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Title: Comments on Yergin and West, "Oil Taxation and Oil Company Motivation"¹

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Abstract:

In a recent paper commissioned by the North Sea Operators Committee-Denmark, Daniel Yergin and Julian West of Cambridge Energy Research Associates offer conclusions contradicting the recommendations of the Danish government's 2001 report on hydro-carbon taxation as well as standard corporate and public finance theory. These include the view that the concept of neutral taxation is flawed, that the current Danish tax regime is already severe, that the proposed changes will reduce government revenue, and that symmetric tax treatment of gain and loss is undesirable. These conclusions are found to lack theoretical and empirical underpinnings.

¹ The views and analyses presented in the working paper are the sole responsibility of the authors. The papers may therefore include views, which are not necessarily shared by the Ministry of Finance.

In their recent paper commissioned by the North Sea Operators Committee-Denmark, Daniel Yergin and Julian West² offer a number of conclusions that are very much at odds with the recommendations of the Danish government's 2001 report on hydro-carbon taxation (HCT).

As will be further elaborated below, Yergin and West's paper also seems to contradict a range of well-known insights and results from the public and corporate finance and macroeconomics literature, including a substantial body of empirical evidence.

The purpose of the present paper is to examine more closely the validity of the analytical foundations and conclusions of the Yergin and West paper.

Among the views expressed by Yergin and West are:

The concept of **neutral taxation** adopted by the Danish government committee is fundamentally **flawed**. More basically, it is not clear what role the concept of neutrality should play in tax design.

The present **Danish tax** regime is **already** fairly **severe** compared with other countries, and there is no evidence that investment behavior of the oil companies is socially inefficient.

The **proposed changes** in the Danish hydro-carbon tax regime involving abolition of the (by international standards, extraordinarily generous) capital uplift provisions and the introduction of an equity return allowance is **likely to reduce**, rather than raise, government **revenue**. Further, the proposed symmetric treatment of taxable gains and losses is undesirable and will encourage inefficient exploration activity.

The proposed changes would reduce the rates of return earned by oil companies in the Danish North Sea to "public utility levels" and hence **make investment** there **unattractive**.

In particular, by increasing the total government take through either taxation or direct government participation, the reduction in the share of profits and losses accruing to private companies will make investment less attractive, i.e. "**financial volume**", or "non-additivity of value", is a **key concern** in oil company investment planning.

Generally, **countries** should - when designing resource rent tax systems - recognize that they **compete** in the world market **for the investment** and human resources of the international oil industry, the amounts of which are fixed rather than flexible.

In addition to these rather strong conclusions, the paper provides a wealth of detail on the specifics of the oil industry, in particular concerning the dynamic evolution of the oil price, investment, risks and rates of return. From a tax design perspective, this material is largely irrelevant, although the high risks associated with, e.g., oil and gas exploration would seem to imply that, among other things, tax rules should be chosen so as to minimize the probability that a firm will never be able to exploit a tax loss. However, somewhat ironically, Yergin and West disagree strongly with the desirability of symmetric

² Both authors are senior researchers at Cambridge Energy Research Associates (CERA). In the disclaimer on page 1, it is stated that "...the views expressed in [the paper] are those of CERA alone". Taken at face value, this appears to be very different from standard practice in academic and government institutions, where responsibility for content and views is customarily assigned to individual authors rather than the institutions with which they are affiliated.

taxation of gains and losses in a sector where such provisions would appear particularly justified in order to promote an efficient allocation of resources

A key argument by Yergin and West relates to the rate of return on investment projects demanded by oil companies. However, little evidence is provided on this key parameter, although a target 15 per cent rate of return is mentioned (page 7, top), while figure 1 on page 6 seems to indicate a 3-4 per cent actual, average return for independent oil companies during the period 1993-2001.

The absence of detailed information concerning investment hurdle rates is unfortunate given the authors' strong, albeit implicit, emphasis on this parameter. It is also surprising given the ready availability of such information from the financial services industry. The 2000 Norwegian government report on HCT thus includes data from Salomon Smith Barney on both the average market risk premium and the systematic risk component (beta) of oil industry equity. The former is estimated at 5 per cent annually, while the oil industry beta is 0,6. Hence, an average oil company should earn a return on equity of at least 3 per cent above the risk-free real rate. With the latter at 3 or 4 per cent, a rational oil company manager should pursue projects with real annual returns above 6 or 7 per cent.

In other words, if oil companies systematically ditch investment opportunities simply because the rates of return on those projects fall short of the "publically stated 15 per cent target", which appears to be what Yergin and West implicitly claim, they are also refusing to outperform the stock market. Against the background of the rather disappointing actual return on oil company equity during the last decade documented by Yergin and West, this does not appear to be a rational approach if it is indeed how firms do business.

The concept of neutral taxation

On page 23, Yergin and West claim that the proposed reform of the Danish HCT is "intended to reduce the returns made by succesful oil companies to public utility [i.e., risk free] levels". Taken at face value, this statement seems to reflect a rather fundamental misunderstanding of what neutral taxation implies. It therefore seems worthwhile to focus first on this key property of the HCT reform proposed by the Danish government committee.

The basic idea in neutral business taxation is that tax rules are designed in order to leave the risk-return tradeoff faced by the private investor exactly unaffected by taxation. A rational business manager will then implement exactly the same investment policies as in the absence of taxation.

Only in the very special case where the tax rate is set at 100 per cent is the claim made by Yergin and West in a certain sense valid. But, as we shall argue below, a 100 per cent tax rate is not a realistic option in practice, and a real-world version of the neutral tax will therefore imply an after-tax risk-return tradeoff precisely identical to the pre-tax one.

Basically, a tax on business income is neutral with respect to investment decisions, provided all income is included in the tax base, and provided the net present value of all cost deductions equals the net present value of the actual cost items. In present value terms, therefore, the tax base is simply the excess of income in NPV terms over total costs in NPV terms.

A project yielding an income just equal to total cost will accordingly not be subject to tax. Obviously, in this case investment is unaffected by taxation. All projects yielding higher returns will have positive net present value and hence should be carried through.

The current Danish HCT regime differs from the neutral benchmark primarily in two key respects. First, unlike the cost of debt finance, the cost of equity capital is not deductible from the tax base. Second, the special HCT depreciation allowance (25 per cent of investment may be deducted annually from the HCT base during a 10 year period) implies that the tax value of new investment will significantly exceed the cost of acquisition for oil companies with positive HCT liabilities. Therefore, current tax rules create an incentive to carry investment to the point where the HCT base is zero, even if the before-tax profitability of the marginal investment is zero.

The proposal by the Danish committee employs a deduction for the cost of equity capital along with the elimination of the HCT allowance in order to ensure neutrality.³ As stated above, under this system, and in direct contradiction of Yergin and West's contention, oil companies would face the same risk-return options as they would in the complete absence of taxation. They would consequently engage in exactly the same investment as in the hypothetical case without any taxes.

The effective equi-proportionate sharing of income and costs under a neutral tax also explains why neutral taxation, at least in principle, is equivalent to direct government participation, where the public sector simply pays a pre-determined share of costs and receives the same pre-determined share of all income. Neutral taxation is therefore said to be equivalent to having the government participate as a "sleeping partner" in each project.

In fact, the comparison may be carried even further by noting that equi-proportionate sharing of cost and income flows is no different from having an additional *private* company participate on terms identical to those of existing partners.

Against this background, it is extremely hard to see why - as Yergin and West repeatedly claim - a neutral tax (or direct government participation) should discourage investment, as it is economically equivalent to having an additional private company participate in each licence (albeit with a pre-determined and legislated share), an action which is routinely and voluntarily undertaken by oil companies in order to adjust their asset portfolios.

Throughout their paper, Yergin and West repeatedly emphasize the inherent riskiness of the oil industry, with particular reference to the oil price and exploration activities.⁴ From a tax design

³ The actual proposal is an application of a theoretical result originally due to Robin Boadway and Neil Bruce, who show that investment neutrality obtains whenever the equity allowance is computed on the basis of the tax value of business assets minus corporate debt, or "tax equity". This implies that the choice of tax depreciation schedule may in principle be left at the discretion of the taxpayer. By writing off assets more rapidly, the equity allowance is also reduced so that the present value of tax deductions remains constant. Further, it should be noted that the equity allowance will also moderate tax enforcement problems associated with "thin capitalization" for which a powerful incentive is created when the marginal tax rate is much higher than for, e.g., parent companies. The neutrality of the R-base cash flow tax, where investment is expensed while financial income is not subject to tax, emerges as a special case of the Boadway-Bruce analysis. See Boadway, Robin and Neil Bruce, "A General Proposition on the Design of a Neutral Business Tax", *Journal of Public Economics* 24, page 231-239, 1984.

⁴ Although, as noted above, the systematic risk component seems to be relatively modest as indicated by the fairly low beta value of oil industry equity. In other words, oil company equity in fact embodies a fair amount of insurance against aggregate market risks, and this particular feature - rather than the risks associated with individual projects - may go a long way towards explaining the alleged less than impressive historical equity yields in the oil industry. Thus, contrary to what Yergin and West contend, the actual track record of oil companies in terms of wealth creation thus appears to be quite consistent with rational decision making on the part of oil company managers when the standard corporate finance measure of risk (that is, covariance with the market return) is used. This reconciliation may perhaps be considered encouraging (although hardly surprising) by those with a preference for the private market economy rather than, e.g., central planning.

perspective this points to the importance of making sure gains and losses are treated symmetrically for tax purposes.

In order to accomplish this, the Danish government committee suggested unlimited loss carry forward with full interest imputation, combined with allowing companies to sell HCT losses, thus effectively providing a government guarantee for the tax value of deficit HCT income. In particular, this is likely to benefit new entrants that are not (yet) in a position to offset, e.g., exploration costs against profits from other fields.

Generally, personal and corporate income tax systems do not allow for fully symmetric treatment of gains and losses. The reason is that general symmetry would give rise to tax enforcement problems associated with, e.g., the need to distinguish between consumption and commercial activities (for closely held businesses), the potential for financial tax arbitrage (in particular when the tax base is computed on a realization, rather than mark-to-market, basis) or outright tax fraud (such as the fraudulent construction of losses that in turn could be sold at close to tax value).

In the case of oil and gas extraction, however, these concerns seem of minor importance, since the relevant entities are subject to close regulatory supervision. Furthermore, because of the long timespan from exploration costs are incurred until a project returns a profit against which to deduct pre-production costs, the induced distortion implying a disincentive to exploration could well be severe.

However, surprisingly, Yergin and West argue strongly against this feature of the proposal, citing on page 30 its "encouragement-at the state's expense-for inefficient exploration activity". The authors build their case on the experience of a few countries with "subsidies" to exploration activity.

Once again, Yergin and West do not seem to fully grasp the requirements of a neutral tax. Obviously, the government must absorb the same fraction of initial, pre-production costs as of subsequent costs and income under a neutral tax. Because the oil company receives the same fraction of subsequent income as it bears of current costs, it will make socially efficient exploration and development decisions when there is unlimited loss carry-forward with interest imputation.

Unlike what Yergin and West claim, there is thus no "subsidy" to exploration in a provision that allows losses may be carried forward with interest and without limit. The key point is that the incentives arising from the fiscal regime should be viewed in their entirety (as a rational company manager would presumably do when evaluating an investment opportunity).

In a wider perspective, the authors' comments on loss carry forward are quite startling, since representatives of the business community typically (and rightly) argue for full loss offsets precisely in order to avoid penalizing firms with initial, or temporary, losses. In recognition of such concerns, the 5 year limit on loss carry forward in Danish tax law was recently repealed. Generally, tax losses may therefore be carried forward indefinitely (albeit without interest imputation).

The logical extension of Yergin and West's argument is accordingly that this measure is a mistake. Taken even further, there seems to be no case for limiting opposition to deducting costs to the case where such deductions are carried forward; surely, no expenditure items at all should be deductible from the tax base. This, obviously, is in violation of efficient tax design, but remains nonetheless the direct implication of Yergin and West's line of argument.⁵

⁵ Also, this would effectively convert the HCT into a production tax, or royalty. However, because royalties are rightly seen as distorting oil company behavior, several countries have recently taken steps to cut or eliminate them, as Yergin and West

One possible explanation for the position taken by the authors is that existing operators with sufficient profits against which to offset the cost of exploration see little interest in a provision that would primarily benefit new entrants. Effectively, Yergin and West thus argue for building into the HCT regime barriers to entry that put existing firms with abundant earnings at a competitive advantage against start-up firms.

There is, however, one particular case where Yergin and West's concern about inefficient decision making is relevant, namely in the (very) special case of a 100 per cent tax rate. In that situation, firms effectively bear neither the costs nor the benefits of their actions, and hence have no incentive to make efficient decisions. But, of course, this problem is not only related to costs that through the carry-forward of losses are deducted against future earnings, but to costs in general.

This raises the question of how to select the marginal tax rate under a neutral tax. In principle, a 100 per cent tax rate would allow the government to capture the full return on natural resources. However, the tax rate should be set to allow private firms a sufficient stake in order to preserve the incentive for efficient decision making. In principle, a 99 per cent tax rate would satisfy this requirement.⁶

At such high tax rates, the temptation to use, e.g., transfer pricing or manipulation of financial structure to minimize taxes, would be very powerful. Although - due to the presence of fairly easily observed market prices for oil products - it may well be difficult for firms to shift profits to related entities through internal oil and gas product pricing, opportunities are likely to abound on the cost side, including, e.g., related transportation and storage services as well as testing and development of new equipment, the costs of which may be allocated to the entity with the highest marginal tax rate within, e.g., a multinational enterprise.

Another consideration relates to costs that may be related to oil and gas extraction, but do not qualify as deductions against the HCT base. A case in point is headquarter costs incurred when planning and supervising oil and gas activities.

It thus appears that the "optimal HCT rate" would emerge out of a tradeoff between, on the one hand, the reasons underlying the desirability of 100 per cent marginal taxation (essentially government ownership of the natural resource) against the problems associated with transfer pricing and cost allocation that become acute at very high tax rates.

But, as the discussion above makes clear, even at a very high tax rate, the fundamental insight remains that neutral taxation will still leave the tradeoff between relative return and risk unaffected. Firms will then be induced to undertake exactly the same investment projects as in the absence of taxation.

An important, though secondary, point emerging from these considerations is that tax authorities have no need for information about the required return on risky (in this case oil and gas) investments in order to impose a neutral tax. As long as loss carry-forwards are effectively risk-less, all that is required is an assessment of the *risk-free* rate of return. Similarly, the relevant rate of return required in order to

themselves report (page 4), apparently without noticing the implicit contradiction with their own argument with respect to the tax treatment of losses.

⁶ The current Norwegian HCT regime featuring a 78 per cent marginal tax rate in combination with direct government participation thus comes pretty close to a combined marginal government take of 90 per cent.

compute the equity allowance is the risk-free market return.⁷ Accordingly, information on the risks to which oil companies are exposed is wholly irrelevant as far as ensuring neutrality is concerned.

It is worth stressing that the central theme of the Yergin and West paper, namely that the proposed neutral HCT would reduce oil company investment returns to the risk-free rate, rests on a rather complete misinterpretation of how a neutral tax works. A possible source of this unfortunate element of the paper is the erroneous - but perhaps from a superficial glance tempting - conclusion that the equity allowance, which as noted above is computed using the risk-free market interest rate, may be viewed as the "residual return on equity" when the marginal tax rate is very high.

However, the sole purpose of the equity allowance is to correct the tax base for differences in the timing of actual cost outlays and the associated deductions in much the same way that interest is imputed when tax losses are carried forward. In almost complete contrast to Yergin and West's claim, the neutral tax has no implications for the rates of return reaped by oil companies.⁸

Why neutral taxation?

On page 22, Yergin and West state that "the standard criteria for judging any tax include equity, simplicity, transparency and ease of administration". Leaving aside the seeming redundancy of one or two of the last three criteria, if the quoted passage is intended as a short-list of the key policy tradeoffs identified in the public finance literature, it's a pretty bad approximation.

Generally, public finance theory views the determination of efficient taxation as a tradeoff between equity, efficiency and (possibly) the cost of administration and compliance. Yergin and West thus seem to ignore completely the efficiency aspect, i.e. the impact of the tax system on resource allocation and hence the deadweight losses associated with behavioral adjustments induced by taxes.

The priority set out by the authors is a very peculiar one, especially since it is difficult to think of important equity concerns in the case of resource rent taxation - except, of course, for the fact that the above-normal returns on natural resource extraction should ideally be captured entirely by the government. The reason is, that if oil companies are owned by well-diversified investors (such as mutual funds, pension funds and life insurance companies), there is no obvious distributional effect from a change in resource rent taxation.

Hence, we are left with precisely the key criterion that Yergin and West quite explicitly disregard, namely allocative efficiency. If the government is to capture a significant chunk of the above-normal return on the extraction of natural resources, obviously the marginal tax rate must be high. In Norway, for example, the marginal tax rate on oil company profits is thus 78 per cent even ignoring direct government participation, as Yergin and West's table 3 shows.

With high marginal tax rates, any deviation from a neutral tax base - i.e., a tax base that identifies correctly above-normal returns - implies potentially severe distortionary costs. This simply reflects the fact that the deadweight loss from a tax rises with the square of the tax rate, or - in more direct language

⁷ In the case of an R-base cash flow tax, no such imputation of equity return is necessary.

⁸ An alternative way of viewing the effects of the neutral tax is to observe that, at the time of investment, the oil company effectively purchases a stake in the investment project equal to one minus the tax rate *plus* a claim on the government equal to the tax rate times initial investment. The latter component reflects the net present value of tax depreciation and the equity allowance and - because the neutral tax is designed so as to effectively guarantee the tax value of deductions - represents a perfectly risk-less claim. Accordingly, standard corporate finance theory dictates that the relevant discount rate applicable to the stream of future tax shields is the risk-free rate.

- the higher the marginal tax rate, the more costs of a non-tax nature would the tax payer be willing to incur in order to shield one unit of income from taxation.

Ideally then, a 100 per cent tax rate should accordingly be imposed on a neutral tax base, but - as noted above - this would impair efficient decision making as firms would not incur any penalties for making inefficient decisions. Ironically, the very efficiency argument that Yergin and West have chosen to ignore is precisely the key reason for not only the desirability of neutrality, but also for setting the resource rent tax rate *below* 100 per cent!

Also on page 22, Yergin and West claim that "neutrality... has never yet been adopted as an over-riding objective" in tax reform. In drawing this very broad conclusion, the authors seem to ignore the fact that changes in business taxation during the last two decades in a large number of countries (including Norway, Denmark, Sweden, Finland, the US and Canada) have specifically been aimed at bringing tax bases closer to what is required for neutrality (e.g., reducing the tax penalty on equity finance and reducing tax depreciation allowances).

Presumably, the general move in the direction of neutral taxation has been driven precisely by the desire of governments to leave the selection of investment projects to purely commercial, rather than tax, considerations and thereby reduce the distortions induced by the taxation of business income.

The "financial volume" argument, investment and tax revenue

A standard idea in corporate finance is that managers seeking to maximize shareholder wealth should pursue all investment projects with positive net present value, where the discount rate is adjusted for the systematic risk component of the after-tax cash flow. Failure to do so implies a loss of shareholder wealth.

Yergin and West - along lines similar to the Norwegian oil industry's response to the Norwegian government report on HCT reform - seem to depart from this standard prescription in emphasizing "financial volume", or project scale, as a key objective for firms. The essence of their position appears to be that *absolute* rather than *relative* returns (also) matter.

Hence, a relatively large, positive NPV project - i.e., a project with large financial volume - will allegedly be preferred to a small, positive NPV project even though they yield the same return and even though standard corporate finance theory would dictate that both should be carried through in order to maximize shareholder wealth.

Presumably, then, oil companies will only be willing to invest in relatively small projects if they yield a higher relative return than do big projects. If this is true, one should observe that the average large oilfield is less profitable in relative terms than the average small field. But this is inconsistent with the widely held belief that the opposite holds in practice; after all, the oil industry itself tends to refer to the higher returns on large Norwegian oil fields when arguing for relatively lower taxation in Denmark.

Furthermore, if the claim by Yergin and West that oil companies are constrained in their access to capital is valid, and if financial volume is an important criterion in project selection, then large oil companies will tend to specialize in large, low-return fields while smaller companies will specialize in small fields with high rates of return. This would imply that the return on equity of smaller oil companies would tend to exceed the return on large company equity. In fact, Yergin and West emphasize that the exact opposite holds: Throughout the last decade, small companies have been outperformed by large companies in terms of equity returns.

One might also add that, given the Norwegian oil industry's concern about financial volume, it seems surprising that oil companies find the relatively small oilfields in Denmark worthy of attention at all in the first place.

From a theoretical viewpoint, "financial volume" seems to be a rather vague concept. One possible interpretation is that some projects are too small for firms to care about - irrespective of the returns offered. But in that case, oil companies specializing in small projects should be able to outperform the market as well as existing oil companies.

Alternatively, the presence of such low-hanging fruit that private firms fail to pick would suggest an opportunity for governments to set up entities aimed at investing in such projects, in particular if private companies are rationed in capital markets (as Yergin and West claim) and hence, unlike the government, unable to borrow. This conclusion - which, if similar reasoning is applicable to the entire private sector, in fact amounts to a pretty harsh indictment of the private ownership economy - seems rather improbable.

A second possible interpretation is that the individual oil company's absolute stake in a given project is important. In that case, an increase in government take would merely cause private partner firms to rearrange their portfolios in order to reestablish a satisfactory average stake size without changes in real investment activities.

A basic argument of Yergin and West is accordingly that oil companies will shift their resources to "existing and new fields" elsewhere, if a neutral tax is introduced in Denmark. Clearly, a firm turning down a (share of a) license in Denmark could buy into other, existing licences elsewhere on normal market terms. But in that case, the oil company would have to pay the existing owner for all but the market risk-adjusted return, i.e. the expected resource rent would be capitalized into the price. Surely, the systematic refusal to exploit above-market return projects in Denmark in favor of investments yielding zero excess returns elsewhere cannot be a rational strategy.

Certainly, to the extent that oil companies have available positive NPV projects elsewhere, these other projects should be carried through, but not at the expense of positive NPV projects in the Danish (or Norwegian) North Sea as long as the overall objective of firms is to maximize shareholder wealth.

Nevertheless, it may well be true that in the short term at least, firms may have limited access to additional (equity) capital due to capital market imperfections. However, given the low margins (typically fractions of a percentage point) charged by banks on lending to first-class commercial borrowers, it seems extremely doubtful that oil companies would in practice be forced to give up projects yielding returns several percentage points above the market return on these grounds.

It should also be noted that there is a vast empirical literature documenting the influence of the "cost of capital", i.e. the pre-tax required rate of return, on investment behavior. In contrast, it has turned out to be much harder to explain actual investment by business after-tax cash flow, as one would expect if in fact the access to capital was limited. In other words, there is a substantial body of empirical evidence supporting the profitability considerations identified by neo-classical theory (and underlying the proposed changes in the Danish HCT regime) while at the same time contradicting the "capital shortage" view held by Yergin and West.

It may also be true - as Yergin and West explain - that firms are constrained in the short term due to organizational rigidities associated with the need for competent managerial oversight of new projects etc. The idea is that there is a limited number of individual projects that company managers can oversee, and hence they select few large (possibly lower return) projects rather than many smaller ones.

A large theoretical and empirical literature has studied the implications for the dynamic behavior of private investment of such "cost of adjustment" associated with changes in firm scale. A general outcome of this literature is that such costs seem to play a role for investment determination, but only in the short term, i.e. over a period of 2 or 3 years.

In a longer-term perspective - certainly including the timespan involved in oil and gas exploration and extraction - firms do seem to have access to additional financial and managerial resources, thus confirming the casual observation that real-world firms in fact expand or shrink rapidly in response to changing business conditions.

On page 2, Yergin and West state that the HCT reform proposal put forward by the Danish government committee will likely lower, rather than raise, tax receipts, thus "...leaving the state significantly worse off".

Yet, Yergin and West provide no evidence to substantiate this strong statement. After all, a large increase in the effective marginal HCT rate will require a significant contraction of investment and activity in order for revenue to decline. However, empirical evidence, or just back-of-envelope sensitivity analysis, or case evidence based on the experience of other countries, is totally lacking.

The authors thus fail completely to corroborate this key conclusion, or even indicate the nature and scale of the alleged behavioral response to a change in the Danish HCT regime on which their conclusion apparently is based.

The current Danish HCT regime

Yergin and West repeatedly state that the current Danish HCT regime is "already quite severe", thus echoing a recent memo compiled by PriceWaterhouseCoopers on behalf of Mærsk Olie & Gas.

A rather fundamental flaw in both papers is, however, that they simply ignore the fact that - at least so far - oil companies have had effectively zero HCT income. Hence, in practice, tax liabilities have been limited to corporate income taxes, royalties and the pipeline charge.

Current production taxes amount to about 10 per cent of the value of output, and the corporate income tax rate is 30 per cent, while the HCT rate is 70 per cent. Obviously, computing the combined tax burden on oil and gas profits inclusive of HCT liabilities that have not occurred in practice is likely to be grossly misleading.

But Yergin and West, as well as PWC, have apparently chosen to ignore the fact that the Danish HCT yields no revenue. And neither paper comments on the quantitatively important discrepancy between actual (i.e., low) tax payments and the (high) effective tax rates they compute.

The reason for the absence of HCT revenue is the uniquely generous Danish capital uplift provisions. As Yergin and West document, no North Sea country allows deductions on a similar scale, although most HCT systems do feature some capital uplift.

It is not possible to determine whether the historical record of zero HCT revenue is simply due to taxable HCT income being wiped out by deductions (i.e., that oil companies at actual investment levels have negative HCT income), or whether oil companies have in fact responded to the incentives embodied in the HCT regime and expanded investment to the point of eliminating all HCT liabilities (i.e., so that HCT income is - approximately - zero).

However, since the discounted value of the tax shield provided by one unit of investment spending exceeds the cost of acquiring the investment good, oil companies continue to face a strong incentive to carry investment to the point where no HCT is due. In principle, therefore, little if any future HCT revenue should be expected.

The government committee on HCT reform paid substantial attention to alleviating the (potential) investment distortions present in the current system. In apparent contradiction of these concerns, the authors express on page 22 the view that there is "no evidence... [that] companies undertake excessive investment".

The risk of "excessive investment" relates to the case where companies invest in projects yielding a before-tax return that falls short of the (risk-adjusted, expected) market rate of return. Although oil companies are subject to regulatory supervision of their operations, including investment, it is extremely hard to imagine that, in practice, a government agency would be able to detect such "excessive" investment, as this would require knowledge about the estimated future returns, and their associated covariance with aggregate financial market risk, at the time investment was undertaken. Such detailed information is unlikely to be available to regulators.⁹

It is worth reiterating that - as previously pointed out - a large body of empirical evidence points to the relationship between the cost of capital and business investment, thus indicating that, if tax rules provide an incentive to engage in socially unproductive investments, companies will tend to do so. And this suffices to establish the case against a tax regime giving rise to significant distortions of investment behavior and devoting attention to changing tax rules to avoid the associated deadweight losses.

The business versus the public finance views of tax design

On page 22, Yergin and West claim that oil companies ".. are indifferent to the theoretical merits of neutral taxation versus other tax systems". It might be added that similar views are frequently implicit in policy recommendations put forward by representatives of private business with respect to, e.g., tax depreciation rules or the tax treatment of capital gains or R&D expenditures.

At first glance, this position may appear surprising; after all, why should private firms oppose efficient tax rules that do not interfere with commercial investment activities? However, the statement does make a good deal of sense once the different perspectives of, on the one hand, business managers seeking to maximize shareholder wealth and, on the other hand, public finance theory, which typically is concerned with identifying the optimal equity-efficiency tradeoff, is recognized.

A rational business manager will carry investment to the point where the marginal return to shareholders equals the marginal cost of investment. If the particular activity is a tax-favored one, where the marginal investment carries a negative net tax burden (such as a debt financed investment in assets

⁹ Substantial regulatory intervention in the investment planning of oil companies might also violate certain provisions of license agreements, including provisions requiring the government to assist license holders in reaping the full commercial benefits of their activities.

subject to accelerated tax depreciation), the after-tax marginal return includes a certain amount of taxes saved.

Of course, to the individual firm, the attractiveness of an investment is independent of whether the net return is provided by the before-tax marginal product or through the implicit (tax) subsidy from the government. From society's perspective, in contrast, things are different: The tax subsidy is simply a transfer of income from tax payers in general to the firm undertaking the investment, thus encouraging excessive investment in the particular activity.

In the case where the marginal investment project is subject to a positive net tax liability, the investment activity is discouraged, and investment will tend to be too low from a social efficiency perspective.

The key determinant of the aggregate efficiency impact of investment decisions is accordingly the nature and size of such "fiscal externalities" through the tax system. And investment neutrality is precisely characterized by the absence of such fiscal externalities. When the marginal investment project generates no net taxes, and hence no fiscal externality, all relevant costs and benefits are internalized by business managers, and they therefore make investment decisions that are desirable not only from the perspective of shareholders, but from society's perspective also.

The whole point of neutral taxation is accordingly not to provide some sort of benefits to individual firms, but to make sure that productive assets are allocated efficiently across alternative uses. A key part of achieving this is eliminating the fiscal externalities arising from the interaction between taxes and private sector behavior.

On this background, it is not really surprising that business representatives show little or no appreciation for the concept of neutrality. But in no way does this invalidate the case for neutral taxation, since it merely reflects the fact that the fiscal externalities giving rise to deadweight losses result from precisely those consequences of business decision making that remain outside the capital budgeting of individual firms.

A slightly different way of stating this insight is based on the observation that, by definition, the marginal investment project does not contribute to shareholder wealth. Instead, the market value of corporate equity is determined by intra-marginal, after-tax corporate income. A tax change benefiting a given firm is thus primarily one that reduces the average, rather than the marginal, tax rate.

In other words, business managers will, from the viewpoint of shareholders, rationally argue in favor of reductions in, e.g., the corporation tax rate (or, in the case of oil and gas extraction, oppose a higher resource rent tax rate) while remaining more or less indifferent to the way taxes affect the marginal investment incentive. But, as noted above, the latter influence of the tax system, rather than the average tax rate which merely affects the distribution of income, is the origin of the deadweight loss, or resource waste, due to taxation.

In the particular case of the proposed reform of the Danish HCT regime, the Danish government committee estimated that the loss of resource rent attributable to the tax system is in the order of magnitude of 9 per cent. Hence, moving to a neutral tax would raise total resource rents in the Danish oil and gas sector by this amount.

However, if the shift to a neutral base is accompanied by the retention of the 70 per cent current marginal HCT rate, government net revenue is estimated to rise from around 50 to almost 90 per cent of total profits.

Obviously, the gains to oil companies from removing the distortions caused by current tax provisions would be overwhelmed by the transfer of income from shareholders to the government implied by a higher average tax rate. Bearing this in mind, it is no surprise that oil companies do not favor the proposed neutral tax.

Concluding remarks

The paper by Yergin and West contains essentially a reiteration of well-known views on resource rent taxation held by the oil industry. Unsurprisingly, like other taxpayers, oil companies do not like the prospect of having to pay higher taxes. And they also do not appreciate the introduction of tax provisions designed to put new entrants on an equal (tax) footing with existing firms. This rather obvious position seems to be the essence of their paper.

In terms of the overall message, the paper thus contains nothing new. The main claims have been made before by the Danish oil industry, and a very similar position was taken by representatives of the oil industry in Norway in response to the Norwegian government report on HCT reform.

Unfortunately, despite being a lengthy piece, the paper is largely devoid of theoretical and empirical underpinnings. It therefore provides no clarification of the logical foundations behind the authors' sweeping conclusions that remain directly at odds with generally accepted insights from public as well as corporate finance theory.

Furthermore, certain parts of the paper seem to reveal an incomplete apprehension of not only the current Danish HCT regime, but also the key theoretical and empirical insights on which the desirability of neutral taxation in general, and the recommendations of the Danish government committee on HCT reform in particular, rests.

These include such basics as how a neutral tax is designed, how it works and (crucially) how it affects the risk-return tradeoff faced by business managers as well as the equivalence between such a system and direct government, or incremental private, participation.

Finally, the paper provides no detail, and (in sharp contrast with the 2001 Danish government report) not even "guesstimates", of the behavioral response of oil companies to changes in the tax regime, which according to the authors would give rise to inefficient decision making with respect to exploration and extraction activities as well as a reduction of government revenue.

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