

# ***OPPORTUNITY COSTS AND DISCOUNT RATES FOR PUBLIC ASSESSMENT OF OIL-RELATED PROJECTS AND POLICIES IN OIL-EXPORTING COUNTRIES***

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## **Overview**

Many oil-exporting countries are going through a transformational journey where the governments are concerned with the allocation of resources to generate new development opportunities. From a government/national perspective, the opportunity cost of oil is key for assessing projects or policies that displace oil from (or add oil to) domestic consumption. Investing in renewables, energy efficiency, industrial development projects, or implementing new regulations can impact domestic demand for oil. The public cost-benefit analysis of such projects and policy shifts requires assuming a value for a barrel of oil displaced from or added to domestic consumption. This value is the opportunity cost of domestic oil consumption. It is not necessarily the international price of oil, since it also depends on the national circumstances of the country. The public discount rate is a critical element in the assessment of the opportunity cost of oil. Because of market uncertainties, future oil price-related cash flows need to be discounted at a rate different than a *risk-free* discount rate (Pierru and Matar, 2014). The value used for the public discount rate may strongly impact the valuation of investments with a long lifetime.

Using informed estimates of the opportunity cost and public discount rates would help leverage countries' oil endowments in maximizing the welfare of their citizens. This paper proposes frameworks that can be used to estimate the opportunity cost of oil and the discount rate that account for the specificities of oil-exporting countries. Some numerical illustrations are provided for the case of Saudi Arabia.

## **Methods**

We expand our previously developed partial equilibrium model and update the results given in Karanfil and Pierru (2021). The model deals with an oil producer's welfare problem considering a major oil exporter. Constraints on oil production, the level of exports, and domestic consumption are taken into consideration as they play key roles in determining the opportunity cost of oil. The model allows us to compare different domestic oil pricing schemes and assess net welfare gains that can be generated from a reform of the domestic oil price. A special focus is given on the value to use for the public discount rate as it is a crucial parameter in the opportunity cost estimates (particularly in calculating the present value of future revenues). As an illustration, to calibrate the discount rate, we apply the extended Ramsey formula using the annual growth rates of Saudi real private and gross consumption per capita.

## **Results**

The study aims at addressing the following questions:

- What are the factors that drive the value of the opportunity cost of oil?
- Which value to use for the public discount rate?
- How to value risk diversification in an economy that depends on volatile oil revenues?

After developing a framework that enables us to study the above questions, we use it to obtain illustrative values for Saudi Arabia. The results show that the opportunity cost of oil for an oil exporter is less than the world market price. The most efficient domestic pricing policy is to set the price of oil equal to its opportunity cost. We show also that once the risk premium associated with the crude oil prices is accounted for, the public discount rate increases significantly.

## Conclusions

The paper devotes particular attention to the implications of opportunity cost and discount rate estimates for assessing projects and policies. It aims to provide frameworks to evaluate these two elements for resource allocation, project selection, and policymaking in oil-exporting countries. We argue that the oil used in public projects has to be valued at the opportunity cost and that expected oil price-related cash flows have to be discounted at a risk-adjusted discount rate, such as determined in this paper.

## References

- Karanfil, Fatih, and Axel Pierru. 2021. "The opportunity cost of domestic oil consumption for an oil exporter: Illustration for Saudi Arabia." *Energy Economics* 96, no. 105161.
- Pierru, Axel, and Walid Matar. 2014. "The Impact of Oil Price Volatility on Welfare in the Kingdom of Saudi Arabia: Implications for Public Investment Decision-making." *The Energy Journal* 35(2): 97-116.