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Working Paper

Increasing resource rent taxation when the corporate income tax is reduced?

Memorandum, No. 03/2018

Provided in Cooperation with:

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Suggested Citation: Lund, Diderik (2018) : Increasing resource rent taxation when the corporate income tax is reduced?, Memorandum, No. 03/2018, University of Oslo, Department of Economics, Oslo

This Version is available at:

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MEMORANDUM

No 03/2018
February 2018

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The seal of the University of Oslo is a circular emblem. It features a central figure of a woman in classical attire, holding a lyre. The text 'UNIVERSITAS OSLOENSIS' is inscribed around the top half of the circle, and 'MDCCCXXXII' is at the bottom. A small dot is visible on the right side of the circle.

Diderik Lund

ISSN: 0809-8786

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This series is published by the
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Department of Economics

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No 07/2017	Eva Kløve and Halvor Mehlum Positive illusions and the temptation to borrow
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Increasing resource rent taxation when the corporate income tax is reduced?

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Abstract

Under international tax competition, corporate income tax rates are predicted to decrease, and the tax burden will shift onto immobile factors. This case study considers tax changes that illustrate the predictions for Norway 2012–2018. Petroleum rent was taxed at high rates in 2012, and while corporate income tax rates were reduced in four steps, the marginal tax on rent was kept constant. The four steps are analyzed in light of the tax burden shift predicted by theory, and possible intentions of the government. The tax on petroleum rent has not been increased. Government intentions seem to have been shifting.

Keywords: rent taxation, tax competition, immobile factors, petroleum, Norway

JEL codes: H21, H25, H87, Q30

1. Introduction¹

Economists have predicted that tax competition between nations will lead to a reduction in taxation of mobile factors combined with an increase in taxation of immobile factors.

Among the latter, natural resources are often mentioned. The reduced tax on mobile factors is in particular predicted to affect the corporate income tax (CIT).

During the years 2012–2018, Norway reduced its CIT rate gradually from 28 percent to 23 percent, while keeping most detailed rules of the tax unaltered, such as the definition of the tax base through deductions and loss carry-forwards. An explicit motivation for CIT rate reduction was international tax competition, in particular over CIT tax rates between OECD countries (Ministry of Finance, 2015b).

Norway is a large oil and gas (petroleum) producer, in particular in relation to its small population of five million people. The sector accounted for 29 percent of government revenue between 2000 and 2014,² dropping to 14 percent in 2017 (Ministry of Petroleum and Energy, 2018). About half of government revenue from the sector comes from non-carried state participation, while the rest arises from the petroleum tax system with a 78 percent marginal tax rate. The topic of the current paper is how the petroleum tax system was adapted during the years 2012–2018 as a consequence of the reduced CIT rate.

The adaption allows a test of the prediction of higher taxation of immobile factors. We discuss how this prediction should be interpreted, and whether it has materialized in this case. We find that petroleum rent taxation has been constant. We also discuss what principles have been followed by the government in adapting the petroleum taxes. During the first years, adaption did not seem to follow a clear principle, whereas revenue neutrality is now the official policy.

2. Literature

There is an abundant literature on tax competition in general, with particular focus on taxation of firms. A survey is given in Keen and Konrad (2013). A much-cited article is Razin and Sadka (1991), who write that, “If, however, there is not sufficient coordination then tax competition leads to low capital income taxes and the tax burden falls on the internationally immobile factors” (p. 69). A reasonable interpretation is that lower capital income taxes imply higher tax on immobile factors, although, as a limiting case, the latter might be constant and total tax revenue reduced. This case has some relevance here, since the finding below is that petroleum rent taxation has not been increased. Many authors have explicitly predicted higher taxes on immobile factors and mentioned natural resources as an example (e.g., Herman 2002, Fitzgerald and Siu 2018). A “shift of taxes from mobile to immobile factors” (e.g., Janeba and Osterloh 2013, Baskaran and Fonseca 2014) is also taken to mean that taxes on immobile factors increase, not only a relative increase.

¹ This research is part of the activities of the research center Oslo Fiscal Studies, which are supported by the Research Council of Norway. The author remains responsible for remaining errors and omissions.

² 29 percent is an unweighted average of yearly percentages, not the total percentage for fifteen years.

Whether there is tax competition also over taxation of natural resource rent, between resource rich nations, is another question. Even though the resources are immobile, one could argue that nations could have motives to reduce taxes to attract investors, in particular foreign investors.³ This is discussed in Mansour and Świstak (2017), who conclude that “tax competition in extractive industries may be less of a concern to governments than it is in other sectors” (p. 252). On the other hand, Osmundsen et al. (2017) argue that there is capital rationing that should be taken into account by nations when rent tax systems are designed.

3. Tax system

The Norwegian petroleum tax system⁴ consists of a CIT at a rate of 23 percent ($\tau_C = 0.23$ from January 2018) and a special petroleum tax (SPT) at a rate of 55 percent ($\tau_S = 0.55$). None of these is deductible in the other, so the total marginal tax rate on additional revenue is 78 percent. This combined rate, $\tau_T = \tau_S + \tau_C = 0.78$, has been unaltered since 1992. When the CIT rate was reduced, the SPT rate was increased.

Exploration costs and operating costs are immediately deductible in the base for both taxes, so the tax system does not distort decisions on these, at least not when the company is sure to pay taxes. For investments (e.g., field development),⁵ there are deductions over several years, and the relevant discount rate is crucial to determine incentive effects of the taxes.

The base for the CIT is operating income (i.e., revenue minus operating costs) minus net financial costs (typically, interest on debt) minus depreciation. Depreciation is linear for six years. Losses can be carried forward with interest, i.e., if the tax base is negative some year, it can be deducted with interest in the subsequent year.⁶

The base for the SPT is the same as for the CIT, except that there is an additional deduction, an “uplift” equal to 5.3 percent of investment each year for four years, like 22 percent extra depreciation. The intention is that the normal rate of return should be taxed only by the CIT, while the SPT taxes the extraordinary rate of return, exceeding the uplift. Neither depreciation nor uplift are fine-tuned to economic realities (i.e., to economic depreciation or to the required return to capital). This is recognized by the Ministry of Finance (2015b, sect. 10.4). However, it is well known from the literature, at least since

³ This could be the result of some imperfection in the market for capital or skilled labor, which would imply that the notion of some given required rate of return after taxes is not sufficient to explain what attracts investment.

⁴ An official description (as of 2017) is found at Ministry of Petroleum and Energy (2018). A brief historical overview and additional discussion are found in Lund (2014b). There is no royalty or similar tax on gross revenues. There is no upfront payment (signature bonus, auctioned fee, or similar) to reflect the net value of a license. In addition to the tax system described here, the government holds a direct interest in some licenses on a non-carried basis.

⁵ In an economic sense, exploration is also investment, but it is treated separately in the tax system.

⁶ If that year also has a negative base (after deduction of the loss carried forward), the unused loss deduction will be carried forward for another year, with another interest accumulation, and so on. The interest rate to be applied each year is based on that year’s one-year government bond rate, adding 0.5 percentage points, then reduced to an after-tax rate. The rules and interest rate for loss carry-forward are not represented in the calculations that follow. These assume that the company is in position to pay both taxes every year, or indifferent to postponement with interest.

Boadway and Bruce (1984), that taxation of the extraordinary rate of return depends on the present value of deductions allowed, not on each deduction in separation. Nevertheless, it might be easier to administer and explain a tax system where each deduction is closer to an ideal. It will be clear from the analysis that follows that the CIT and SPT do not match the theoretical ideals of corporate income taxes and rent taxes. Why this has not been changed by authorities, is outside the scope of the paper. Part of the explanation may be the need to be recognized as income taxes by authorities in other countries, the U.S. in particular, in order for companies from those countries to obtain foreign tax creditability, cf. Ministry of Finance (2006, sect. 9.5.4).

Since 2005 the system gives exploration a special treatment. If a company has no tax base in which to deduct exploration costs, their 78 percent tax value is refunded in the same year. For other costs, the tax value of remaining losses carried forward, not yet deducted, is refunded if and when a company closes operations in the sector. Worldwide both types of refunds are uncommon,⁷ and indicate a strong willingness by authorities to avoid distortions.

Ever since the SPT was introduced in 1975, interest payments on debt have been deductible both in CIT and SPT. This could be compared with two well-known alternative proposals for business taxation, ACE and ACC (OECD, 2007). Both have the intention to exempt the normal return to capital, but to tax returns above this. The ACE achieves this by allowing deductions for reported interest payments on firms' debt together with an imputed return on equity. The ACC gives deductions for an imputed return on both debt and equity. The SPT, on the other hand, gives deductions for an imputed return on debt and equity (the uplift), plus reported interest payments on debt. This seems illogical, like a double deduction for the return on debt. Mintz and Chen (2012, p. 15, p. 20) explicitly assumes that reported interest payments are not deductible in the Norwegian SPT, assuming it is of the ACC type. That would be logical, but not in line with the facts.

The deduction for reported interest payments against 78 percent tax makes debt financing very attractive.⁸ Companies often borrow from sister or parent companies abroad, so normal worries about risky debt service do not apply. Consequently, since 2007 there has been a thin capitalization rule prohibiting deduction in the SPT for debt exceeding 50 percent of the tax-written-down value of fixed capital assets. We can then assume that all companies borrow up to this limit.⁹ For our comparisons, we note that the interest deduction in the CIT is similar to what is available in other sectors, and there is no reason to include this deduction in our calculation of how much the tax system covers of an additional investment. The deduction in the SPT will be included, however, as it appears as an extra incentive for investment.¹⁰

⁷ Alaska has had similar refunds for exploration, see Bradner (2017).

⁸ This would also be true for an ACE system at 78 percent, but not for an ACC system.

⁹ The same assumption is used by, e.g., Ministry of Finance (2013) and Osmundsen et al. (2015).

¹⁰ This is the standard assumption when a firm calculates net present values with a weighted average cost of capital (WACC). The interest deduction in the CIT is taken care of in the WACC (the discount rate in the denominator), but additional benefits from debt must be accounted for in projected cash flows (in the numerator). The same method is applied by, e.g., Ministry of Finance (2013, Table 5.1) and Osmundsen et al.

For readers familiar with the recent decades' discussions of CIT and rent tax systems, it may be useful to summarize the Norwegian CIT-cum-SPT system in the terms from that literature. The CIT applied in the petroleum sector is of a traditional type with deduction for reported interest on debt. It has a linear depreciation schedule over six years, which is recognized as too fast (generous) compared with true economic depreciation for a large majority of projects. The SPT is applied to the same tax base except for two deviations: There is a thin capitalization rule (50 percent), and there is an uplift deduction over four years, proportional to investment (debt plus equity financed). For both taxes, there are three rules to preserve full loss offset. (1) When companies are out of tax position, the tax value of exploration costs are refunded. (2) Other tax losses are carried forward with interest. (3) If a company closes down, the tax value of any remaining accumulated loss, with interest, is refunded.

The combination of CIT and SPT has the intention that projects with no rent should pay a similar CIT as in other sectors. The SPT has investment-related deductions that to some degree are similar to an ACC tax, with the idea that the present value of deductions should be equal to the investment. That would imply it is a tax on rent. An additional complication is the illogical deduction for reported interest on debt. These deductions need to be seen in combination in order to evaluate the system.

4. Evaluation criteria

This section will set up criteria by which the changes in the petroleum tax system will be evaluated.

The first question is whether taxes on natural resource rent increase during these changes. This may seem a simple question, but it turns out that it needs detailed investigation. Sometimes the question is answered by looking at numbers for the whole sector. As an example of this, Mansour and Świstak (2017, Figure 13.1) show "Composition of tax revenue in Sub-Saharan Africa: resource vs. non-resource 1980–2010." Their diagram indicates something about revenues, but not much about tax systems, since the diverging curves could have been the results of changes in, e.g., relative prices or availability of resources. One would prefer some hypothetical comparison based on a given level of activity and profits (or at least controlling for some of the variation in background variables).¹¹

But even if tax revenue is compared between sectors, before and after a reform, based on some given activity level, the tax revenue from the resource sector will not give the whole picture of taxation of immobile factors. It is interesting to distinguish between taxation of mobile and immobile factors within that sector. In particular, the profits of the company consist of the normal return to capital plus the resource rent. While the CIT and the SPT are said to be taxes on each of these elements, respectively, the discussion above showed that they

(2015, Table 4).

¹¹ More advanced attempts at revenue-neutral tax reforms will predict the behavioral impact of a reform. This is not pursued explicitly here.

are at best approximations to ideal taxes on capital return and resource rent. To find which factor was taxed more or less as a result of each step in the reform period, an analytical approach is needed, where the tax on return to capital is defined from basic principles. The approach will be applicable, with small modifications, for any tax system.¹²

The formulation that follows allows a different discount rate to be applied to the operating revenues and the tax deductions. Only the latter rate is needed. This means the method is robust to the discussion over separate discount rates. There are three simplifying assumptions: The tax system is linear, with no progressivity. Second, after each reform step, tax rates are assumed to be constant, and deduction rates are assumed to have expected values equal to their statutory values.¹³ Third, the discount rate applicable to future tax deductions is constant and the same for all of these deductions. There is first a general formulation, then an application to the Norwegian case.

Consider an investment, I , which results in operating income (i.e., operating revenue minus operating costs) during subsequent years. Let the market valuation of the operating income be Y . This can be thought of as a present value at some risk-adjusted discount rate. Each year's operating income is taxed at the rate τ_T , which means that the same rate can be applied to Y . The investment gives rise to deductions with market valuations $\tau A(r)I$, which, in the general formulation, is a product of a vector of tax rates, τ , with a vector of present values of deduction rates, $A(r)$, then with the scalar I . Each tax rate multiplies those deductions allowed in the base for that tax, and all these deductions are proportional to investment. Each deduction is represented as a present value, i.e., the market valuation based on a constant nominal discount rate, r .

The value of the project before taxes is $Y - I$, while the after-tax value is

$$Y(1 - \tau_T) - I(1 - \tau A(r)). \quad (1)$$

The tax on the return to capital is defined as the tax on a project which has zero rent before taxes, i.e., a project with $Y = I$. The tax on capital return is thus equal to the before-tax value (which is zero) minus the after-tax value for this case, which reduces to the negative of the after-tax value, i.e.,

$$(\tau_T - \tau A(r))I. \quad (2)$$

For a project with positive rent (ex ante), we have $Y > I$, and the tax on rent is clearly equal to $\tau_T(Y - I)$.

For the Norwegian case, let the relevant (now, scalar) deductions (those that are proportional to investment) be denoted $(\tau_C + \tau_S)A_d(r)$ (tax value of depreciation deductions), $\tau_S u A_u(r)$ (tax value of uplift) and $\tau_S A_i(r, i)$ (tax value of interest deductions

¹² The applicability is complicated if a tax system does not guarantee immediate, effective deductions in years when the project does not by itself give positive values for the bases for each tax.

¹³ After a reform step, future tax deductions may be risky, and that risk may be systematic. This is one reason to do the calculations for a range of discount rates.

in the SPT), where the last one is a function of both the nominal discount rate and the nominal debt interest rate allowed, denoted i . Observe that the uplift rate, u , since it is assumed constant for the four years, has been separated out as a factor in the second expression for convenience in discussion below. The version of (2) for the Norwegian case is thus, with $\tau_I(r)$ defined as the marginal tax (reduction) rate for investment,¹⁴

$$(\tau_T - \tau_I(r))I \equiv (\tau_T - (\tau_C + \tau_S)A_d(r) - \tau_S u A_u(r) - \tau_S A_i(r, i))I. \quad (3)$$

Figure 1 below will illustrate whether the tax on the return on capital, (3), increased or decreased during the steps of the reform.

The second question is, what principles were followed by Norwegian authorities when petroleum taxes were adapted to the reductions in the CIT rates? The Ministry of Finance has stated an aim that the petroleum tax system should be neutral.¹⁵ This will be called incentive neutrality, to distinguish it from revenue neutrality. Revenue neutrality is a property of a tax reform, a comparison of the system before and after, under which revenue is the same. Incentive neutrality is a property, possibly, of one tax system by itself.

Incentive neutrality has two interpretations in this connection. The simpler alternative says that taxation of petroleum companies is neutral when a project is found profitable by companies under the system if and only if it would be found profitable if there had not been any taxation of the project at all. The somewhat more complicated alternative observes that other business activity in Norway is subject to a corporate income tax (CIT). Petroleum taxation can be called neutral when a project is found profitable by companies under the system if and only if it would be found profitable if the project had been subject only to the country's CIT. The second version makes sense in particular since the petroleum companies actually pay the CIT, and then a special petroleum tax (SPT) in addition. One can ask whether the SPT represents a neutral addition. It is this second alternative that has been the official aim of Norwegian authorities.

More specifically, we ask how each of the four changes 2012–2018 can be understood in relation to the ideal of incentive neutrality. Did the changes attempt to move the tax system closer to incentive neutrality, or did they attempt to maintain an existing neutrality? How can an existing neutrality be maintained when conditions, e.g., the nominal market interest rate, changes?

The third question is whether incentive neutrality can be achieved when tax systems are changed while many companies have ongoing activities. This can be seen as a question of reputation. In order not to discourage investment, authorities would want to convince companies that taxes will not be increased unexpectedly after investment.

¹⁴ It may be surprising that the SPT rate and the specific SPT deductions appear in the expression for the tax on capital return. The reason is that the SPT is not a pure rent tax. Whether a company pays the SPT at all is not the same question as whether the company earns rent. The expressions here assume that the SPT payment in any year can be positive or negative. Under the Norwegian system, this is OK if the company has other, profitable activity, but also if it does not, because of carry-forward with interest, and refund.

¹⁵ Incentive neutrality was an aim at least since Ministry of Finance (2001), and was repeated in Ministry of Finance (2013).

5. Calculated effects of four tax changes

This section calculates present values of tax deductions and makes relevant comparisons for five consecutive tax regimes 2012–2018. The simpler type of incentive neutrality is achieved if the present value is equal to the marginal tax rate on operating revenue, 78 percent, i.e., when expression (3) is zero. If this is true, the investment criterion under decreasing returns to scale will be unaffected by tax rates. To illustrate in one period: If f is a concave production function, and a company maximizes $(1 - \tau_T)pf(I) - (1 - \tau_I)I$, then the first-order condition leads to the same optimal investment, I , if the tax rates are zero as if they are between zero and unity, but equal.¹⁶

The other version of incentive neutrality, comparing SPT-cum-CIT with a only a CIT, could be done with the actual CIT applied in the sector. Instead, we will stick to the stated intention of the Ministry of Finance (2013), which is that the SPT-cum-actual-CIT in the sector should give the same incentives as an “ideal” CIT with the actual CIT tax rate. The “ideal” consists in applying true economic depreciation, the same principle as in other Norwegian sectors, with the implicit recognition that the actual depreciation in CIT for petroleum, six years linear, is too fast. Comparison with the “ideal” helps in understanding whether authorities have reached their stated aims. We follow the Ministry of Finance (2013) and compare with twelve years linear depreciation, supposed to be close to average true economic depreciation in the sector.¹⁷

However, the comparison is not between the SPT-cum-actual-CIT and an ideal CIT alone. Instead, we construct a tax system which has the actual marginal tax rate, $\tau_T = 0.78$, and at the same time only those (dis)incentive effects that are found in the “ideal” CIT. The comparison system will be a hypothetical combination of this “ideal” CIT and a true cash flow tax (Brown 1948).¹⁸ The cash flow tax is introduced since it is well known that in theory, this is an incentive neutral addition to a CIT, so this is a way to obtain a 78 percent marginal tax rate combined with the disincentives given by the “ideal” CIT. The cash flow tax is applied to after-CIT cash flows, and the rate, τ_B (B for Brown), is chosen so that $(1 - \tau_C)(1 - \tau_B) = 1 - \tau_T$.

Two more assumptions are needed before we can make the comparisons. The nominal interest rate on debt is set to a moderate 2.5 percent.¹⁹ Moreover, we take into

¹⁶ Here, p is the product price, and τ_I is the marginal tax (reduction) rate for investment, here in a single-period setting.

¹⁷ Neither actual nor this “ideal” depreciation schedule makes any attempt at correcting for general inflation. The nominal depreciation allowances are constant for six or twelve years, adding up to 100 percent.

¹⁸ By «true» cash flow tax, we mean a constant proportional tax on non-financial cash flows with immediate refund of negative taxes.

¹⁹ For these calculations we should use maximum allowed interest rate for deduction. At this point one should distinguish between two interpretations of the calculations that follow: We use a range of discount rates that may be interpreted as varying the risk free rate and/or the risk premium. If the risk free rate varies, the interest rate on debt will also vary. As the risk premium for tax deductions vary, it is not so clear that the allowed maximum interest on debt would vary, but it might. For simplicity, we keep it constant at 2.5 percent irrespective of the discount rate in order to provide a conservative estimate of tax deductions.

consideration the fact that the sector pays taxes with only 6 months average lag, while the hypothetical system for our second comparison will have a one year lag before the first depreciation deduction is allowed, closer to the theoretical ideal.

Table 1: Tax values of deductions following an investment of unit value in year 0

	Year	1	2	3	4	5	6	7–12
Actual tax system	Depreciation	$\frac{1}{6}\tau_T$	$\frac{1}{6}\tau_T$	$\frac{1}{6}\tau_T$	$\frac{1}{6}\tau_T$	$\frac{1}{6}\tau_T$	$\frac{1}{6}\tau_T$	
	Uplift	$u\tau_S$	$u\tau_S$	$u\tau_S$	$u\tau_S$			
	Interest	$0.5i\tau_S$	$0.5\frac{5}{6}i\tau_S$	$0.5\frac{4}{6}i\tau_S$	$0.5\frac{3}{6}i\tau_S$	$0.5\frac{2}{6}i\tau_S$	$0.5\frac{1}{6}i\tau_S$	
Hypothetical system (CIT)	Depreciation	$\frac{1}{12}\tau_C$	$\frac{1}{12}\tau_C$	$\frac{1}{12}\tau_C$	$\frac{1}{12}\tau_C$	$\frac{1}{12}\tau_C$	$\frac{1}{12}\tau_C$	$\frac{1}{12}\tau_C$

Table 1 shows the deductions that go into the present value calculations. The interest rate on debt is denoted i , and the uplift rate (currently 0.053) is u . Investment is undertaken mid-year. Under the actual system, deductions then occur after 0.5 year, 1.5 years, etc.

Table 2: Rates of tax, uplift, and interest in 2012, 2014–15, 2016, 2017, and 2018

	Until 2012	2014–2015	2016	2017	2018
τ_C	0.28	0.27	0.25	0.24	0.23
τ_S	0.50	0.51	0.53	0.54	0.55
τ_T	0.78	0.78	0.78	0.78	0.78
τ_B	0.6944	0.6986	0.7067	0.7105	0.7143
u	0.075	0.055	0.055	0.054	0.053
$u\tau_S$	0.0375	0.0281	0.0292	0.0292	0.0292
r_G	1.53%	1.29%	0.50%	0.42%	

Table 2 shows the development of tax, uplift, and interest rates over time. The rates were changed in 2013,²⁰ in 2016, in 2017, and again in 2018. During these changes, the new uplift rates have been applied to subsequent investment only. The last line shows the nominal yield r_G on one-year government bonds in 2012, 2014, 2016, and 2017. It can be argued that the choice of discount rate and uplift rate should depend on this, but we will not impose any exact relation of that sort.

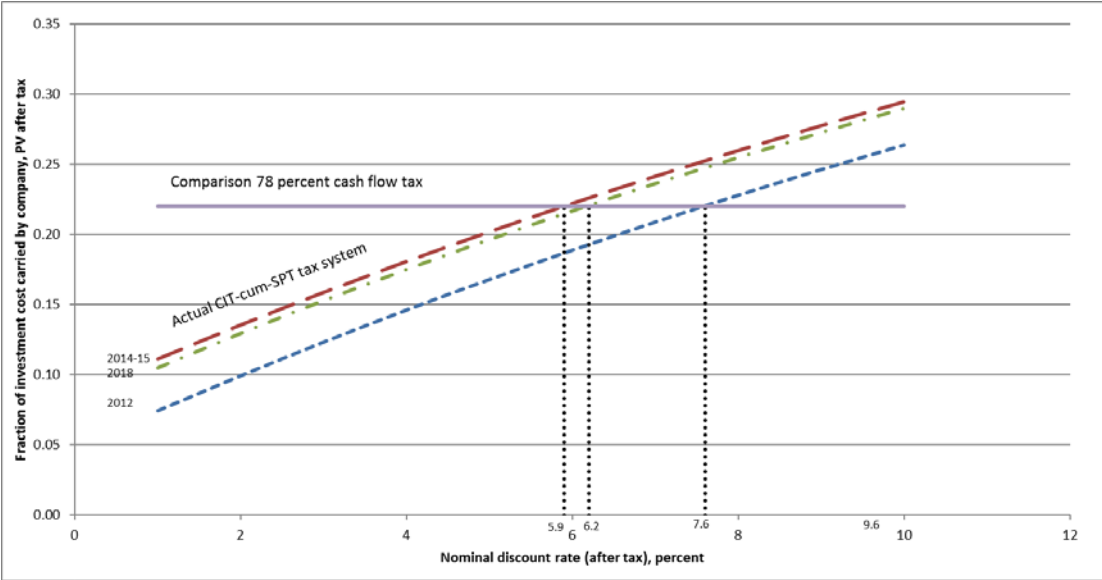
Figure 1 makes the first comparison (based on the simpler version of incentive neutrality) for a range of values of the nominal after-tax discount rate. The fraction of investment covered by the company, after tax, is 22 percent under a pure 78 percent cash flow tax. Under the actual tax system the company pays out 100 percent of investment in year 0, while the implied tax deductions in the following six years are taken from Table 1, with numerical values from Table 2. The difference, covered by the company, is the NPV of these elements, shown in the diagram.

Figure 1 shows that the reform from 2012 to 2014 increased $1 - \tau_I(r)$ substantially, by between 3.1 and 3.7 percentage points, most for the lowest discount rates. In 2012, a firm using a discount rate below 7.6 percent was given a (positive) tax incentive to invest, while in

²⁰ The 2013 change happened in two coordinated steps. These are not represented separately here.

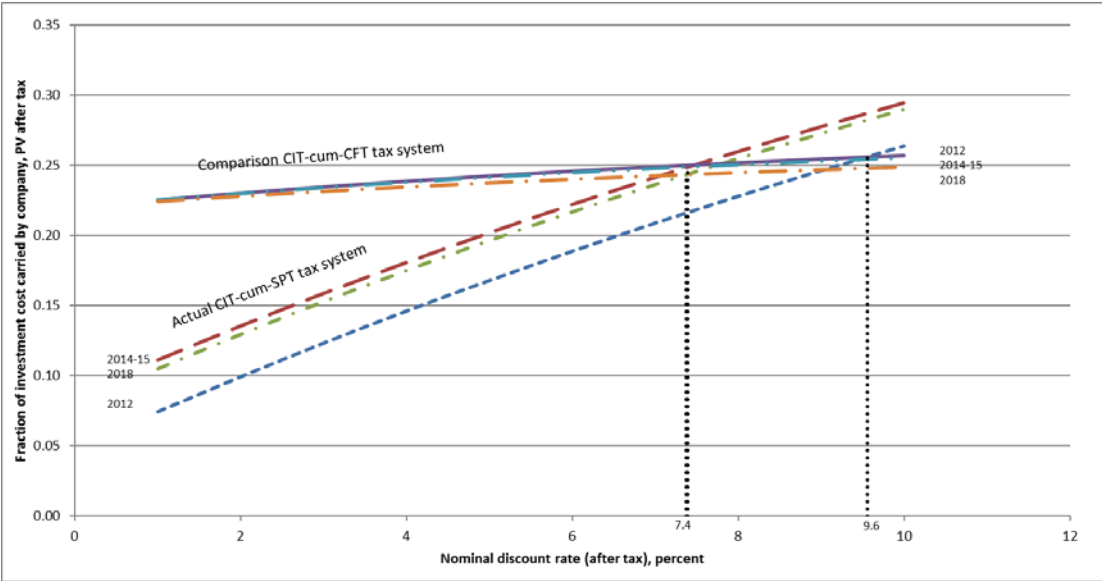
2014, the incentive only worked in that direction for a firm using a discount rate below 5.9 percent. Then there was a slight reduction between 2015 and 2018, so that the positive incentive exists for discount rates below 6.2 percent.

Figure 1: Fraction of investment costs covered by company, after tax, under actual tax systems 2012, 2014–15, 2018, compared to 78 percent cash flow tax



The second comparison, in Figure 2, is with the combination of a CIT and a pure cash flow tax (CFT), where the CIT has the actual rate for each regime, while the CFT rate is adjusted to maintain the total rate of 78 percent. The curves for the actual system are the same as in Figure 1.

Figure 2: Fraction of investment cost covered by company, after tax, under actual tax systems 2012, 2014–15, 2018, compared to CIT-cum-CFT



The curves for the CIT-cum-CFT tax system reflect the coverage by that combined system of an added investment. For concreteness, with 2018 rates, the hypothetical system covers parts of investment as follows: The company pays out 28.57 percent of investment in year 0 (due to the 71.43 percent cash flow tax, see above), while the tax value of the subsequent tax deductions in the following twelve years are 28.57 percent of the reduced CIT in those years, shown in Table 1. The difference, covered by the company, is the NPV of these elements, i.e., 28.57 percent of (1 minus the PV of CIT reductions).

The comparison system is distortionary for any given, fixed discount rate, which is well known for CIT systems (except under full debt financing). The small differences in the three curves for the comparison system reflect the CIT rate changes only, since the changed uplift rate has no consequence in the comparison system. Thus the curves move gradually downward over time. The curves for the actual system move first up, then down. In 2012, the actual system gave less of a disincentive for investment than the comparison system for discount rates below 9.6 percent.²¹ In 2014 and 2018, this range was reduced to below 7.4 percent, the same for both years when rounded to one decimal.

Whether the relevant discount rate is really above or below the limiting values that are shown, is not the topic of the current paper.²² Ministry of Finance (2013) uses a 1.8 percent nominal discount rate, assuming the deductions are risk free, while Osmundsen et al. (2015) use 9 percent, arguing that they are not risk free, and no one knows how risky they are. The risk free rate in Norwegian currency (NOK) is indicated in the last row of table 2.

The two diagrams do not show the years 2016 and 2017. The reason is that the relevant curves for these years are so close to the 2018 curves that they would be indistinguishable. This can be explained from the tables. Table 2 shows that $u\tau_S$ has almost exactly the same value for 2016, 2017, and 2018, namely 0.02915 or 0.02916. This was intended by authorities. Table 1 shows that this product appears as the tax value of uplift in the third row. The only element that changes 2016–2018 is in the fourth row, the interest deduction in the SPT. This is reduced when the SPT rate is reduced, but the NPVs of the changes are so low that the curve would not change notably.

6. Discussion

In all four steps (see Table 2), the CIT rate was reduced, and the SPT rate was increased so as to keep the sum of the two rates constant. This sum, 78 percent is the marginal tax rate on a rent windfall. That is, if output price and/or quantity increases without any change in investment, 78 percent of the increased (gross and net) value will be paid in taxes.

Next, consider the four steps separately in order to see what distinguishes them. Clearly, they differ by the changes in the uplift rate. The first two changes do not follow the

²¹ «Less of a disincentive» means that for this range of discount rates, either there was a disincentive, which was reduced in absolute value, or there was a positive incentive (see Figure 1), increased in absolute value.

²² On the relevant interest rate for achieving tax neutrality, Zodrow (2006, p. 283) states that, «The determinations of this rate would inevitably be controversial.» A theoretical discussion is found in Lund (2014a).

simple principle mentioned above, that the product $u\tau_S$ is kept constant. Table 2 shows that it is first decreased substantially from 2012 to 2014–15, then increased somewhat from 2014–15 to 2016. The first, substantial decrease does not seem to be a change to maintain incentive neutrality (in any sense); if there had been neutrality in 2012, there would not be in 2014.²³

Figures 1 and 2 show that for any given discount rate, the amount the company has to cover of an additional investment is increased notably from 2012 to 2014 for all discount rates shown. A possible interpretation is that the authorities used the opportunity to adjust the uplift rate down in order to move closer to an incentive neutral system. The official position was that deductions were too generous, and that the relevant criterion for neutrality is the one illustrated in Figure 2. Since the Ministry's position was that a discount rate well below 7 percent was relevant, it was a move in the right direction to narrow the range of the positive investment incentive from 9.6 percent discount rate to 7.4 percent. Revenue neutrality was not mentioned as a relevant criterion for the changes.

The subsequent step, from the 2014–15 system to 2016, did not entail any change in the uplift rate. This could perhaps be seen as a concession to companies in the sector, who had complained that the change in 2013 ruined profitability of many projects or possible project extensions. Again, there was no revenue neutrality consideration. In fact, projected revenue decreased by 630 million NOK (approx. 80 million USD), due to the shift from CIT to SPT (Ministry of Finance 2015a, Table 4.1). Under the second interpretation of incentive neutrality (see Figure 2), the comparison system and the actual system changed in the same direction, and the regions for discount rates giving incentives versus disincentives were not perceptibly changed.

The third and fourth steps were intended to maintain revenue neutrality. The product $u\tau_S$ is kept constant. Among the three elements of $\tau_I(r)$ (see expression (3)), only the smallest one, the tax value of deductions in SPT for interest on debt, changes slightly. The changes are so minuscule that the range for investment incentives, rounded to one decimal, is still up to 7.4 percent in Figure 2. If there is deduction for interest on debt equal to 50 percent of tax-written-down capital also in the CIT (where it is not a legal limit), there is actually exact revenue neutrality, since the higher tax value of interest deduction in the SPT is counteracted exactly by a lower deduction value in the CIT. The interest deduction in the CIT is not captured in the calculations above.

A possible motivation for changing the tax system could be a reaction to reductions in market interest rates (see the last line of Table 2; in fact, the reduction had been going on well before 2012 also). One problem with the Norwegian system is that the uplift deduction is written into the tax codes with no reference to actual interest rates or other rates of return in the market. When interest rates come down, the possible incentive for overinvestment will be more pronounced. The change in 2013 could perhaps be understood in light of this.

²³ We come back to the possible argument that the change restored neutrality after several years of decreased market interest rates.

The tax on the return to capital defined in (3), for $I = 1$, is the gap in Figure 1 between the constant horizontal line, $1 - \tau_T$, and each year's curve for $1 - \tau_I(r)$. For nominal discount rates below 7.6 percent it was negative in 2012, but the tax increased (algebraically) in the first step of the reform, and became positive for discount rates between 5.9 and 7.6 percent. Even though the CIT rate went down, the decrease in the uplift rate was sufficient to increase the tax on capital return in the sector. The next change, from 2014–15 to 2016, reduced the tax on capital return somewhat,²⁴ and the final two steps kept it almost constant.

For any given project (i.e., given I, Y), the tax on petroleum rent was kept constant at $(\tau_C + \tau_S)(Y - I)$. That is, both the marginal and average tax on rent is constant as long as the sum of the two tax rates is constant. By this design (the constant sum), all four changes affected the tax on capital return only, not the tax on resource rent. The predicted increase in the tax on immobile factors did not happen, at least not for petroleum rent.

It is not obvious why authorities have chosen not to increase the tax on resource rent. With petroleum taxes such a large share of government revenue, an increase might have mattered in order to counteract a decrease in the general taxation of corporate and capital income. A possible explanation for the constant rent tax rate is that the taxation of petroleum rent was already at a very high level. The authorities could think that there was no room for increase. A full analysis of this is beyond the scope of this paper. The optimal determination of a rent tax rate is not often analyzed (Lund 2009), but could, e.g., be found in a trade-off with incentives for profit shifting (Lund 2002).

7. Incentive neutrality and transitions

Since governments worry about incentives of tax systems, there is a particular concern when the tax system is changed while activity is ongoing. If the change is not anticipated, companies will often experience unfavorable surprises: They invest under one tax system, but find that a new tax system reduces after-tax profits. If companies have some anticipation in this direction, this creates an additional disincentive for investment, not captured by the more static analyses above.²⁵

The largest change in the period studied, was a negative change for companies in 2013, i.e., an increased tax on the return to capital in the sector. The Ministry of Finance (2013) saw the danger that this might ruin its reputation of providing a predictable investment environment. The reduced uplift rate was thus only applicable for new projects, i.e., projects that had not already submitted their required development plans to the authorities.

While this was useful in order to preserve the reputation, the policy does not achieve this completely. Some companies had incurred exploration costs under the assumption of

²⁴ This may be the most counterintuitive conclusion from the analytical approach. When the CIT rate is reduced and the SPT rate increased, so that their sum is constant, but there are additional deductions in the SPT base, and these are unchanged, then (3) shows that the tax on the return to capital is actually decreased. In step 1, 3, and 4, this is counteracted by the increase in the uplift rate, so that the tax on return to capital is increased in step 1, while it is almost constant through steps 3 and 4.

²⁵ There can also be unanticipated positive surprises for companies. No general discussion is given here.

one set of tax and uplift rates, but would experience a less favorable set of rates if and when they later submitted their development plans. If authorities want to avoid this, they would need to apply the new rules only to new licenses. In the Norwegian case, with relatively much of total resources in already existing licenses, this would be costly, creating a possible trade-off for the authorities.

When activities are ongoing, and authorities discover the need for tax increases, it will be difficult to implement these without any loss of reputation. The most important lesson is that it is better to design tax systems so as to minimize the need for unanticipated changes. For instance, in the current case, if the uplift rate had been linked in the tax regulations to market interest rates, any explicit decision to change it might have been unnecessary. As a contrast, this is already taken care of in the rules for interest accumulation for loss carry-forward.²⁶

8. Conclusion

The prediction from the theory of tax competition, of a higher tax on resource rent when the corporate income tax is lowered, is not confirmed for Norwegian petroleum 2012–2018. A possible explanation is that petroleum rent tax was already very high, with no room for further increase. For the analysis it has been necessary to develop an analytical approach that separates the tax on the return to capital in the resource sector from the tax on petroleum rent. This method can potentially be useful with other tax systems as well. It has the benefit that neither the time profile nor the applicable discount rate for the operating revenues need to be specified.

Whether petroleum taxes in Norway were incentive neutral at any stage in the reform process, depends on what discount rate is applied to future tax deductions. The first step in 2013 was motivated by a view with the authorities that the deductions had been too generous. In present value terms, the tax value of deductions decreased between 3 and 4 percentage points that year. Subsequent changes were smaller, the second step in the opposite direction, later steps with hardly any effect on incentives.

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²⁶ See footnote 6.

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