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A Note on US Royalty Relief, Rent Sharing and Offshore Oil Production

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Abstract

This paper offers an economic analysis explaining why royalty relief under US Federal legislation is expensive in terms of revenue foregone, but is largely ineffective in increasing US offshore oil production. Repeal of royalty relief is therefore justified.

Journal of Economic Literature Classification: Q48

Keywords: oil taxation, royalty relief, offshore oil

A NOTE ON US ROYALTY RELIEF, RENT SHARING AND OFFSHORE OIL PRODUCTION

Under the Deepwater Royalty Relief Act (1995) royalty relief is given as an incentive to increase offshore oil exploration, development and production; relief was given on leases awarded between 1996 and 2000 for drilling in water in the Gulf of Mexico deeper than 200 meters. The program expired in November 2000, the responsible authority, the Minerals Management Service, continued with a similar relief arrangement. In August 2005 the Energy Policy Act came into force; section 344 extended royalty relief to gas production in US waters of more than 200 meters deep, and section 345 provided for additional mandatory royalty relief for deep water oil drilling.[1] However, the 2008 federal budget proposes repeal of sections 344 and 345 of the 2005 Act.[2] This short paper discusses why repeal of royalty relief is justified in terms of fairer sharing of economic rents between oil companies and the owners of US submerged lands – American citizens. Admittedly, repeal of royalty relief could reintroduce a small tax distortion to offshore oil activity to the extent that royalty payments rendered some deepwater offshore oil production uneconomic. However, as the calculations by Alton, Upton and Rothkopf (2005) discussed below imply, the distortionary effect of royalties on US deep water offshore oil activity is very slight, while their effect on lost government revenue is very

[1] Energy Information Administration, Office of Oil and Gas (2006), *Overview of the Federal Offshore Royalty Relief Program*, June, 2006, page 1 http://tonto.eia.doe.gov/FTPROOT/features/ngoffshore.pdf
[2] Minerals Management Service, US Department of the Interior, *Budget Justifications and Performance Information for FY 2008*, page 9.
http://www.doi.gov/budget/2008/data/greenbook/FY2008_MMS_Greenbook.pdf

great. A fair minded observer might conclude therefore that the distortion-fair shares trade-off offered by the ending of royalty relief was worthwhile accepting.[3]

Alton, Upton and Rothkopf (2005) calculate that royalty relief offered to oil companies for wells drilled in marginal, deepwater, fields has little effect on oil production, but could cost the government a great deal in forgone royalty revenues. Projected total oil production is expected to increase by only 0.9 percent, gas production by 0.6 percent, and offshore oil reserves by only 1.1 percent. The cost of these small increases in reserves and output is estimated to be about $48 billion in present value (2003 constant dollar) terms, or, 7 percent of projected offshore oil and gas royalty revenues.

The reason for the cost ineffectiveness of Federal government's royalty relief program is caused by the behavior of marginal production costs, which are known to increase sharply as oil production moves into deeper waters – beyond 5,000 feet in the case of the Gulf of Mexico. Indeed, the Federal government justifies royalty relief for marginal fields on the basis that their exploration, development and production costs are high, and need to be subsidized.

Economic analysis

Economic analysis of the foregoing disappointing findings is straightforward. Begin by writing oil company operating profit net of corporation taxes and royalties as

$$\Pi = [PQ(1 - r) - C](1 - t)$$

[3] Besides, in practice completely non-distortionary taxes can hardly be the standard set for the establishment of any rent sharing tax regime.

where Π is profit net of corporation tax, t, and royalty rate, r. P is the market price of a barrel of oil, Q is the level of oil production per period of time, and C is the cost of producing a barrel of oil.

Multiplying through and rearranging gives

$$\Pi = PQ(1 - r - t + rt) - C(1- t).$$

And dividing through by Q yields

$$\Pi/Q = P(1 - r - t + rt) - C(1 - t)/Q$$

which states that net operating profit per barrel = net price minus net per barrel cost of production.

The effect of royalty payments and corporation taxes on net price, production and the combined tax-royalty take is shown in Figure 1 that uses a stylized function reflecting the government's assumption of sharply rising marginal costs as oil production moves into deep waters.

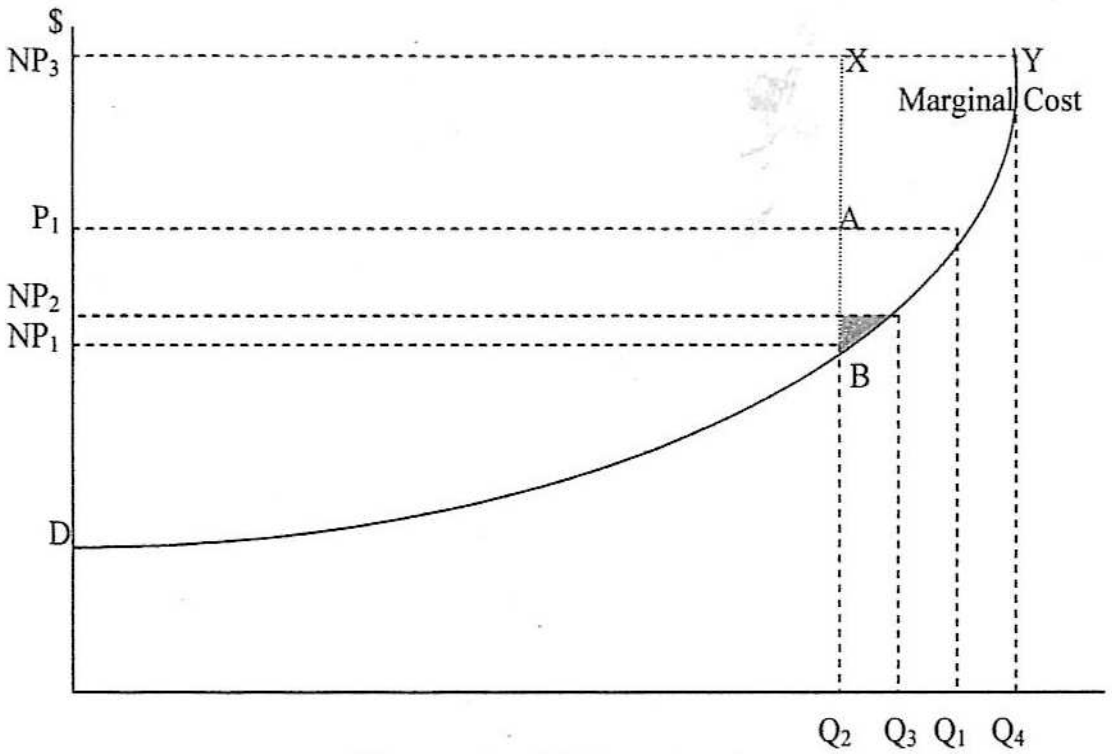

Figure 1: Oil Production

P_1 is price before corporation tax and royalties. At P_1 production per year would be Q_1. As corporation tax and royalty are levied, net price is NP_1, and production is Q_2. Government revenues are P_1ABNP_1, equal to about 40% of economic rent (area P_1ABD) – the approximate government-take in the US case. Oil company net revenue is NP_1BD, equal to about 60% of economic rent.

Waiving royalties on marginal fields raises net price received by oil companies on production from these fields by between 12 and 16 percent (equal to the royalty rates). Thus,

$$NP_2 = P_1(1 - t) > NP_1 = P_1(1 - r - t + rt).$$

As a result oil production rises from Q_2 to Q_3. Corporation tax and royalty-receipts on the pre-existing fields (i.e. those producing up to Q_2 barrels of oil) remains unchanged.

Net operating profit on the marginal fields is:

$$\Pi = [P_1(Q3 - Q2)(1 - t)] - C(1- t)$$

Forgone royalty revenue on the marginal fields is $P_1(Q3 - Q2)r$ – which is equal to a portion of the shaded area in Figure 1. It is not the whole area as corporation tax is collected on profits generated by this marginal deepwater production.

It is observed that royalty relief has only a small effect on offshore oil production but the cost is not great in terms of foregone royalty revenue. However, royalty relief is much more costly if market prices of oil skyrocket, as they did between 1999 and 2006 - from less than $20 per barrel to almost $80 per barrel. Suppose that at the much higher market prices, net price with royalty relief rise to NP_3. Forgone royalty revenue is now much greater than at lower market prices (proxied by P_1) when the royalty relief incentives scheme were put into effect. At NP_3 foregone royalty revenue is now a portion of the much larger area XYB.

It follows therefore that a sensible royalty relief program would phase royalty relief out once oil prices reached a critical level high enough to cover production costs, so as not to leave oil companies with 'too much' economic rent. This level would be where market price net of corporation tax and royalties is equal to cost of production net of corporation

taxes. That is, where $P(1 – r – t + rt) = C(1 - t)/Q$. Given estimated costs of producing in deepwater this critical market price might be between $40 and $50 per barrel.

However, the Department of the Interior continues to argue that "The continued use of royalty relief in the deep waters of the Gulf provides the needed economic incentive to keep industry moving forward on new technologies and exploring deeper water frontiers" (2007). Accordingly forgone royalty relief might be worthwhile if, by creating an incentive to operate in deepwater, oil companies were given a incentive to create the technology to make this possible. However, as the foregoing economic analysis indicates, it is the steep increase in oil prices in recent years (by a multiple of four) rather than royalty relief (only 12 – 16% of revenue) is clearly proving critical in inducing oil companies to move into deeper offshore waters. The effect of higher prices on offshore oil activity has been frequently analyzed. For example, Kemp and Stephen (2006) estimate that the number of exploration wells drilled in the British sector of the North Sea would almost double from 20 to 38 per year as oil prices increased from $25 to $40 per barrel. Kemp and Kasim (2000) calculate that oil sector investment depends positively on oil prices, and a similar finding is found for investment in the US oil sector (Farzin, 2001).

Conclusion

Given sharply rising production costs in deep water oil fields, royalty relief of, at most, 12 -16 percent is an incentive of marginal significance in either stimulating exploration activity or in spurring technological change. Indeed, royalty relief, by raising net price,

could have the reverse of the intended effect on technological change, as oil companies incentive to be cost-efficient is somewhat reduced. Besides, it is the sharply higher oil prices of recent years that have created much stronger incentives to move into deeper waters. The main effect of royalty relief therefore has been to reduce the government's share of offshore oil rents.

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