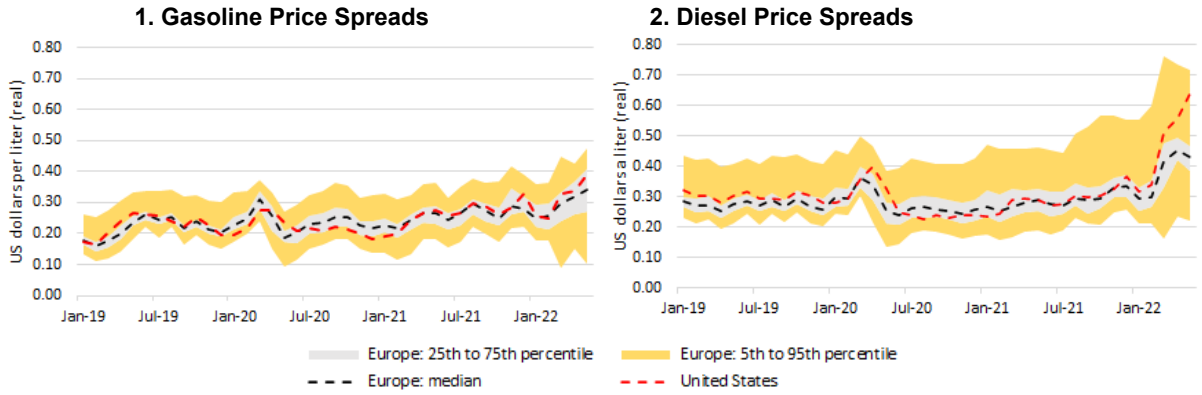
[7] See Baunsgaard and Vernon (forthcoming) for an analysis of emission taxes on fossil fuel producers.

[8] In general, it is less persuasive to introduce additional taxes on imports to seek to capture rents; it has been argued, however, in the context of the European Union, that import tariffs can be targeted at extracting monopoly rents on Russian oil exports and could provide a strong incentive to diversify the energy mix (Gros 2022).

Box 1. Comparison of Increased Pre-tax Retail Prices and Crude Oil Prices

Tax-free retail prices have increased by more than international oil prices in the United States and some European countries, indicating that mid- and/or downstream companies are receiving a portion of windfalls from oil price increases. Spreads, which are defined as the difference between the crude oil prices and gasoline/diesel retail prices, excluding taxes, have increased relatively more in the United States than in the average European country and more for diesel than for gasoline (Figure 2). However, there is significant variation across countries in Europe. In some there has been a decrease in spreads; in others the increase has been higher than in the United States. The average increase in spreads is quite large: gasoline spreads are currently ~$0.15 per liter (~65 percent) higher in Europe and the United States than the 2019 average, while diesel spreads are $0.15 per liter higher in Europe (56 percent) and $0.34 per liter higher in the United States (112 percent).

Figure 2. Gasoline and Diesel Price Spreads



Sources: EU Oil Price Bulletin; US Bureau of Labor Statistics; US Energy Information Administration; and IMF staff calculations.
Note: Spreads are adjusted for inflation. Brent and West Texas Intermediate oil prices are assumed as the international benchmark for European countries and the United States, respectively.

There is evidence that increases in spreads result in higher refinery profits. For example, recent analysis from the US Energy Information Administration (EIA) finds that refinery profits increased substantially across all regions within the United States in 2021 relative to 2020 and are above or near 10-year highs (EIA 2022a), while other EIA analysis shows that crack spreads were also elevated in Europe and Singapore in recent months (EIA 2022b).

A confluence of temporary events has resulted in higher spreads for refineries. These factors include (1) reduced refining utilization and petroleum product export quotas in China, (2) reduced supply of Russian petroleum products due to sanctions, (3) reduced US capacity due to some refineries shutting down, (4) inelastic refining supply since refineries are operating near capacity and it takes time to build new capacity, and (5) increased demand for petroleum products from the COVID recovery (EIA 2022b). In all, this allows operating refineries to increase prices, but markets should eventually rebalance and return to pre-COVID conditions.

If there are indeed economic rents consistently earned by electricity generators and oil refiners, policymakers should identify and remedy the root cause. For electricity generation, the windfall profits are at least partly a by-product of the design of the electricity tariff-setting mechanism. It may therefore seem more fruitful to focus on how to strengthen the tariff-setting mechanism if temporary windfall gains by some electricity producers are viewed as a disadvantage.

An excess profits tax on such companies could, nonetheless, provide a backstop against future windfall profits. An argument can also be made for a more permanent excess profits tax that applies more generally, as discussed in Hebous, Prihardini, and Vernon (forthcoming). As with a tax that targets economic rents in the

extractive sector, such a tax should apply to a clear, well-defined measure of excess profits (for example, the return on capital above a specified level), allow for carryforward of losses, and avoid parameters that reference a particular time period or price level. These design characteristics are desirable since they should avoid distorting investment decisions by taxing only profits above the cost of capital and avoid the need for ad hoc adjustments to the tax rates or parameters as market conditions change.

Country Practices

Fiscal Instruments Targeting Economic Rents or Windfall Profits

Many countries with fossil fuel extraction already have an instrument in their upstream fiscal regime targeting economic rents either with a flat or variable rate structure. Examples include Norway (special petroleum tax), progressive R-factor–based production sharing (for example, common in many developing countries), and rate-of-return-based fiscal instruments (for example, Angola and Australia). A few countries have tax rates for either income taxes or royalties that vary with commodity prices (for example, Canada, Nigeria, Trinidad and Tobago) or additional taxes on the sector (for example, the supplementary charge and the recently introduced energy profits levy in the United Kingdom). In contrast, other countries have fiscal regimes that are less responsive to surges in profits; for example, the United States.[9] Table 2 provides examples of several countries' rent-targeting fiscal instruments.

Table 2. Petroleum Fiscal Instruments Targeting Economic Rents

Country	Regime	Instrument	Rates	Thresholds	Capital expenditure	Interest deductible	CIT integration
Algeria	Tax-royalty	R-factor	10%; 50%	R: 1.0 - 3.0	Depreciated	No	Pre-tax
Angola (offshore) /1	PSC	IRR	30% - 90%	IRR: 15% - 40%	Expensed	No	Post-tax
Australia	Tax-royalty	IRR	40%	IRR: LTBR + 5% /2	Expensed	No	Pre-tax
Azerbaijan**	PSC	R-factor	55% - 90%	R: 1.50 - 2.50	Expensed	No	Pre-tax
Brazil (offshore) /3	Tax-royalty	DROP	0% - 40%	4 DROP tiers	Expensed	No	Pre-tax
Canada (Alberta) /4	Tax-royalty	DROP, price	25% - 40%	IRR: LTBR	Expensed	No	Pre-tax
Croatia 1/	PSC	R-factor	10% - 40%	R: 1.0 - 2.0	Expensed	No	Pre-tax
Kazakhstan	Tax-royalty	R-factor	10% - 60%	6 profitability tiers	Depreciated	No	Post-tax
Malaysia	PSC	R-factor	10% - 70%	R: 1.5 - 2.5	Unclear	Unclear	Unclear
Mauritania	PSC	R-factor	31% - 42%	R: 1.0 - 3.0	Depreciated	Yes	Pre-tax
Mozambique 1/	PSC	R-factor	15% - 60%	R: 1.0 - 4.0	Depreciated	Yes	Post-tax
Nigeria (offshore)	Hybrid	Royalty	0%-10%	Oil price: $50 - $150	NA - applied		NA
Norway	Tax-royalty	Excess profit	56%	20.8% uplift on capex	Depreciated	Yes	Pre-tax
Norway (proposed)	Tax-royalty	Cash flow	71.8%	Refund losses	Expensed	No	Post-tax
Papua New Guinea	Tax-royalty	IRR	30%	IRR: 15%	Expensed	No	Post-tax
Russia	Tax-royalty	IRR	50%	IRR: 16.3%	Expensed	No	Pre-tax
Saudi Arabia	Tax-royalty	Price	15% - 80%	Oil price: $70 - $100	NA - applied to revenue		
Trinidad and Tobago	Tax-royalty	Price-based	25% - 47%	Oil price: $90 - $200	NA - applied to revenue		
United Kingdom /5	Tax-royalty	Excess profit	10% + 25%	62.5% - 80% uplift /5	Expensed	No	Pre-tax

Source: IMF, Fiscal Analysis of Resource Industries (FARI) database.

Note: Immediate expensing of capital expenditure (rather than depreciation) ensures that the investor recovers its capital costs prior to paying tax and reduces the likelihood that the tax system will distort investment decisions. Interest deductions are uncommon for rent-targeting taxes because the investor generally receives an allowance for the cost of debt and equity financing through either an uplift on losses or capital costs or having a relatively high profitability threshold to trigger the payment of tax. Capex = capital expenditure ; CIT = corporate income tax; IRR = internal rate of return; LTBR = long-term bond rate; NA = not applicable; PSC = production-sharing contract; R = R-factor, DROP = daily rate of production. 1) Parameters for the rent-targeting mechanisms vary by contract. 2) The law changed in 2019

[9] Several competing tax reform proposals attempting to capture windfalls from the petroleum sector have been put forward in the United States (see Matheson 2022 for an assessment of the proposals). However, at this stage none of these proposals have moved forward.

to reduce the uplift amount and adjust time limits on uplift levels. 3) Called a “special participation fee.” An additional deduction is provided based on the DROP so that the tax base approximates excess profit. Decrees set forth the parameters. 4) Applies only to oil sands. The "royalty" is 1 percent–9 percent on gross revenue prior to the project recovering costs and then 25 percent–40 percent of net cash flow with adjustments. 5) Uplift on eligible investment is 62.5 percent for the 10 percent supplementary charge and 80 percent for the 25 percent energy profits levy.

Some European countries have introduced or announced new taxes or other fiscal mechanisms in recent months on a temporary basis to capture windfall profits. These apply in one case to fossil fuel extraction (United Kingdom) but, otherwise, target the electricity sector. In most cases, the revenue from temporary tax measures is earmarked for expenditure measures to soften the consumer impact of higher energy costs.

- Greece: Imposed a 90 percent levy on windfall profits of domestic power producers for the period October 2021–March 2022.
- Hungary: Announced a temporary windfall tax for 2022 and 2023 on “extra profits” from energy companies (as well as other sectors with different tax rates). In the energy sector, the tax applies on revenue generated from the difference between world market oil prices and actual prices paid on imports of oil products from Russia with a 40% tax rate (the rate was 25% until the end of July 2022).
- Italy: Introduced a one-time 25 percent tax on energy companies (producers and sellers of electricity, natural gas, and petroleum products). The tax applies to company profits that rose more than €5 million between October 2021 and April 2022 compared with the same period in the previous year.
- Spain: Announced a temporary windfall profits tax for extraordinary profits earned in 2022 and 2023 by electricity utility companies.
- Romania: Introduced an 80 percent windfall profits tax on additional revenue realized by electricity producers calculated on the monthly difference between the average selling price and 450 lei per megawatt hour. The tax was subsequently modified to apply to net revenue, taking account of costs. The government also adjusted the fiscal regime for natural gas, introducing a progressive tax of 15 percent to 70 percent on additional income on gas prices above 85 lei (about $18) per megawatt hour.
- United Kingdom: The energy profits levy, introduced in July 2022 and set to expire by the end of 2025, is an additional 25 percent tax on oil and gas profits on top of the existing taxes, taking the combined rate to 65 percent. Previous losses or decommissioning expenditure cannot be offset against profits subject to the levy. To encourage new investment, there is an additional 80 percent investment allowance. The levy does not apply to electricity generation.

The European Commission also issued guidance on the design of temporary windfall profits tax measures that would apply to electricity generators (EC 2022, Annex 2). The guidance sets out a number of requirements for such taxes, including a requirement that taxes be temporary, preserve market signals (that is, not increase marginal costs), discriminate based on generation technology, and use clear and verifiable criteria for determining “excessive” rents.

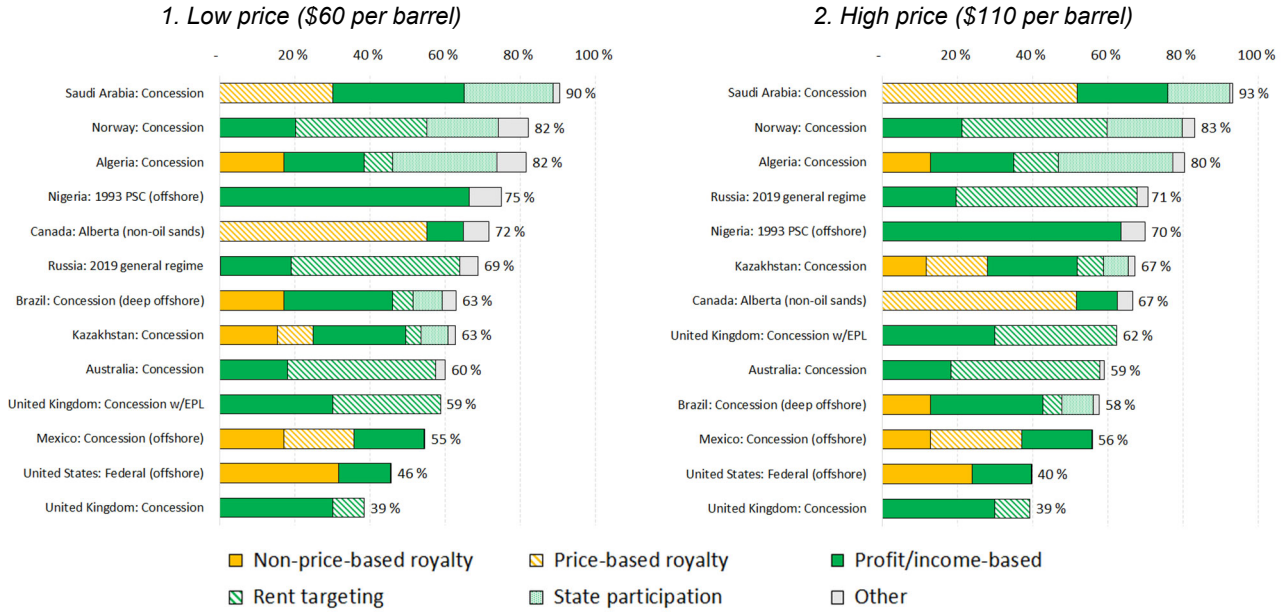
Evaluating the Responsiveness of Petroleum Fiscal Regimes to Changes in Profits

When evaluating the sharing of project cash flow between the investor and the government, there should be a focus on the entire fiscal regime. This makes it possible to capture the interaction between different fiscal instruments (for example, rent-targeting taxes, royalties, production sharing, profit taxes, state participation, and so forth). The Fiscal Analysis of Resource Industries (FARI) framework (IMF 2022) is designed to support such analysis and is used in the following paragraphs to analyze the fiscal regimes of large producers. See Annex 3 for a detailed description of the modeled fiscal regimes.

The level and composition of the government take vary significantly across oil and gas producing countries (**Error! Reference source not found.**3)**.** Average effective tax rates (AETRs) for a selected group of large producers range from 35 to 90 percent, with lower AETRs resulting in a greater share of project profits for

investors. The variation in AETRs is driven both by the baseline level of tax rates for more common taxes, such as royalties and the corporate income tax, and by whether a tax system has mechanisms directly targeting economic rents (for example, Norway's Special Petroleum Tax and Australia's Resource Rent Tax), significant equity participation (for example, Algeria), or royalty rates that increase with prices (for example, Saudi Arabia). Jurisdictions with AETRs above 70 to 80 percent when prices are high (for example, Norway and Saudi Arabia) collect a large portion of project profits and have no basis for imposing new taxes in response to windfalls. This is not true of countries with AETRs (far) below 70 percent (for example, Mexico, United States, and United Kingdom before introduction of the energy profits levy), most of which do not have robust rent-targeting mechanisms in their fiscal regime. The analysis also shows that the introduction of the temporary energy profits levy makes the United Kingdom petroleum fiscal regime less of an outlier.

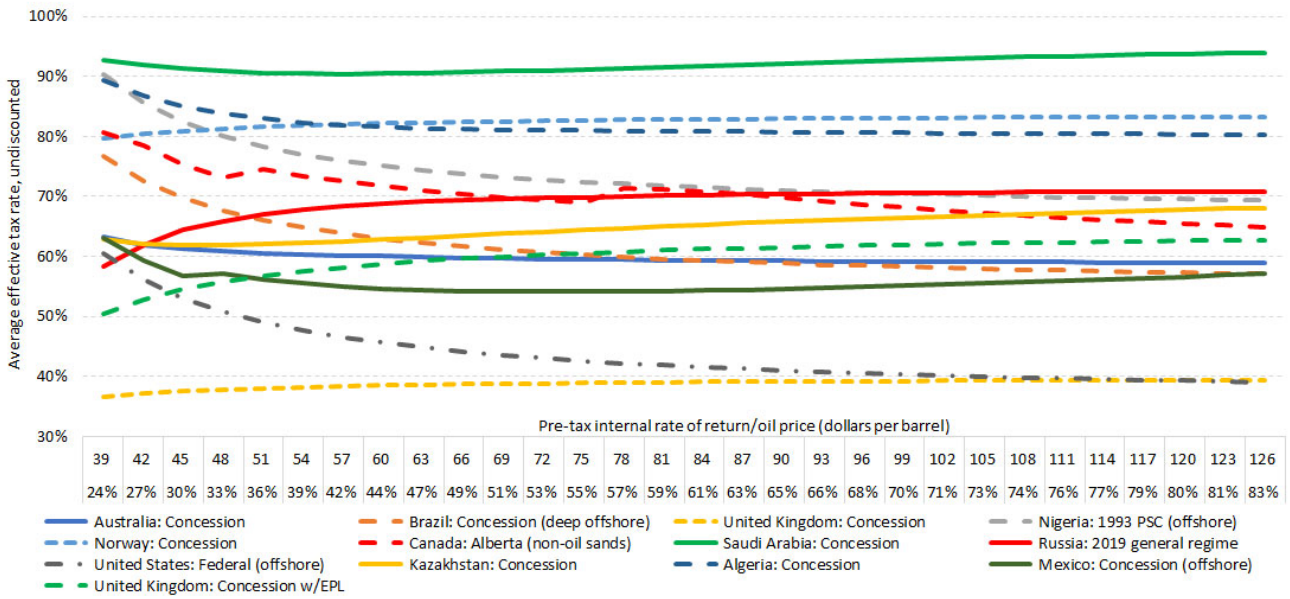
Figure 3. Average Effective Tax Rate



Sources: IMF, Fiscal Analysis of Resource Industries (FARI) model; and IMF staff calculations.
Note: Production sharing relying on mechanisms not related to economic rents, such as production rates and corporate income tax, is categorized as "profit/income-based." The "other" classification includes primarily taxes on pollution, such as carbon taxes, and withholding taxes. Norway does not require its state-owned oil and gas company, Equinor, to take an ownership stake in new licenses, but Equinor participates in numerous production licenses as a majority or minority partner. EPL = excess profits levy; PSC = production-sharing contractor.

The extent to which the government's take responds to changing price levels also varies (**Error! Reference source not found.**4)**.** Countries relying more on profit-based fiscal mechanisms have relatively stable AETRs across different profitability outcomes since the tax base (and sometimes the tax rate) grows as prices increase, while fiscal regimes with higher royalties and no excess profit taxation have declining AETRs because pretax profit grows faster than the tax base. Fiscal regimes including a progressive instrument result in more stable outcomes as prices change and greater certainty for investors due to reduced political pressure to introduce discretionary changes to taxes when prices are high. Norway is an outlier in that it has both a progressive regime and a high AETR. Others have either modest AETRs but adequate progressivity (Australia) or low AETRs and/or regressive fiscal regimes (the US government take is particularly low and regressive). In addition to rent-targeting tax or price-based royalties, Algeria, Norway, and Saudi Arabia also increase progressively through large, fully paid equity stakes in oil and gas projects.

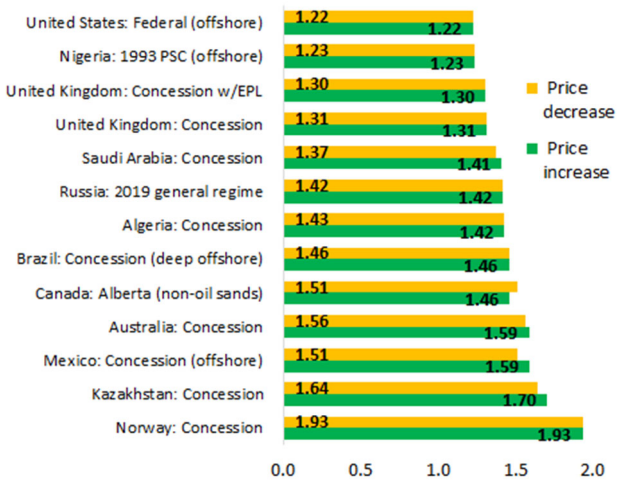
Figure 4. Progressivity, AETR across Price Levels



Sources: IMF, Fiscal Analysis of Resource Industries (FARI) model; and IMF staff calculations.

The short-term response of government revenue to a negative or positive price shock across countries generally mimics that of progressivity.[10] A higher short-term response (that is, higher elasticity) means that the government takes on a larger portion of short-term commodity price risk (Figure 5). Fiscal regimes with profit-based mechanisms tend to have larger immediate changes to revenue (for example, Algeria and Norway) since the price change feeds directly through to changes in the tax base; royalties and indirect taxes are not as responsive because the tax base change is less pronounced[11] and the price change may not be large enough to trigger a new royalty rate threshold.

Figure 5. Elasticity of Government Revenue



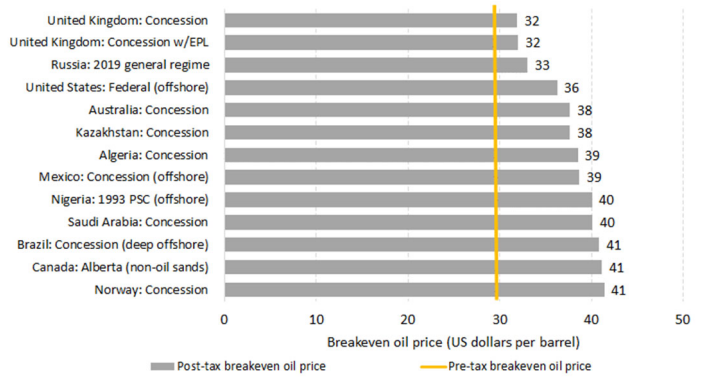
Sources: IMF, Fiscal Analysis of Resource Industries (FARI) model; and IMF staff calculations.
Note: Assumes a 20 percent price increase and decrease. EPL = excess profits levy; PSC = production-sharing contractor.

[10] The elasticity metric measures the one-year change in revenue for a given project that has recouped its initial investment, as compared with the progressivity analysis, which assess the level and evolution of effective tax rates over the life of an entire resource project (that is during the exploration, development, production, and decommissioning phases).

[11] A numerical example is provided to show how the change in commodity prices impacts the tax base of royalties and profit-based taxes. Prior to the price increase, revenue is $10, costs are $6, and profit is $4. The price increases by 50 percent, resulting in revenue of $15 and profit of $9, meaning that the profit tax base increases by more than 100 percent (as it goes from $4 to $9), whereas the royalty base increases by only 50 percent (as it goes from $10 to $15).

The breakeven price is a measure of whether a fiscal regime distorts investment decisions (Figure 6)**.** Taxes that are independent of profit levels generally result in higher breakeven prices because they apply regardless of the project's underlying profit—some examples include carbon taxes (in Norway and Canada) and royalties (in most countries)—but taxes targeting economic rents are not distortionary and, thus, should not prevent investment. For example, although Norway's AETR is far higher than that of offshore US projects (~85 percent compared with 40 percent), the breakeven price is only $5 per barrel higher since Norway's excess profits tax increases the government's take when prices are high but imposes only a small (or no) burden on projects that are less profitable as a result of lower commodity prices or higher project costs.

Figure 6. Breakeven Price



Sources: IMF, Fiscal Analysis of Resource Industries (FARI) model; and IMF staff calculations.
Note: investor minimum return is assumed to be 13 percent in real terms. The project has the same pre-tax return across fiscal regimes to isolate the impact of the fiscal regime on the breakeven price. In reality, the underlying project production and cost structure vary significantly. EPL = excess profits levy; PSC = production-sharing contractor.

Annex 1. Windfalls by Country

Methodology

The country-level impact of recent oil, gas, and coal price increases is estimated at an aggregate level both for energy consumers (that is, households, firms, and government) and for producers.

The impact on producers is estimated using the following steps: (1) Production remains at 2019 levels (the most recent year of comprehensive data from the International Energy Agency World Energy Balances), except in the case of Russia, for which production is adjusted down to reflect reduced sales. (2) Producer prices increase by the difference between the average price from March 2021 to July 2022 and the average price for 2019 for the portion of production that is exported, while domestically consumed production is valued at the change in domestic retail prices—the discount between Urals oil and Brent oil is applied to Russian exports. The increase in government revenue from taxing producers is also estimated using average effective tax rates for a country fuel pair, calculated in the IMF Fiscal Analysis of Resource Industries (FARI) model (or the world average if data are missing) using country-specific fiscal models.

A similar methodology is used for consumer impact: (1) Consumption remains at 2019 levels. (2) Consumer prices are observed or (if data are not available) estimated using the historical relationship between international fossil fuel price changes and retail prices (Amaglobeli and others 2022).

Windfalls for largest producers

Combined gains for producers and governments of several large fossil fuel producers exceed 10 percent of GDP (Annex Table 1.1); gains are generally largest for natural gas producers, especially those that sell into European markets, since European natural gas prices have increased more than those of coal and oil. The gain to producers and government offsets the consumer loss in almost all cases (with the exception of India).

Annex Table 1.1. Producer, Government, and Consumer Impacts of International Price Increases

Country	Coal			Natural gas			Oil			All			Net gain/loss
	Investor	*Govt.*	*Consumer*	*Investor*	*Govt.*	*Consumer*	*Investor*	*Govt.*	*Consumer*	*Investor*	*Govt.*	*Consumer*	
Australia	1.1 %	0.6 %	(0.2)%	0.1 %	0.2 %	(0.1)%	0.1 %	0.2 %	(0.6)%	1.3 %	1.0 %	(0.9)%	1.4 %
Canada	0.1 %	0.0 %	(0.1)%	0.5 %	0.2 %	(0.3)%	0.8 %	2.5 %	(1.1)%	1.3 %	2.8 %	(1.5)%	2.7 %
China	1.4 %	0.5 %	(1.5)%	0.0 %	0.0 %	(0.0)%	0.1 %	0.1 %	(0.5)%	1.5 %	0.6 %	(2.0)%	0.1 %
Colombia	1.1 %	0.5 %	(0.1)%	0.5 %	0.3 %	(0.4)%	1.9 %	1.2 %	(0.1)%	3.5 %	2.0 %	(0.6)%	4.9 %
India	0.6 %	0.5 %	(1.6)%	0.0 %	0.0 %	(0.0)%	0.1 %	0.1 %	(0.5)%	0.7 %	0.6 %	(2.1)%	(0.8)%
Indonesia	2.0 %	1.0 %	(0.3)%	0.1 %	0.1 %	(0.0)%	0.2 %	0.7 %	(1.5)%	2.2 %	1.8 %	(1.9)%	2.1 %
Iran	0.0 %	0.0 %	(0.0)%	0.1 %	0.1 %	(0.1)%	0.3 %	1.1 %	(0.3)%	0.4 %	1.2 %	(0.4)%	1.3 %
Iraq	-	-	-	0.3 %	0.2 %	(0.3)%	4.8 %	16.7 %	(0.2)%	5.1 %	16.9 %	(0.6)%	21.4 %
Norway	0.0 %	0.0 %	(0.0)%	5.9 %	14.2 %	(0.3)%	1.3 %	3.0 %	(0.3)%	7.3 %	17.2 %	(0.6)%	23.9 %
Qatar	-	-	-	12.0 %	14.6 %	-	1.7 %	5.4 %	-	13.7 %	20.0 %	-	33.6 %
Russia	1.4 %	0.2 %	(0.2)%	12.4 %	6.6 %	(2.7)%	0.8 %	0.5 %	-	14.6 %	7.3 %	(2.9)%	19.0 %
Saudi Arabia	-	-	-	0.1 %	-	-	3.1 %	8.3 %	(0.0)%	3.3 %	8.3 %	(0.0)%	11.6 %
South Africa	2.7 %	1.3 %	(2.1)%	0.0 %	0.0 %	(0.0)%	0.0 %	0.0 %	(1.2)%	2.7 %	1.3 %	(3.3)%	0.7 %
United Arab Emirates	-	-	(0.0)%	1.5 %	2.4 %	(4.8)%	2.5 %	8.9 %	(1.0)%	4.0 %	11.3 %	(5.8)%	9.4 %
United States	0.1 %	0.1 %	(0.1)%	0.3 %	0.1 %	(0.3)%	0.5 %	0.3 %	(0.8)%	0.9 %	0.5 %	(1.2)%	0.2 %

Source: IMF staff calculations.

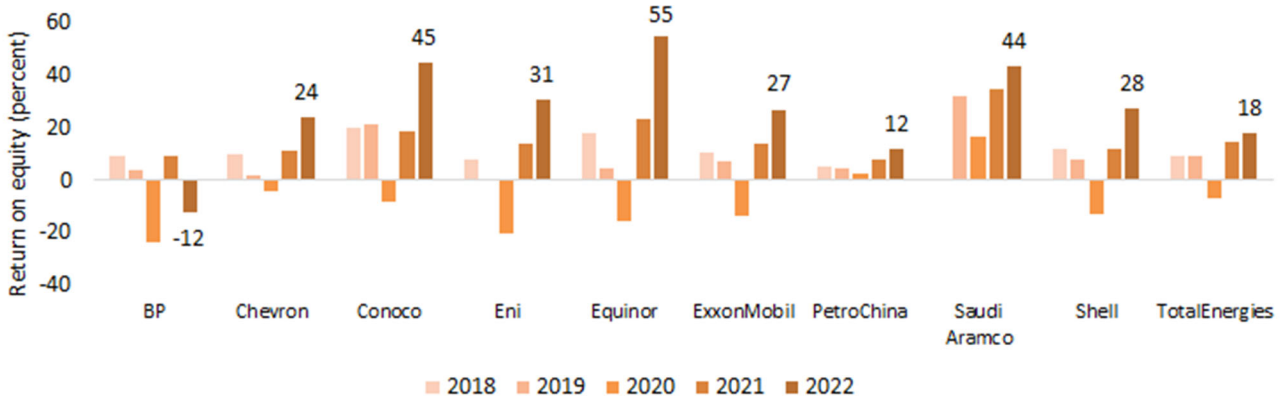
Note: government revenue is included as a gain. If the extractive company (that is, the investor) is a state-owned company, all gains effectively go to the government, but this is ignored due to a lack of data on such companies.

Annex 2. International Oil Company Profits

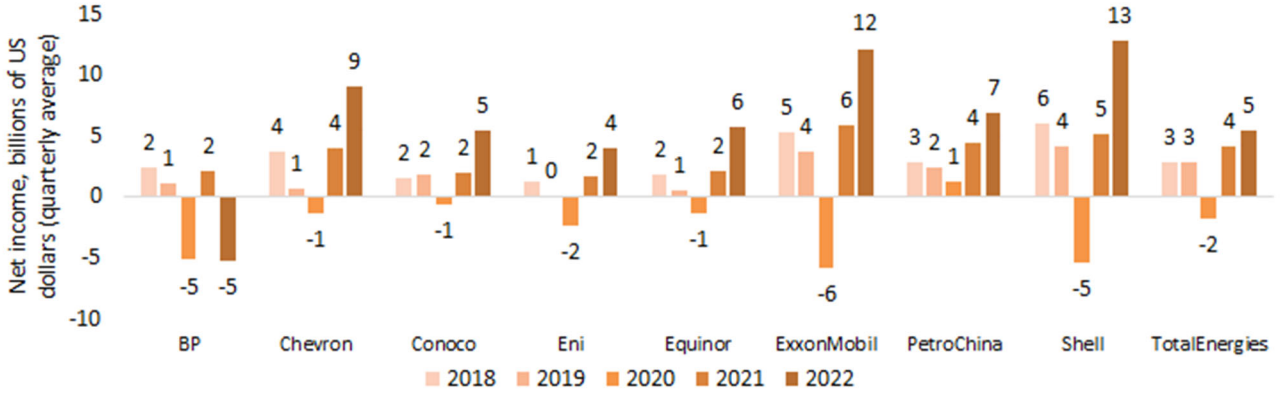
The largest oil and gas companies experienced increased profitability in the first quarter of 2022, with indications that the upstream segment drove profit (Annex Error! Reference source not found.2.1**).** Across major petroleum companies, the return on equity and net income for the first quarter of 2022 far exceeded that of the previous four years, illustrating that the negative impact of impairments of assets in Russia was more than offset by higher oil and gas prices. The profit increase appears to have been driven by extraction activities, at least until the second quarter of 2022—for example ExxonMobil, Chevron, and Eni saw a three- to fivefold increase in upstream profits in late 2021 and early 2022 (FT 2022a; Chevron 2022a; Eni 2022a). In the second quarter of 2022, refining and downstream sales contributed more to total profits than in the previous quarter, but exploration and production activities still drove profit increases (ExxonMobil 2022; Chevron 2022b; Eni 2022b).

Annex Figure 2.1. Large Oil and Gas Company Profitability

1. Return on equity (percent)



2. Net income, quarterly average (billions of US dollars)



Source: S&P Capital IQ database.

Note: Saudi Aramco has been excluded from the net income chart due to very high income ($10 to $39 billion quarterly average in each year). PetroChina and Saudi Aramco had not reported their second quarter 2022 earnings at the time of the analysis.

Annex 3. Fiscal Regimes for Comparator Countries

Annex Error! Reference source not found.**3.1 provides the main mechanisms and parameters for the fiscal regimes modeled above.** The full structure of the fiscal regime and interactions between individual mechanisms are important because they ultimately determine the government take and the impact of fiscal policy on investment decisions—in other words, looking only at the progressive (or distortive) elements can result in misleading assessments. Note that the modeled regimes may not reflect the most recent structure, as they are intended to capture the design applicable to most existing projects (for example, the Nigeria 1993 production-sharing contract and Saudi Arabia 2017 concessions are modeled, rather than the 2021 Petroleum Industry Bill and updated royalty rates, respectively).

All modeled countries apply corporate income tax to the extractive sector, while there is mixed use of royalties and rent-targeting taxes. Seven countries have royalties, with rates ranging from five to 50 percent, and three countries have royalty rates that vary with commodity prices (Canada, Mexico, Saudi Arabia). Seven countries also have rent-targeting taxes, but with varying designs—three allow for additional deductions to capital (Norway) or all expenses (Brazil and Kazakhstan), two are cash flow taxes with uplift on losses (Australia and Russia), Algeria has a tax rate increasing with the R-factor, and the United Kingdom provides a surcharge on the corporate income tax base but without a deduction for interest. Five countries have significant equity interests, all of which are assumed to pay their share of exploration costs (although conclusive information is not available for Algeria and Kazakhstan).

Annex Table 3.1. Modeled Oil and Gas Fiscal Regimes

			Production Sharing		Corporate Income Tax		
Country	Regime	Royalty Rate	Cost Recovery Limit	State Share	Rate	Depreciation	Loss Carry Forward
Algeria	2019 Hydrocarbon Law	10%	NA	NA	30%	4 years SL	4 years
Australia	Concession	0%	NA	NA	30%	10 years SL	Unlimited
Brazil	Concession (deep offshore)	10%	NA	NA	34%	10 years SL	Unlimited
Canada	Alberta (non-oil sands)	10%-40%; price, profit	NA	NA	23%	30%-45% DB	20 years
Kazakhstan	Concession	5%-18%; DROP /1	NA	NA	32% /2	15% DB	10 years
Mexico	Concession (offshore)	7.5%-30%; price /3	NA	NA	30%	4 years SL	10 years
Nigeria	1993 PSC (offshore)	0%	100%	20%-60%; prod.	50%	5 years SL	Unlimited
Norway	Concession	0%	NA	NA	22%	6 years SL	Unlimited
Russia /4	2019 general regime	~0%	NA	NA	20%	5 years SL	Unlimited
Saudi Arabia	2017 concession	20%-50%; price	NA	NA	50%	4 years SL	15 years
United Kingdom	Concession	0%	NA	NA	30%	Immediate	Unlimited
United Kingdom	Concession with EPL /5	0%	NA	NA	30%	Immediate	Unlimited
United States	Federal (offshore)	18.5%	NA	NA	21%	Hybrid DB, SL	Unlimited

Source: IMF, Fiscal Analysis of Resource Industries (FARI) library.
Note: DB = declining balance; DROP = daily rate of production; EPL = excess profits levy; NA = not applicable; prod. = production; PSC = production-sharing contractor; SL = straight line.
[1] Royalties are reduced by 50 percent for domestic sales. There is an additional export tax of 0–32 percent depending on the oil price.
[2] Includes the 15 percent branch profit tax.
[3] A non-price-based component of the royalty is biddable and assumed to be 10 percent. The Mexican regime reflects that of the 2017 bid round 2.4.
[4] There are multiple regimes in Russia. The latest regime with the adoption of the resource rent tax (called the AIT) is modeled.

			Indirect taxes /1		Withholding Taxes /2			
Country	**Regime**	**Additional Profit Tax Rate**	**Environmental, per ton of CO2 eq /3**	**Import Duties**	**DWT**	**IWT**	**SWT /4**	**State Participation**
Algeria	2019 Hydrocarbon Law	10% to 50%; R-factor	NA	0%	0%	0%	30%	51% working interest
Australia	Concession	40%; IRR	NA	0%	0%	0%	10%	NA
Brazil	Concession (deep offshore)	10%-40%; DROP, excess profit	NA	0%	0%	15%	15%	15% working interest
Canada	Alberta (non-oil sands)	NA	USD ~25-150	0%	5%	10%	15%	NA
Kazakhstan	Concession	10%-60%; excess profit	NA	0%	5%	10%	0%	15% working interest
Mexico	Concession (offshore)	NA	NA	0%	0%	10%	0%	NA
Nigeria	1993 PSC (offshore)	NA	NA	0%	7.5%	7.5%	7.5%	NA
Norway	Concession	56%; excess profit	USD ~65-220	0%	0%	0%	0%	27% working interest
Russia	2019 general regime	50%; IRR	NA	10%	5%	0%	0%	NA
Saudi Arabia	2017 concession	NA	NA	0%	5%	5%	5%	70% working interest
United Kingdom	Concession	10%	NA	0%	0%	0%	0%	NA
United Kingdom	Concession with EPL	35%	NA	0%	0%	0%	0%	NA
United States	Federal (offshore)	NA	NA	0%	0%	0%	15%	NA

Source: IMF, Fiscal Analysis of Resource Industries (FARI) library.

Note: DROP = daily rate of production; DWT = dividend withholding tax; EPL = excess profits levy; IRR = internal rate of return; IWT = interest withholding tax; NA = not applicable; PSC = production-sharing contract; SWT = state withholding tax; USD = US dollar

[1] Value-added tax is not included as all modeled countries are assumed to provide timely refunds on exports and not exempt major business inputs.

[2] Withholding tax rates represent the lowest available rates provided through a country's tax treaties.

[3] CO2 eq = carbon dioxide equivalent with methane converted to CO2 equivalent using a 100-year time horizon.

[4] Applies only to nonresident subcontractors in most cases.

References

Amaglobeli, David, Emine Hanedar, Gee Hee Hong, and Céline Thévenot. 2022. “Fiscal Policy for Mitigating the Social Impact of High Energy and Food Prices.” International Monetary Fund, Washington, DC.

Baunsgaard, Thomas and Nate Vernon. Forthcoming. “Tax Policy for Fossil Fuel Production in Support of Climate Change Mitigation.” International Monetary Fund, Washington, DC.

Chevron. 2022a. “Chevron Announces First Quarter 2022 Results.” https://www.chevron.com/-/media/chevron/stories/documents/1Q22-earnings-press-release.pdf.

Chevron. 2022b. “Chevron Announces Second Quarter 2022 Results.” https://www.chevron.com/-/media/chevron/stories/documents/2Q22-earnings-press-release.pdf.

Daniel, Philip, Michael Keen, and Charles P. McPherson, eds. 2010. *The Taxation of Petroleum and Minerals: Principles, Problems and Practice*. Routledge Explorations in Environmental Economics. New York: Routledge/International Monetary Fund.

European Commission (EC). 2022. “Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and The Committee of the Regions.” Brussels. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A108%3AFIN.

Eni. 2022a. “Eni: Fourth Quarter and Full Year 2021 Results.” https://www.eni.com/assets/documents/press-release/migrated/2022-en/02/eni-fourth-quarter-2021-ceo-claudio-descalzi-comments-results.pdf.

Eni. 2022b. “Eni: Results for the Second Quarter and Half Year 2022.” https://www.eni.com/assets/documents/press-release/migrated/2022-en/07/eni-second-quarter-2022-ceo-claudio-descalzi-comments-results.pdf.

ExxonMobil. 2022. “ExxonMobil Announces Second-Quarter 2022 Results.” https://corporate.exxonmobil.com/-/media/Global/Files/investor-relations/quarterly-earnings/earnings-announcements/2022-earnings-announcements/2q-earnings-release.pdf.

Financial Times (FT). 2022a. “ExxonMobil Flags Highest Quarterly Profit since Boom Year of 2008,” April 4. https://www.ft.com/content/7b92387d-c39f-4f9b-be3f-5d806831b5d7.

Financial Times (FT). 2022b. “When the Windfall Blows,” May 24. https://www.ft.com/content/7228c193-b848-4c95-943a-bf1b29460c68.

Gros, Daniel. 2022. “The Smartest EU Sanction on Russia,” March 18. https://www.project-Resyndicate.org/commentary/eu-impose-special-import-tariff-on-russian-gas-and-oil-by-daniel-gros-2022-03?barrier=accesspaylog.

Hebous, Shafik, and Alexander Klemm. 2018 “A Destination-Based Allowance for Corporate Equity.” https://www.imf.org/-/media/Files/Publications/WP/2018/wp18239.ashx.

Hebous, Shafik, Dinar Prihardini, and Nate Vernon. Forthcoming. “Excess Profit Taxes: Historical Perspective and Contemporary Relevance.” International Monetary Fund, Washington, DC.

International Monetary Fund (IMF). 2022. “Fiscal Analysis of Resource Industries (FARI).” Washington, DC. https://www.imf.org/en/Topics/fiscal-policies/fiscal-analysis-of-resource-industries.

Matheson, Thornton. 2022. “How Should the US Tax Petroleum Profits?” Tax Policy Center, Washington, DC. https://www.taxpolicycenter.org/taxvox/how-should-us-tax-petroleum-profits.

US Energy Information Administration (EIA). 2022a, “Financial Review of the Global Oil and Natural Gas Industry: 2021.” Washington, DC. https://www.eia.gov/finance/review/pdf/finance_2021.pdf.

US Energy Information Administration (EIA). 2022b. “Short-Term Energy Outlook: May 2022.” Washington, DC. https://www.eia.gov/outlooks/steo/archives/may22.pdf.

Wen, Jean-Francois. 2018. “Progressive Taxation of Extractive Resources as Second-Best Optimal Policy.” International Monetary Fund, Washington, DC. https://www.imf.org/en/Publications/WP/Issues/2018/06/13/Progressive-Taxation-of-Extractive-Resources-as-Second-Best-Optimal-Policy-45923.