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Bjart Holtsmark and Geir H. M. Bjertnæs

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A discussion with special relevance to Norway

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Preface

The report discusses the size of the marginal cost of public funds with special relevance to Norway. The report was prepared with financial support from the Ministry of Finance

Statistisk sentralbyrå, 13 February 2015.

Torbjørn Hægeland

Abstract

NOU 1997:27 (Nyttekostnadsanalyser – Prinsipper for lønnsomhetsvurderinger i offentlig sektor), discussed the appropriate size of marginal cost of public funds. They recommended that MCF in cost-benefit analyses should be set equal to 1.2, and this has been the recommended practise since. This report aims to re-evaluate the recommendation of NOU 1997:27 and discuss whether there are reasons to change current practice. First, different concepts of MCF used in the literature are introduced and illustrated by numerical examples. Second, an overview of estimates of MCF in different studies is provided. We conclude that we do not have firm ground to give a point estimate of MCF. Rather, we provide a broad overview of the contributions, which point in different directions. We recommend that more research should be conducted to evaluate and quantify unresolved aspects related to estimates of MCF. The conclusions are partly based on simulations with the general equilibrium model MSG-6. The MSG-simulations are thoroughly documented in a separate report (Bjertnæs, 2014).

Sammendrag

NOU 1997: 27(Nyttekostnadsanalyser – Prinsipper for lønnsomhetsvurderinger i offentlig sektor) drøftet den aktuelle størrelsen på den marginale skaffefinansieringskostnaden (MCF). Der var anbefalingen at MCF i kost-nytte-analyser bør settes lik 1,2, og dette har vært den anbefalte praksis siden. Denne rapporten ser nærmere på grunnlaget for anbefalingen i NOU 1997: 27 og diskuterer om det er grunn til å endre dagens praksis. Først blir forskjellige konsepter for skattefinansieringskostnaden diskutert og illustrert ved hjelp av numeriske eksempler. Dernest gis en oversikt over estimater av skattefinansieringskostnaden i ulike studier. Vår konklusjon er at vi ikke har solid fundament for å gi et punktestimat på MCF. Rapporten gir isteden en bred oversikt over analyser, som gir forskjellige estimater på MCF. Vi anbefaler at mer forskning bør gjennomføres for å evaluere og kvantifisere uløste aspekter knyttet til estimater av MCF. Konklusjonene er delvis basert på simuleringer med den generelle likevektsmodellen MSG-6. MSG-simuleringene er grundig dokumentert i en egen rapport (Bjertnæs, 2014).

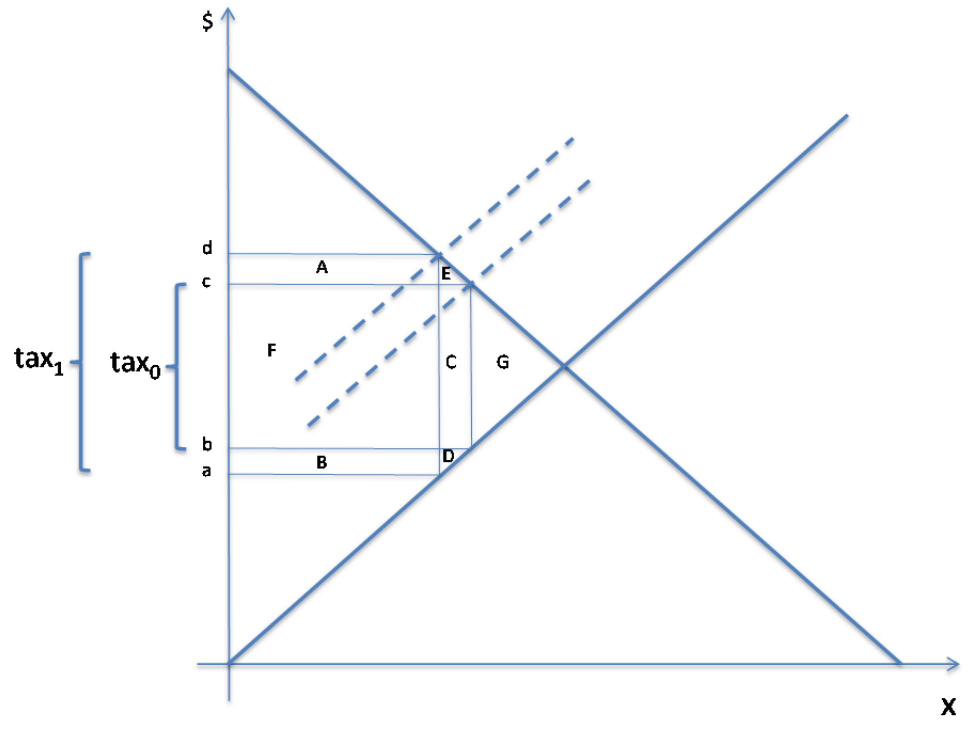
Contents

1. Introduction[1]

Public goods and services will often be difficult to finance in the market. In such cases, taxes have to be used for financing. Consumers and producers face different prices when taxes are introduced in the economy. Such tax wedges will alter production and consumption decisions so that the economy suffers a loss of efficiency. A tax wedge means that the salary employees receive after deduction of taxes is lower than the salary expense to the employer. Costs connected to such efficiency losses are incorporated into cost-benefit analysis of public projects by multiplying the cost, which equals the need for public funding, with a factor. This factor, which represents the marginal efficiency cost of raising additional tax revenue, is often referred to as the marginal cost of public funds.

This does not apply to all taxes, however. The tax system is characterized by a variety of taxes that correct for externalities such as environmental and health costs of car driving, for example. If these taxes are set correctly, they do not provide efficiency losses. Moreover, Christiansen (1981, 2007), Sandmo (1998) and Kaplow (1996, 2004) show that taxes at least in theory could be designed to harvest a welfare gain related to redistribution such that there is no need to include additional funding costs related to public projects. More generally, MCF varies with regard to the tax instrument used for financing. This last point will be illustrated by numerical examples.

Figure 1. An introduction to the marginal cost of public funds. MCF is the area A+B+E+D (the increase of private sector's costs of the tax) divided by A+B-C (the increase of tax revenue)



The tax system aims to collect a larger share of the income of the rich than from the less wealthy and the poor. Thus, the marginal tax rates on income are higher than the average tax rates. This progressive property of the tax system is considered to be welfare increasing. At the same time higher marginal tax rates give higher distortions. How the welfare gains, in terms of a more even income distribution, should be weighted against the efficiency losses caused by high marginal tax rates have no simple answer. It is therefore difficult to estimate the size of the MCF.

[1] The authors are grateful to Vidar Christiansen, Erling Holmøy, and Dirk Schindler for useful comments to an earlier version.

Before aspects of the tax system's effects on income inequality is taken into account, the literature finds that MCF is larger for taxes on high incomes only, see Ballard and Fullerton (1992), and that a tax increase on top incomes, only, may even reduce tax revenue collected; see e.g. Kleven and Kreiner (2006). Estimates of MCF are, however, reduced when concerns for income inequality is taken into consideration. Redistribution with optimal non-linear taxation, which includes progressive taxation, implies an MCF of approximately one; see Christiansen (1981) and Jacobs (2013).

NOU 1997:27 discussed the appropriate size of MCF. They recommended that MCF in cost-benefit analyses should be set equal to 1.2. This report aims to re-evaluate the recommendation of NOU 1997:27 and discuss whether there are reasons to change current practise. Our conclusion is that we do not have firm ground to give a point estimate of MCF. We discuss the main arguments for higher and lower estimates, but recommend that more research should be conducted to evaluate and quantify unresolved aspects connected to estimates of MCF.

2. Definitions of MCF

As an introduction, fig. 1 illustrates the MCF as a concept. Assume that there is only one good and that the market for this good is perfectly competitive with no external effects. Moreover, assume that all consumers and producers are identical so that distributional concerns can be ignored. We will in the subsequent sections return to situations where these simplifying assumptions do not apply. Let the upward sloping line represent the marginal cost curve of a private good while the falling curve represents the demand. First, assume there is a tax on the good with the size equal to the distance *b*-*c*. This tax will lead to public revenue equal to the area *F+C*. At the same time the sum of consumers and producers' surplus will be reduced by an amount equal to the area *F+C+G*. The area *G* is therefore usually labelled the deadweight loss from the tax.

Next, assume the tax is increased to the distance *a*-*d*. The marginal cost of public funds is meant to measure the cost of a marginal change in revenue. We here consider a discrete change for the purpose of illustration. After the tax change the public revenue is *A+F+B*. Hence, the revenue change is $\Delta R = A+B-C$. Assuming that the revenue is not returned to the consumers or producers, the loss of welfare, measured as the reduction of the consumers' and producers' surplus, is $\Delta W = A+B+E+D$.

The MCF is equal to the welfare loss of the consumers and producers per dollar of revenue, or

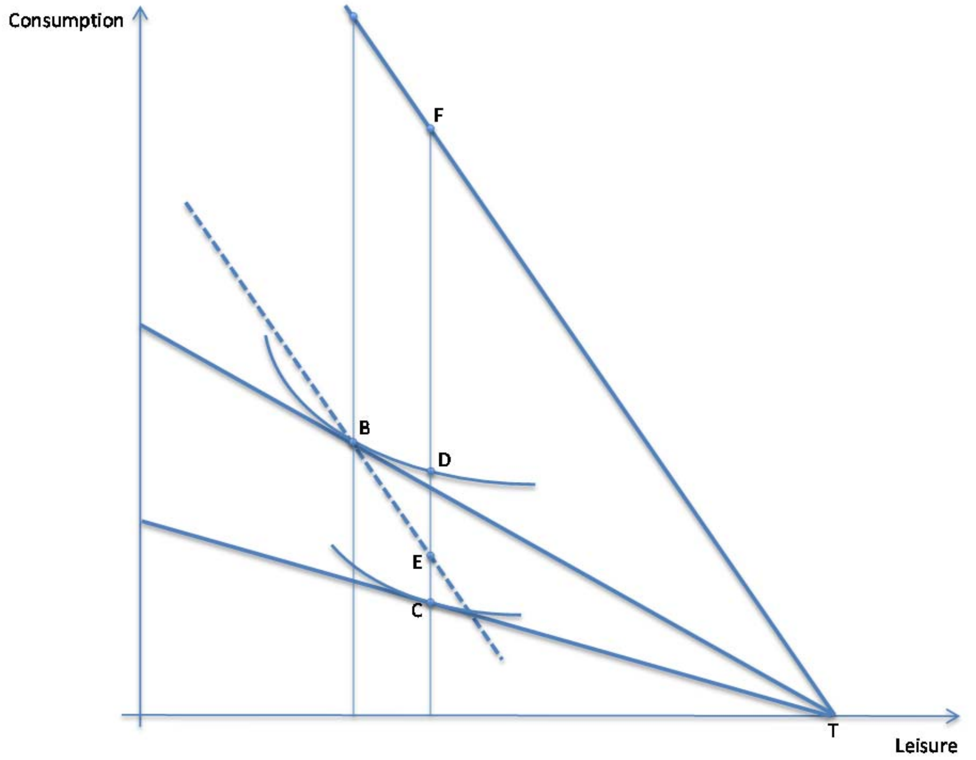
(1) $$MCF = \frac{A+B+D+E}{A+B-C}$$

With a falling demand curve and a rising supply curve, as drawn in the diagram, and no externalities in any markets and identical consumers, it follows from (1) that MCF is greater than one.

This simple illustration of the concept gives the impression that MCF is always greater than one. This is, however, not always the case. We will show that MCF could be smaller than one, although that is a less likely case in an economy with tax rates close to zero.

Note, however, that the illustration above ignores potential welfare gains from public projects.

Figure 2. An increased wage tax with no rebate. The dashed line through B represents points where the tax revenue is the same as in point B. The tax revenue after the tax increase equals the distance FC. The distance CE represents the additional revenue provided by the tax rise. CD is the utility loss of the consumer (measured in units of the consumer good). Thus, MCF=CD/CE



2.1. The Stiglitz-Dasgupta-Atkinson-Stern approach

The scientific literature provides different definitions of MCF. In the following subsections we introduce the two most frequently applied definitions.

The first precise definition of MCF to be introduced has been labeled the Stiglitz-Dasgupta-Atkinson-Stern approach (SDAS) after the works by Stiglitz and Dasgupta (1971) and Atkinson and Stern (1974). Although these papers did not use the concept MCF, they discussed the costs of raising public funds.

Figure 2 illustrates their case. The vertical axis measures consumption, *c*, while the horizontal axis measures leisure, *l*. Let the steepest budget line *AT* represent the case without any taxes. This line also shows the production function.

Let the curved lines through point *B* and *C* represent indifference curves. After the introduction of a proportional tax on income, the budget constraint becomes less steep, and the consumer chooses point *B*, giving tax revenue equal to the distance *AB*, which is equal to the vertical distance between line *AT* and the dashed line through point *B*.

Next, we consider the consequences of increasing the tax. By definition MCF measures the effects of marginal changes. However, for illustrative purposes we consider a discrete change. The flattest line represents the consumer's budget constraint after the tax increase, and the consumer chooses point C.

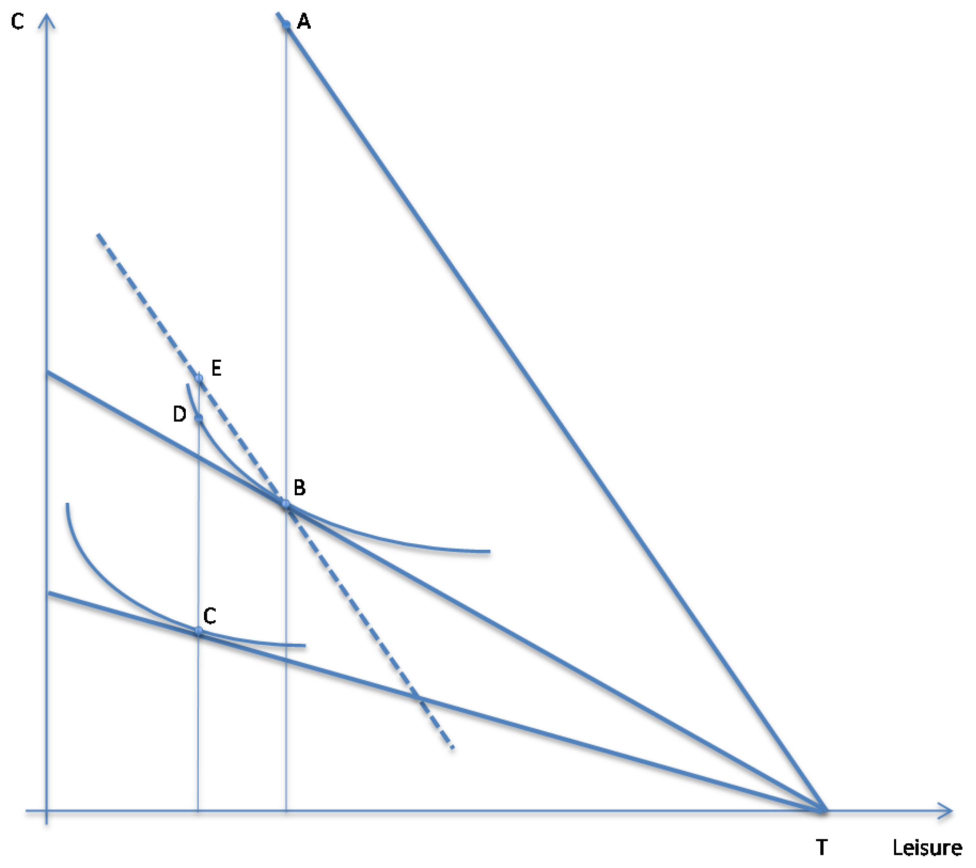
The tax increase means a lower price of leisure. This gives a substitution effect towards increased leisure and reduced labour supply and consumption. However, the tax increase also gives an income effect that draws in the opposite direction (reducing both leisure and consumption). The indifference curves in Figure 2 are drawn such that the tax increase leads to increased leisure, meaning that the substitution effect is stronger than the income effect, i.e. that the labour supply curve is upward sloping.

At point *D* the consumer would be as well off as he was at point *B*. Hence, the distance *CD* is a measure of the welfare loss caused by the tax increase, measured in units of the consumer good. The distance *CD* is also a money measure of the welfare loss caused by the tax increase.

The dashed line through *B* represents points where the tax revenue is the same as in point *B*. The tax revenue after the tax increase equals the distance FC. Thus, the distance CE represents the additional revenue provided by the tax rise. Define MCF as the welfare cost of public funding per unit of additional funding. Then the relationship CD/CE represents MCF, and we clearly see that MCF>1 in this case, as we also found in the graphical illustration in the introduction.

Next, we will show that MCF also could be smaller than one when the SDAS-concept is applied. Such a case is illustrated with Figure 3, which is similar to Figure 2. However, in Figure 3 it is assumed that the income effect of the tax increase dominates the substitution effect such that the consumer increases labour supply after the tax change. This means that the labour supply curve is back-ward bending. Now, we have that *CD/CE=MCF*<1. This illustrates that we cannot rule out the possibility that MCF is smaller than one.

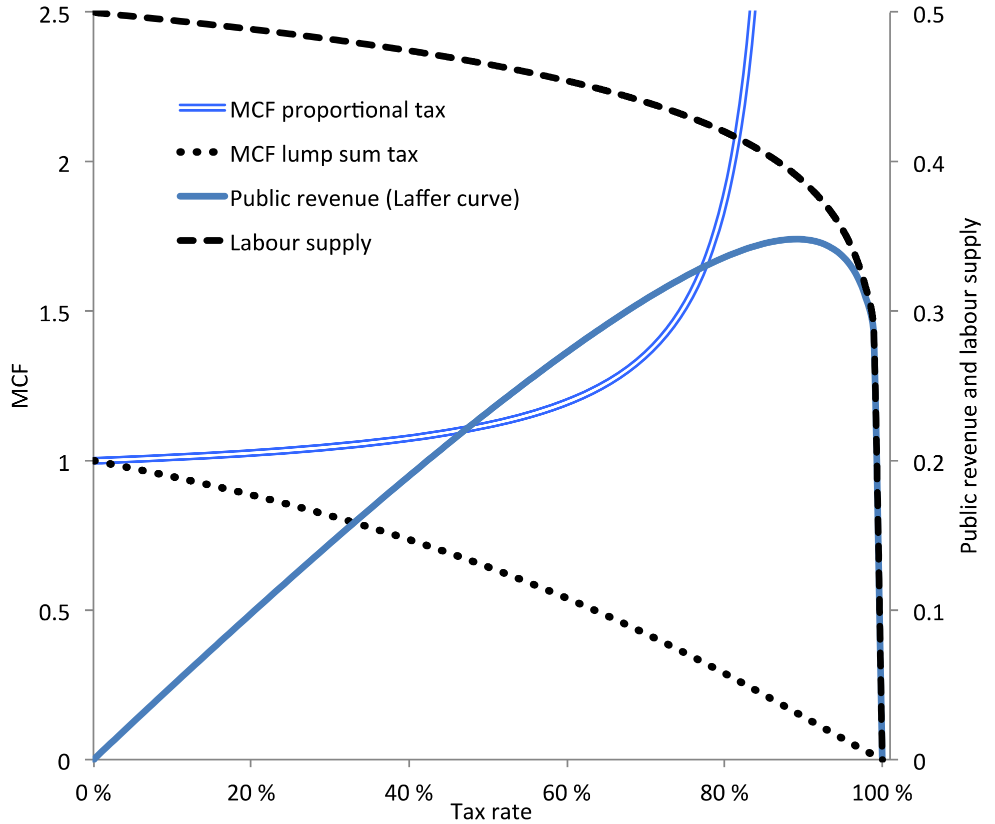
Figure 3. Increased wage tax with no rebate. The income effect of the tax increase dominates the substitution effect such that the consumer increases labour supply after the tax change. This means that the labour supply curve is back-ward bending. MCF= CD/CE



The SDAS-based MCF-definition can also be calculated as follows: Consider a consumer with the utility function $u = u(c,h,g)$ where c, h, and g are consumption of a private good, working hours, and public consumption, respectively. The consumer has a budget constraint, for example of the type $(1+t_c)c = (1-t_w)\, wh + z$, where w is the wage rate, t_c and t_w are taxes on consumption and income, respectively, and z is a lump sum tax. The indirect utility function v(·) follows from the consumer's maximisation. Given that λ is the consumer's marginal utility of consumption of the private good and η is the shadow price of the public budget constraint, then the SDAS-based definition means that MCF = η/λ. If there are *n* consumers, then MCF is equal to the shadow price of the public budget constraint divided by the average of the consumers' marginal utility of private consumption.

Before we proceed, a comment on the above discussion is appropriate. Traditional understanding of public economics tells us that taxation causes distortions that have social costs, as illustrated in Figure 1. Therefore, it might appear paradoxical that MCF could be smaller than one. However, recall that a tax change has two effects on the consumer. First, there is a substitution effect: If the tax on labour income is increased, after-tax-income is reduced on the margin and labour supply becomes less attractive from the viewpoint of the consumer. This substitution effect draws in the direction of reduced labour supply. This is not beneficial and should be considered a distortion with regard to the supply of labour.

Figure 4. MCF (based on the SDAS approach) and the Laffer curve with a single consumer case. The consumer has a CES utility function with an elasticity of substitution at 1.2 and a proportional tax in addition to a lump sum tax. The horizontal axis measures the level of the proportional tax rate. The lump sum tax increases marginally from zero in all considered cases



Second, the tax increase has an income effect. The lower after tax income makes the consumer think he 'cannot afford' the same amount of leisure as before. This tends to increase labour supply and hence, reverse some of the distortion in the supply of labour. Put differently, the tax increase implicitly sends a message to the consumer that public projects need funding. The increased labour supply following the income effect should be seen as an intended response to the tax increase. If this *beneficial* income effect is stronger than the distortionary substitution effect, MCF becomes smaller than one. For example, a lump sum tax, which has no substitution effect, only an income effect, will within this approach have an MCF smaller than one when the initial tax rate is positive. The income effect generates a welfare gain as the distortion in the supply of labour is reduced. This explains why MCF becomes smaller than one when the lump-sum taxes are increased.

2.2. Numerical illustrations of MCF with the SDAS-approach

To illustrate the SDAS-case with a linear tax further; some numerical examples are presented in the following. The numerical examples are based on a representative consumer model with a CES utility function in consumption and leisure

(2) $U = (a\, c^r + (1\text{-}a)\, l^r)^{1/r}$

The share parameter a is set to 0.5 throughout the paper. The elasticity of substitution will be $s = 1/(1\text{-}r)$. In most simulations it is assumed that s=1.2, which means that the labour supply elasticity with respect to the wage rate is 0.1. According to the literature review in Holmøy and Thoresen (2013) this is a reasonable estimate of this elasticity. We have not included consumption of the public good in the utility function. That is not important for the following discussion.

The consumer has the time constraint

(3) $l+h=T$,

where h is working hours and T is total time available. It is assumed that T=1. The production function is linear such that the production x is proportional to the amount of labour:

(4) $x=kh$

where k is a productivity factor. As a starting point we assume that the productivity factor k is one. When we below discuss progressive taxes, the productivity factor will be varied. The consumer's budget constraint is $c=(1\text{-}t)wh\text{-}z$ where the price of the consumer good is normalized to one, t is the tax rate. Given that the producer is assumed to have zero profit, it follows that $w=k$.

Figure 4 shows the first numerical example. The dashed curve shows MCF for different tax rates. At tax rates close to zero, the diagram shows that MCF is close to 1. With an increasing tax rate, MCF is increasing. When the tax rate is in the interval 0.7 – 0.8, MCF is rapidly increasing and tends to infinity as the tax rate approaches 0.9. For higher tax levels there is a Laffer-effect in the sense that increasing the tax rate reduces public revenue.

The dotted curve shows that MCF of the lump sum tax is close to one (but always smaller than 1) for levels of the proportional tax rate close to zero. As the proportional tax rate increases, MCF of the lump sum tax decreases. This decreasing trend is explained by the distortion of the proportional tax rate t which means inefficiently low supply of labour. The income effect of the lump sum tax means that the consumer increases labour supply. As there is an inefficiently low labour supply when the tax rate t >0, increased lump sum taxation means increased efficiency and thus an MCF < 1 for the lump-sum tax. The greater is the tax distortion in the first place, the larger is the gains from increased labour supply, and, thus, the smaller is the MCF of the lump sum tax.

2.3. The Pigou-Harberger-Browning approach

In addition to the SDAS approach there is a definition of MCF based on the approach taken by Pigou (1947), Harberger (1964) and Browning (1976, 1987) and has therefore been labeled the Pigou-Harberger-Browning (PHB) approach. The PHB-approach considers a case where the revenue collected by a distortionary tax is redistributed to the consumer as a lump-sum tax. The redistribution of the tax revenue is done to isolate the distortionary effect of the tax. In other words, the

PHB-approach does not include the intended income effect that was emphasized in the discussion of the SDAS approach. Thus, MCF based on the PHB approach is based on the compensated supply elasticity of labour, while the SDAS-approach is based on the uncompensated labour supply elasticity.

Figure 5. The Pigou-Browning-Harberger approach to MCF

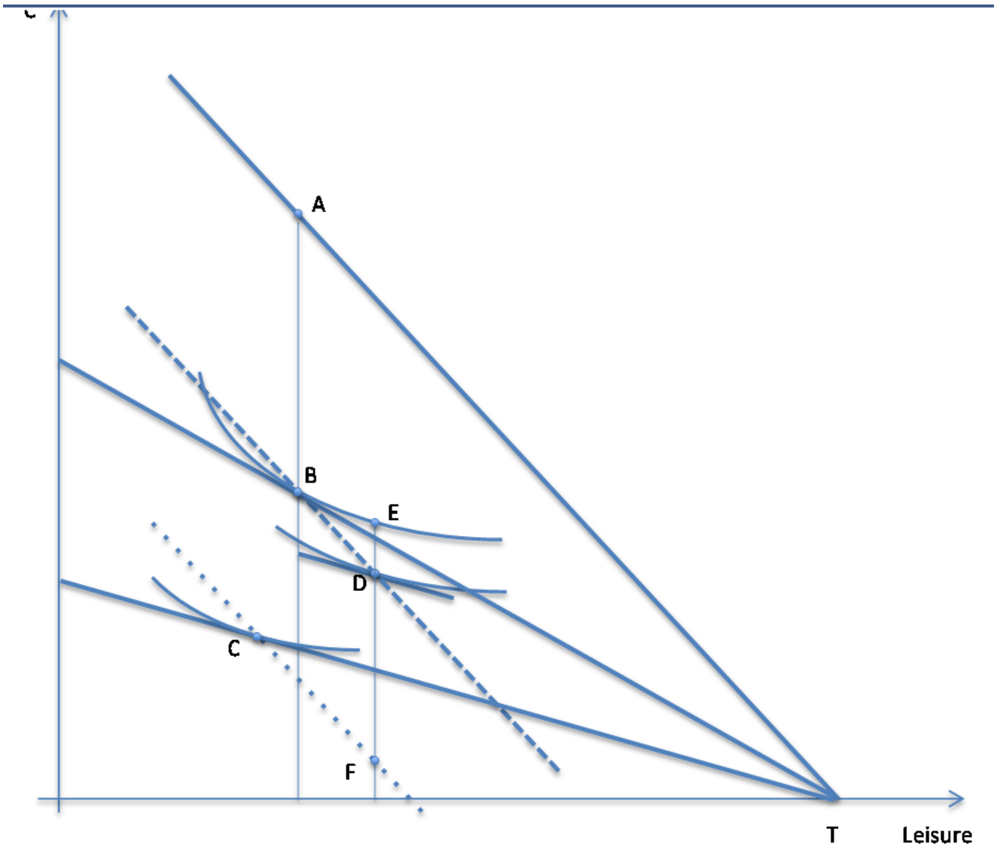


Figure 5 illustrates the PHB approach. Before the tax change the consumer is settled at B. The vertical distance between the line through A and the dashed line through B is equal to the tax revenue before the tax change. After the tax change, but before the reimbursement of the revenue, the consumer is at C. The collected revenue is equal to the vertical distance between the dashed line and point C. After redistribution of the revenue as a lump-sum transfer, the consumer will settle somewhere along the dashed line and at a point where the indifference curve has the same steepness as the budget line through point C. This means that the consumer now settles at a point to the right of point B.

Point D illustrates a possible solution. The cost of the tax increase is equal to the collected revenue plus the utility loss caused by the distortionary effect, which here is the distance EF. The tax revenue is equal to the distance DF. Hence, with the PHB-approach MCF = EF/DF.

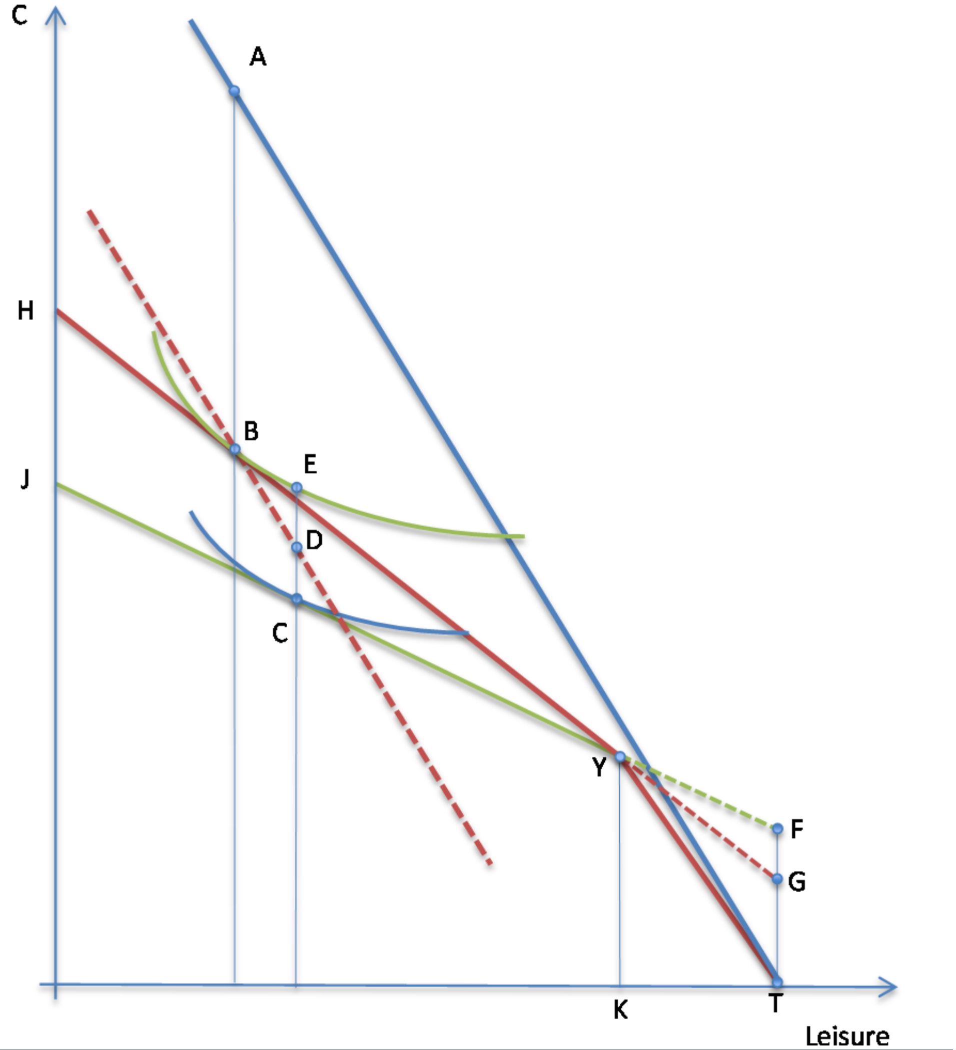
With this definition, MCF is always greater than one. The reason is simply that only the distortionary substitution effect is considered, while the income effect is ignored. Hence, the size of MCF based on the PHB-approach depends on the compensated labour supply elasticity, while the SDAS-approach depends on the uncompensated labour supply elasticity.

2.4. The Pigou-Harberger-Browning approach within a CGE model of the Norwegian economy

Bjertnæs (2014) employs the intertemporal, disaggregated general equilibrium model, MSG6, calibrated to the Norwegian national account and tax system in

2009, to calculate the marginal cost of public funds. The study quantifies MCF of a general income tax increase, an increase in value added taxes, and an increase in corporate and capital income taxation. An increase in current public spending pattern is financed by increases in these respective tax types. The study found that MCF associated with collecting additional tax revenue using a general income tax or a value added tax amounts to approximately 1.05. This estimate is approximately identical to the estimate in Holmøy and Strøm (1997). The main explanation for this relatively low estimate is that higher public consumption reduces consumption possibilities for private households, and thus also reduced leisure. The tax increase implies that consumption of goods and services become more expensive relative to leisure. Hence, this leads to substitution towards leisure. A general equilibrium wage rate increase contributes to reverse some of the substitution effect generated by the tax rate increase. The increase in public consumption combined with the increase in taxes therefor generates more modest reallocations between time spent working and leisure. The welfare cost of taxation is consequently reduced even though the alternative value of leisure is lower compared to time spent working. The alternative value is lower because the returns from working are taxed by a series of taxes as income tax, VAT on the sale of goods, payroll and other taxes on production, while leisure is not taxed. The MCF associated with corporate and capital income taxation is estimated to be higher. The study found that MCF is about 1.2 when tax revenue is collected using corporate and capital income taxation. This result, however, relies on uncertain assumptions about foreign ownership and capital flight.

Figure 6. Progressive taxation. Increasing the top tax rate. A case where the tax rate increase leads to increased public revenue



2.5. The SDAS approach with progressive taxation

In the previous sections proportional income taxes were discussed. However, the tax system in Norway, as the tax system of other countries, has progressive elements. In the following some aspects of progressivity is discussed in relation to MCF.

Figure 6 introduces a progressive, but stepwise linear tax with two different tax rates. The budget constraint could now be written as follows:

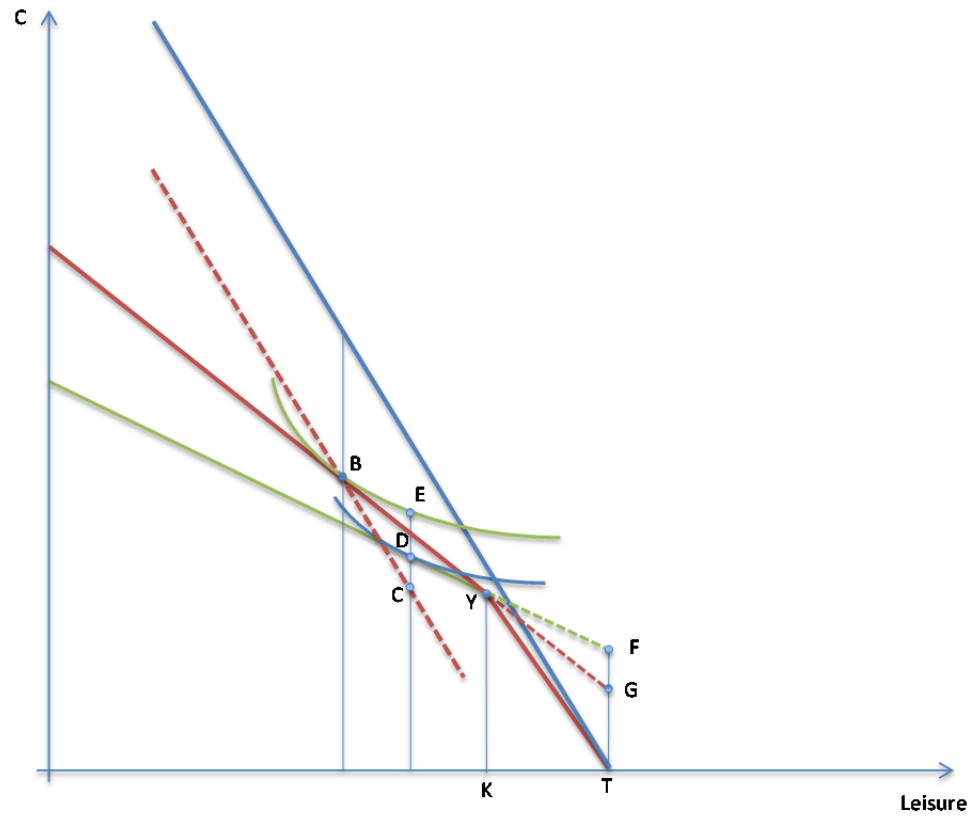
(5) $c = wh - twh - t_{top}\, max(0; wh - I) - z.$

As above, the tax rate t represents a flat (proportional) tax, while the tax rate t_{top} represents the progressive element. This tax rate applies to income levels exceeding I only.

The red solid line in Figure 6 defines the budget constraint before a tax increase. This line is kinked at the point where the before-tax-income is equal to I. The distance TG is usually labelled virtual income in the literature. The consumer chooses point B. The revenue, measured in units of the consumption good, is equal to the distance AB.

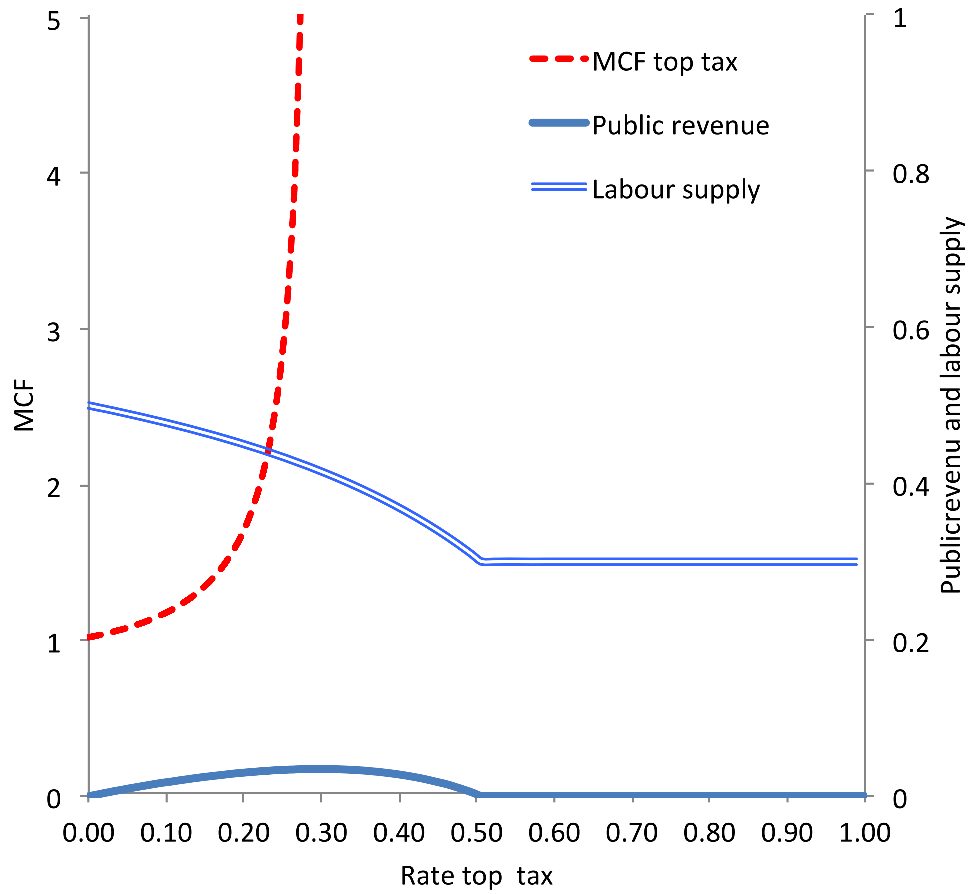
The green solid line shows how the budget constraint is changed after an increase in the top-tax rate. This makes the budget constraint flatter and increases the virtual income to TF.

Figure 7. Progressive taxation. Increasing the top tax rate. A case where the tax-rate-increase leads to reduced public revenue (Laffer-effect)



When the top tax increases, the budget line rotates around point Y. In contrast, with a proportional (flat) tax structure, the tax change means that the budget constraint rotates around point T. With rotation around Y instead of T, the income effect of a tax rate increase will be less important. The closer the consumer is to point Y, the smaller is the income effect of the tax change, which makes it more likely that the substitution effect will dominate the income effect. Figure 7 illustrates a case where the consumer in the initial situation is settled close to point Y, such that the substitution effect becomes so strong that increasing the tax rate leads to a drop in public revenue (a Laffer effect).

Figure 8. The case with progressive taxation. MCF, labour supply and public revenue in a single consumer case. The consumer has a CES utility function, the elasticity of substitution at 1.2 (corresponding to a labour supply elasticity of 0.1), and a tax that only applies to income levels above the threshold I=0.3. The horizontal axis measures the level of the tax rate. There are no other taxes in this numerical example



To illustrate the effects of progressive taxes with regard to MCF, some numerical examples are presented in the following. As in the previous analyses the production function is $x = kh$, where k is a productivity factor. From the zero profit assumption it follows that w=k. As a starting point, we assume that k=1, as was assumed in the numerical examples presented so far. The elasticity of substitution is assumed to be 1.2. Moreover, we assume that the flat tax is fixed at t=0.25 and it is assumed that I=0.3. Hence, the top tax applies when the income exceeds 0.3.

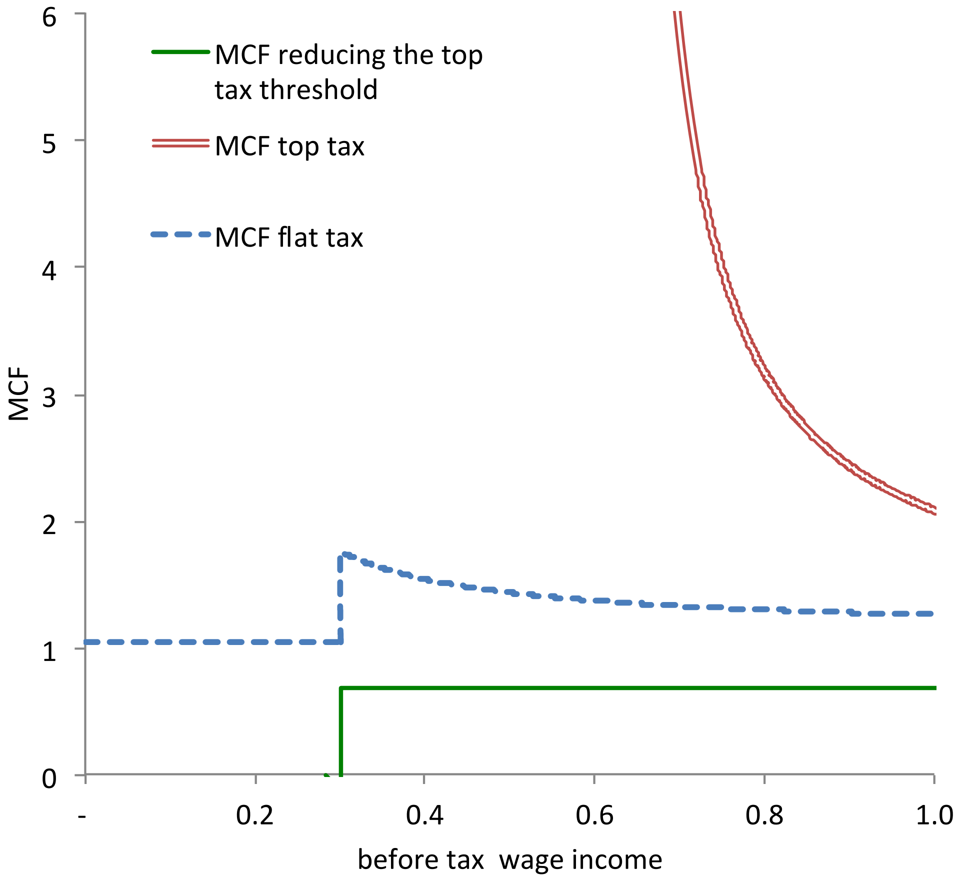
Figure 8 shows the effect of the top tax with these assumptions. When the top tax approaches 0.12, then MCF goes to infinity, see the dashed curve. Increasing the top tax gives decreasing labour supply, see the double-lined curve. For top tax rates above 0.12, there is a Laffer effect. And as the top tax exceeds 0.36, the top tax no longer applies because the labour income has dropped below the threshold I; see the flat parts of the labour supply and public revenue curves in Figure 8.

A comparison of Figure 4 and Figure 8 is useful. As shown in Figure 4, the MCF of the flat tax is slowly decreasing in the tax rate up to tax rates levels of 0.7. Figure 8 gives a different picture. MCF of the top tax is rapidly increasing from low levels, while the labour supply is rapidly decreasing in the tax rate. The intuition to this result is that with a progressive tax the income effect becomes weaker while the substitution effect is as in the flat tax case.

To further illustrate the effects of taxation within the progressive Norwegian income tax system, we will now consider how MCF varies as we change the income tax brackets. To do this, we will let the productivity factor k vary. Figure 9 illustrates a case where the elasticity of substitution is equal to 1.2. The continuum of values assigned to k gives a continuum of different income levels. The income level is measured along the horizontal axes. Both the flat tax t and the top tax t_{top} are now fixed at 0.25. First, consider the dashed line of Figure 9. This line shows MCF of the flat tax rate t. As long as wage income is below 0.3, the top tax does not apply and MCF of the flat tax is constant at 1.04. However, as soon as the wage income exceeds the threshold level I, such that the top tax comes into effect, MCF jumps to a higher level, see the dashed curve of Figure 9. Hence, the introduction of a progressive element in the tax system increases the MCF of the flat element of the tax system as well. The intuition here is that a higher tax wedge increases the distortionary effect of taxes in general.

Next, consider the double-lined curve in Figure 9. This line shows MCF of the top tax. For income levels below 0.3, the top tax does not come into effect. When income is in the interval 0.30 - 0.62, increasing the MCF reduces public revenue (Laffer effect), cf. the discussion related to Figures 6 and 7, where it was shown that if the consumer has an income above but relatively close to the threshold I, there might be a Laffer effect of increasing the top tax. At income levels above 0.62, there is a positive revenue effect of increasing the top tax rate. However, MCF is high, especially for income levels only slightly above 0.62, see the convex and decreasing double-lined curve in Figure 9.

Figure 9. **The case with progressive taxation. MCF in a single consumer case. The consumer has a CES utility function, elasticity of substitution at 1.2, a proportional tax fixed at 0.25, and also a top tax fixed at 0.25. The top tax applies to income levels above the threshold I=0.3 only**



Finally, consider the solid green curve in Figure 9. This curve shows the MCF of *reducing* the threshold *I* at which the top tax comes into play. If the considered consumer has an income above 0.3, the MCF of reducing the threshold *I* is 0.67, see Figure 9.

In the next section, we will present numerical examples that could illustrate effects of this type based on a model of the Norwegian tax system.

2.6. Numerical illustrations of a system similar to the Norwegian system

The numerical examples that follow below are based on a model of the same type as used above. The applied CES utility function is parameterized as above, and also the linear production function and time budget are as above. However, we now include a system for taxation of labour income that in some important respects is similar to the Norwegian system for taxation of labour income.

The Norwegian tax system consists basically of linear elements, but has a progressive structure that appears as a set of breakpoints at individual budget constraints, as shown for example with point Y in Figures 6 and 7. First, there is no tax on ordinary income if it is below a certain threshold (85614 NOK in 2014). Hence, for income levels below this level, the only effective taxes are the value added tax and other taxes on goods and services, the payroll tax and the social security tax. Actually, no social security tax is paid if the income is below a certain threshold. This element in the system is for simplicity neglected in the following numerical examples and it was instead assumed that the social security tax is proportional to all wage incomes. However, we take into account that there is a certain tax deduction from ordinary income below a certain threshold level which reduces the marginal tax on low income levels, see specification below. Finally, there is a certain tax on gross income above a certain threshold (the top tax).

To sum up, the numerical examples that follow include a consumer tax of 0.25, a payroll tax of 0.141, a proportional wage tax of 0.082 a tax on ordinary income of 0.27. However, instead of a single threshold *I*, as in the previous examples, there are a number of corresponding thresholds in the following numerical examples. First comes the threshold at which tax on ordinary income comes into play (85 614 NOK in 2014). The next threshold is where the minimum deduction does no longer has effect (195 698 NOK). The third threshold is where the top tax (0.09) comes into play (527 400 NOK) and the fourth threshold is where the second level top tax (0.03) comes into play (857 300 NOK).[2]

The numerical examples are conducted by changing the productivity parameter *k* in the production function, as also was done in relation to Figure 9.
Figure 10 shows the estimates of MCF of the added tax, the top tax, and the tax on ordinary income when an elasticity of substitution of 1.2 is applied.

The double-lined curve shows MCF of VAT. This varies between 1.06 and 1.23 with the assumed parameter values. The higher is the tax wedge, the higher is MCF of the VAT.

[2] Note that with the given set of tax parameters, and incomes above all the four thresholds, the effective marginal tax rate (including pay roll tax and VAT) is 63.0 percent. The effective marginal tax rates at within the other tax brackets are 60.9, 54.6, and 46.4 per cent, respectively.

Figure 10. A single consumer case and a taxation system similar to the Norwegian system. The consumer has a CES utility function with a elasticity of substitution at 1.2, which means a labour supply elasticity of approximately 0.1

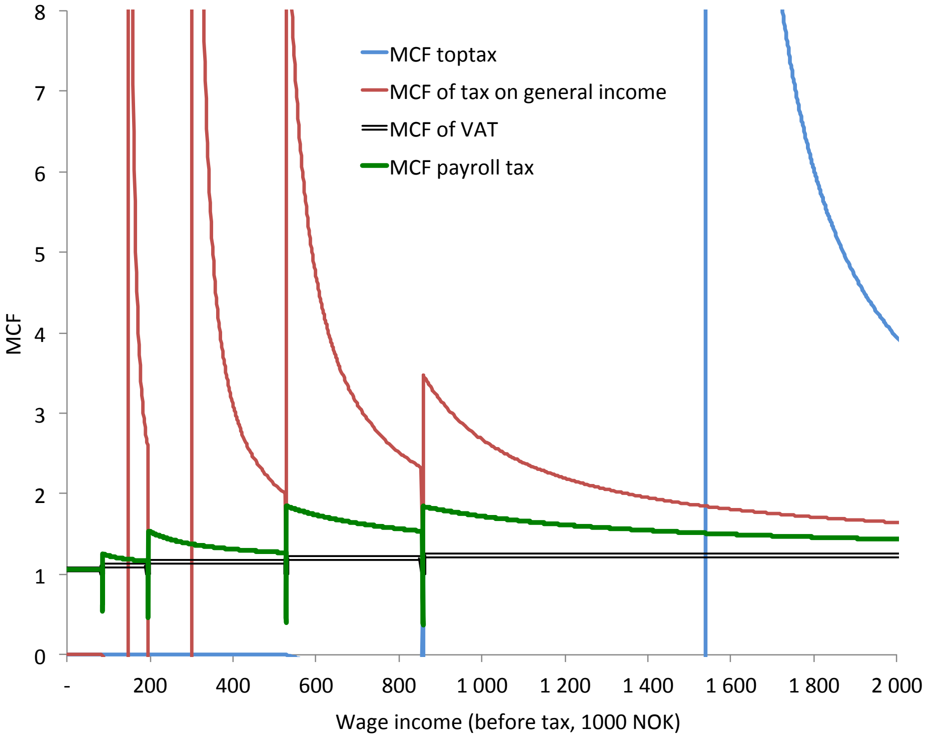
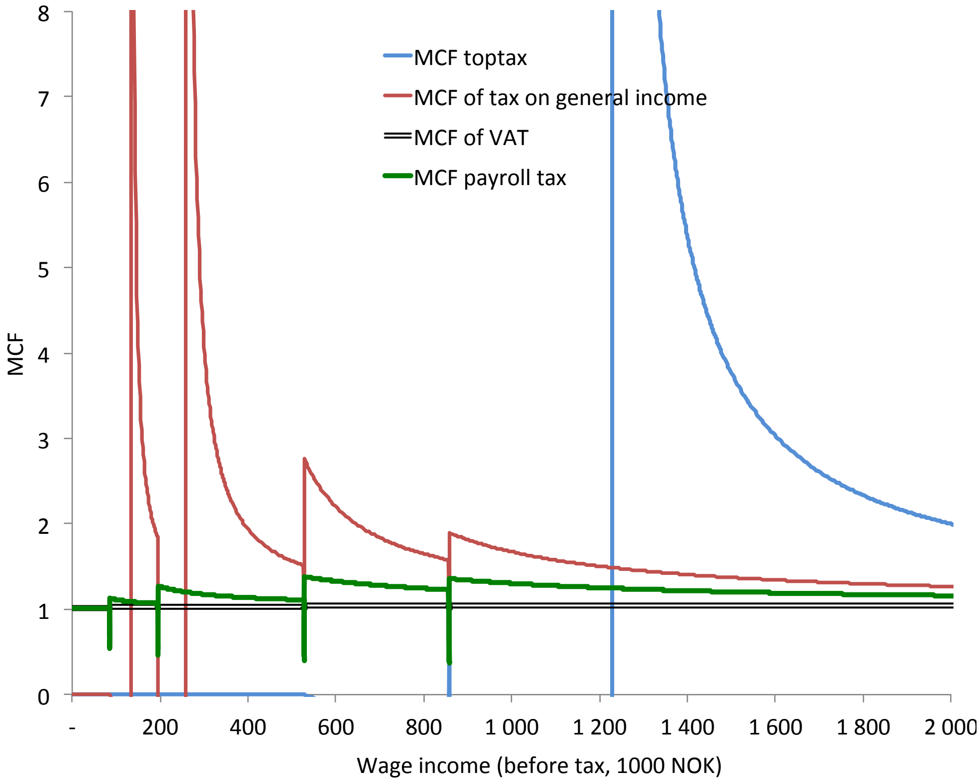


Figure 11. The same exercise as in Figure 10. However, now the CES utility function has an elasticity of substitution at 1.05, corresponding to a labour supply elasticity of 0.03.



The green curve of Figure 10 shows MCF of the pay roll tax. It might appear surprising that this curve is significantly above the double-lined VAT-curve as the pay roll tax is a proportional tax as well. Moreover, in a static model of this type, without transfers, the MCFs of the pay roll tax and VAT are usually identical. However, the reason is that increasing the pay roll tax from the assumed 0.141 rate, reduces the wage *w* paid to the employee after deduction of the pay roll tax, as the gross wage including the pay roll tax is equal to the producer price of the production and does not change. This means that the threshold values at which the tax on ordinary income and the top tax come into play are increased relative to the equilibrium wage rate *w*. This could be illustrated with Figures 5 and 6. Increasing the pay roll tax means that point Y is moved to the left. This means that the substitution effect of a tax change becomes more important compared to the income effect. The consequence is a higher MCF of the pay roll tax compared to MCF of VAT, and especially so when the income is above, but close to, the threshold values. Note, however, that the MCF of the pay roll tax would be identical to the MCF of VAT, if the threshold values were adjusted downwards with the same percentage as the reduction in the equilibrium wage *w* that follows from an increased payroll tax. Note also that for income levels below 85 614 NOK, MCF of the pay roll tax and of VAT in this simplified model are identical, as no threshold levels come into play.

The red curve in Figure 10 shows MCF of tax on ordinary income. The effects of the progressivity in the tax system again become evident. For income levels below 85 614 NOK, there is no tax on ordinary income. If the consumer has an income level in the interval 85 614 - 148 000 NOK, there will be a Laffer effect of increasing the tax on ordinary income. There is also a Laffer effect in the interval 195 700 - 301 000 NOK, as this is ‘close’ to the second threshold.

Figure 10 shows that the MCF of tax on ordinary income is high for individuals that pay top tax but are close to the thresholds at which the top taxes come into play. It is not straight forward to give good intuition to this result. However, the numerical results make it evident that the substitution effect dominates over the income effect also in this case.

Finally, Figure 10 shows the MCF of the top tax. There is a Laffer effect if the considered worker’s labour income is in the interval 527 400 – 1 540 000. For income levels above 1 540 000 MCF is high but decreasing.

Figure 11 illustrates the same cases as Figure 10. However, now the elasticity of substitution is reduced to 1.05, which means a labour supply elasticity with respect to the wage rate at 0.03. With a less elastic labour supply MCF is significantly reduced compared to the case of Figure 10. Moreover, the intervals with Laffer-effects have become smaller. This illustrates the sensitivity of estimates of MCF with respect to a key parameter as the labour supply elasticity.

2.7. The public finance approach

The previous sections presented numerical examples to illustrate MCF as a concept and the numerical estimates’ sensitivity with respect to parameter values and progressive elements of the system. A conclusion from these examples is that estimates of MCF are highly sensitive both to the parameters of the applied model and to the exact model of the tax system. For example, the numerical results presented in Figure 4 are based on a model with a flat tax system. The introduction of progressivity in Figure 8 changed the results significantly. Figure 9, which both shows MCF of a proportional tax and a progressive tax that are working simultaneously, pointed in the same direction. Figures 10 and 11 show the sensitivity of MCF with respect to the substitution elasticity as well as the sensitivity with respect to the progressivity of the system.

With regard to the numerical results showing high MCF in progressive tax systems, these results must be interpreted with care, taking into account that we have considered single-individual economies only. A progressive tax system is introduced to collect higher shares of the income from the rich compared to the poor. Income distribution concerns are, however, omitted from the single-household models of the numerical examples. Several studies have therefore criticized estimates of MCF that are based on model frameworks with a single consumer, as these ignore concerns for redistribution, see for example Sandmo (1998) as the first study to emphasize this weakness with the early literature on MCF. This section explains why estimates are lower when redistribution are considered, and presents some key findings from the more recent literature.

The common point of departure in most recent contributions is a social welfare function. The utilities of individuals with different abilities to earn income represent the arguments in this welfare function. The utility of each individual is typically a function of quantities of consumer goods, leisure, and a public good. The government maximizes the social welfare function with respect to income tax rates, a uniform lump-sum transfer to all individuals, and the supply of the public good. Welfare maximizing income tax rates generate a welfare cost on the margin, due to distortions in the labour/leisure choice. This welfare cost is balanced against a redistributional welfare gain. The gain consists of redistributing income from high to low income households, with a higher marginal utility of income. Important here is also that rich consumers' relative high shares of funding for the public good are enjoyed by the "poor". The optimal supply of the public good is in most cases given by the modified Samuelson rule. The modified Samuelson rule says that the rate of substitution between the private and the public good accumulated over all individuals equals the rate of transformation between private and the public good multiplied with MCF. The practical interpretation is that public projects where the total willingness to pay for the project exceeds the cost multiplied with MCF should be implemented. The first-best solution is characterised by setting MCF equal to one. Different studies with different assumptions find different values of MCF. As mentioned, the contribution by Sandmo (1998) was the first to an important new line of research on MCF. Sandmo reminded us that the main reason why we have distortionary taxes, and not lump sum taxes, is the distributional problem; if issues of equity and justice could be disregarded altogether, the design of an efficient tax system would be much less challenging. Sandmo (1998) therefore introduced a model with *n* consumers with identical preferences but different productivity and thus different wages. At the same time he introduced a lump sum transfer of the same size to all consumers, in addition to the standard proportional wage tax.

Sandmo (1998) is primarily a theoretical study. But he did also present a numerical example where he indicated that with his model the MCF would most likely be in the interval 1.1 – 1.2 if there are no concerns related to income distribution. However, Sandmo (1998) also showed that to the extent that there is a negative covariance between the marginal utility of money and individuals labour income, MCF is lower and perhaps close to one.

This result in Sandmo (1998) makes a comment appropriate, as the discussion in sections above indicated that progressive tax systems could lead to a significantly higher MCF, not lower as indicated by Sandmo. There is a simple explanation for this apparent discrepancy. Although the net average tax rate is increasing in Sandmo's model, his model represents a flat tax system, as the wage tax is proportional to the wages. Hence, the model of Sandmo does not capture the type of effects of progressivity that were discussed in relation to Figures 6 and 7 in section 2, which lead to significantly higher MCF.

That said, it should be noted that extending the model beyond the numerical examples in section 2 to include a set of heterogeneous consumers assuming a negative covariance between their marginal utility of money and their productivity (income), would have given different results and should be explored further. Indeed, Sandmo (1998) is a key reference in the literature as he explicitly included distributional concerns when estimating MCF. Sandmo (1998) also emphasized that the evaluation of public projects should take into account the effects of government revenue that stem from the behavioural responses generated by the expenditure side of the projects. For example, a government investment in infrastructure or childcare can increase working hours, and thereby tax revenue. Second, distributional concerns become important for the optimal level of public goods. Such aspects of MCF are also discussed by Christiansen (2015).

While the starting point of Sandmo (1998) was that there might be a distortionary cost of taxation that should be taken into account in cost-benefit analyses, there are other contributions to the literature that show that there also might be public projects and taxation schemes that do not lead to any distortionary costs, see Christiansen (1981) and Kaplow (1996), who show that the original Samuelson rule holds, and hence, that MCF equals one in the presence of optimal non-linear income taxation. Kreiner and Verdelin (2012), on the other hand, illustrate a case where public goods are underprovided. To construct such taxation schemes is, however, in practise very difficult.

Another study that should be mentioned is Christiansen (2007) although this study primarily gives a contribution to the discussion of what is the optimal size of the public sector given the limitations of the tax system. The main point of this paper is to show that the limitations the policy makers have in designing the tax system is important primarily for the optimal size of the public sector as well as the size of MCF. Christiansen (2007) argues that public good provision should be determined by the Pareto criterion when a sufficiently rich tax system is available. The original Samuelson rule holds within a simple Mirrlees setting. A more complex social welfare approach is required when the tax system is restricted. Jacobs (2013) is another contribution that takes distributional issues and the effects of governmental spending into account. This paper claims that MCF is one if all taxes are set to the level that maximizes a social welfare function. He finds that MCF equals one at the optimal tax system, for both lump-sum and distortionary taxes, for linear and non-linear taxes, and for both income and consumption taxes. Jacobs' conclusion is based on the same type of uniform lump-sum transfer as in Sandmo (1998). If Jacobs' model and definition of MCF are applied with no or limited access to lump sum taxation, his result is that MCF is larger (smaller) than one if the efficiency cost of taxation is larger (smaller) than the welfare gain connected to redistribution. It should be noted that Jacobs (2013), which is not published in a scientific journal, employs a modified definition of MCF. It has not been applied in other contributions to the literature on MCF but was based on Diamond (1975), who argued that the social value of private income should include the income effects on the taxed bases. Actually, with the definition of MCF employed by Jacobs the size of MCF is higher compared to SDAS-based MCF-estimates.

The public finance approach is primarily concerned with the case where production of public goods is financed with public funds. The production of certain private goods (e.g. hospitals) is, however, also financed with public funds. Jacobs (2009) shows that it is undesirable to impose distortions in public provision of such private goods. Hence, he recommends that MCF should be set to one in such cases.

Another shortcoming of the public finance literature on MCF is the assumption that transfers are given to all individuals. Most countries have, however, adopted means tested social transfer schemes, where individuals are classified into groups. Akerlof (1978) shows that such tagging improves welfare, as less distorting taxes are needed when transfers are limited to specific groups. This outcome might, however, not hold when transfers lead to exit from the labour market and entry into tagged groups.

3. Discussion

Section 2 of this report provided a theoretical overview of MCF as a concept as well as a number of numerical examples. The theoretical analysis was based on early literature on MCF, such as Stiglitz and Dasgupta (1971) and Atkinson and Stern (1974), who emphasized the distortionary effects of taxation, as well as later studies, such as Browning (1987), Stuart (1984), Ballard (1990) and Ballard and Fullerton (1992), who provided estimates of MCF. When Ballard and Fullerton (1992) included progressive taxes, their MCF estimates were increased. This is in line with the numerical examples presented in this report. As the taxation of personal income in Norway has progressive elements, this is relevant information.

However, the early studies of MCF and the numerical examples presented in this report have one common characteristic, i.e., that the model includes a single representative individual only. A new line of research was introduced by Sandmo (1998). He emphasized the main reason for introducing distortionary taxes in the first place, namely distributional concerns. Sandmo (1998) found that MCF is reduced when redistribution of income is included in the model framework. The discussion in section 2.7 showed more generally that inclusion of distributional aspects draws the estimates of MCF downwards.

There are a number of other studies of MCF that discusses other aspects that are relevant for the determination of MCF. Section 3.1 below presents some of these studies. Section 3.2 presents the connection between MCF and external effects. The timing issue is briefly discussed in section 3.3.

3.1. A discussion of other relevant studies of MCF

Kleven and Kreiner (2006) employ the more traditional starting point and do not assume an optimal policy situation. The work of Kleven and Kreiner (2006) was motivated by the emerging consensus in empirical literature that labour market participation is more important than hours of work on the individual level. At the same time Kleven and Kreiner (2006) pointed to the fact that previous studies employed the standard convex model of behaviour, where individual hours of work is determined by the local slope of the budget constraint. With this approach, if the local slope of the budget line changes a little bit, individuals change hours worked a little bit. This means that previous contributions considered labour supply responses only among hours worked for those who are working (the intensive margin), while the entry/exit decision (the extensive margin) was ignored. Moreover, participation elasticities seem to be very large for people at the lower end of the earnings distribution. By contrast, Kleven and Kreiner (2006) based their calculations on the assumption that hours-of-work elasticities estimated conditional on working are close to zero among different demographic subgroups and earnings levels.

For the purpose of comparison, Kleven and Kreiner (2006) first presented results based on the traditional convex model without any exit or entry to the labour market and they used a simple model with proportional taxes. Their results were then similar to earlier results, not least the results in Ballard and Fullerton (1992), with MCF-estimates in the interval 0.85 – 0.93. However, when they, next, applied the non-convex model with exit-entry decisions related to fixed work costs their results changed significantly with higher estimates of MCF. They reported different scenarios based on different assumptions. However, in their base case of the non-convex model the estimated MCFs varies from 1.26 in the UK to 2.20 in Denmark.

Dahlby (2008) contains a thorough overview of most studies on the issue up to 2008. The large variation of the estimates reflects the high degree of uncertainty with respect to what is the real size of MCF, and in addition that MCF depends significantly on the specific tax source used for funding a public project.

Table 1. An overview of MCF estimates in different studies

	Results – estimate of MCF
Browning (1987)	1.1 – 4.0
Stuart (1984)	1.07 – 1.2
Ballard (1990)	1.001 – 1.2
Ballard & Fullerton (1992)	Flat tax: 0,936 – 1.147 Progressive tax: 1.54 – 1.989
Sandmo (1998)	Primarily a theoretical work. Concludes that distributional concerns could draw in the direction of MCF close to 1, or even below one.
Feldstein (1999)	2.65
Kleven and Kreiner (2006)	With use of the traditional model with no entry-exit to the labour market: 0.85 – 0.93 With use of a model with entry-exit: 1.26 – 2.20
Dixon et al. (2012)	CGE-study of Finland. 1.30 – 2.22 depending on model version and tax source.
Dahlby and Ferede (2012)	Results apply to Federal Government of Canada Corporate Income Tax: 1.71 Personal Income Tax: 1.17 General Sales Tax: 1.11
Barrios et al. (2013)	Labour taxes: 1.30 – 2.41 Energy taxes: 0.62 – 1.42

Dixon et al. (2012) is a recent CGE-study of Finland with estimates of MCF for Finland, considering wage income taxes, capital income taxes, and commodity taxes. First, it should be noted that the authors emphasize that they found considerable differences between MCF for different taxes. Second, they emphasize that the estimates of MCF are sensitive to model specifications. They applied both an original and an improved version of the model, both in a case with a perfectly competitive labour market and a case with wage rigidity. Generally the estimates of MCF are higher when the improved version of the model was applied, compared to the results of simulations with the original version and when assuming higher wage rigidities than in the version with a competitive labour market. With the original version of the model, the estimates of MCF vary between 1.30 (income taxes and a competitive labour market) to 1.46 (commodity taxes, rigid labour market). With the improved version of the model of the Finnish economy, the estimates of MCF vary between 1.63 (commodity taxes and a competitive labour market) to 2.22 (income taxes, rigid labour market).

Barrios et al. (2013) applied the CGE-model GEM-E3 to estimate MCF of labour taxes and energy taxes in the EU countries. They mention that their CGE-model has limitations with regard to how detailed the EU countries' tax systems are modelled. For example, they mention that their models do not capture the progressivity of the member states' tax systems, but rather model flat taxes only. Nevertheless, Barrios et al. (2013) found relatively high estimates of MCF when labour taxes were considered. For example they found an MCF for Denmark of 2.31 for labour taxes. Especially with regard to labour taxes they found that there is a strong positive relationship between the countries' general tax level and MCF.

3.2. MCF, external effects and the race for status

MCF is influenced by external effects because efficiency can be improved if taxes correct for external effects. However, the question is whether external effects in the Norwegian economy are sufficiently large to have an impact on MCF that should be employed in cost-benefit analyses of public projects.

Recent research has uncovered a relationship between MCF and external effects associated with preferences for status. A representative sample of individuals from Sweden was asked which society they preferred, one where A: own income equals 27.000 SEK and average income equals 30.000 SEK, or B: own income equals 25.250 and average income equals 22.950. As many as 75 percent preferred B even though A would have given them a higher absolute income, see Carlsson et al. 2007. Empirical studies estimate that the increase in own reported happiness due to a pay rise generates a decrease in other’s reported happiness of about 30 percent of the gain in own reported happiness. Leisure consumption, however, does not display a similarly negative external effect. Solenick and Hemenway (1998) suggest that others' pay is significantly more likely than the consumption of leisure to produce negative external effects. However, the effect from leisure consumption is not likely to be negligible; Alpizar et al. (2005). Layard (2005) argues that such rivalry to earn and consume more than others is a form of pollution, and to discourage excessive pollution, the polluter should pay for the disbenefit he causes. Hence, the polluter should lose 30 pence out of every 100 pence that he earns. Layard (2005) therefore argues that an income tax of 30 per cent would offset the external effects of that form of rivalry. People fail often to grasp the complete ramifications of dearer habits, opting therefore for an extravagant lifestyle. In Layard's (2005) view, this misallocation could also be rectified by introducing an income tax of no less than 30 per cent. So to offset the negative external effect associated with rivalry, and the effect of dearer habits, one would need an income tax of 60 per cent overall. Layard contends that the deadweight loss associated with the tax on income is virtually zero in most European countries as the effective income tax rate is around 60 per cent in these countries, Layard (2002). Setting aside the distributive aspect for a moment, it follows that the marginal cost of public funds should equal one in these countries.

Layard's arguments are controversial for several reasons. First, it is not obvious how one should scale production of public goods in a situation with preferences for status, see Aronsson and Johansson - Stenman (2008). Second, a positive correlation between average happiness and income at levels above \$20,000 is found in Deaton (2008), and in Stevenson and Wolfers (2008) even though most surveys support the notion that earning/ consuming more than other matters a lot. Third, the conclusion drawn by Becker et al (2005) -- they assume status can be bought on a market or acquired via a luxury item which ranks status perfectly -- is quite different from Layard's. A market-based solution, they find, would be identical to a social planning solution and the status race would not, among other things, cause labour market inefficiency. Becker et al (2005) also conclude that these results rely heavily on certain assumptions the underlying empirical evidence of which is inconsistent. For one thing, the availability of the luxury good must be given. If the luxury item can be manufactured, which the evidence suggests is indeed possible for a range of status-conferring items, the market solution would cause overproduction.

The main impression from this literature is that preferences for status reduce the estimate of the MCF, and that the effects are significant. There is however considerable uncertainty associated with the size of the external effects, as well as how MCF should be adjusted to take account of these effects.

Brendemoen and Vennemo (1996) find that it is important to include environmental externalities in the MCF estimates. A general public project financed by a proportional increase in all taxes has an expected MCF of 1.48 in the Norwegian economy when environmental externalities are included. The traditional MCF of the same project is 1.67. Other contributions have found that the relationship between MCF and external effects associated with emissions of greenhouse gases are mixed. Bovenberg and van der Ploeg (1994) argue that a large public sector and a high overall tax level become less damaging if the only way to improve the environment in response to greener preferences is a lower level of the private sector. However, if substitution between dirty and clean goods is easy or the productivity of abatement does not decline rapidly, the environment can be enhanced through a `greener' composition of economic activity. In that case, it is optimal to reduce the level of public consumption. The composition of government spending also matters. Ligthart and van der Ploeg (1994) show that the marginal cost of public funds falls (rises) if productive government spending is negligible (substantial) relative to public consumption and abatement. Introducing concerns for redistribution within a Mirrlees economy completely alters the picture. Jacobs and De Mooij (2014) claim that the optimal second-best tax on an externality-generating good should not be corrected for the marginal cost of public funds. The marginal cost of public funds equals unity at the optimal tax system, if the government always has access to a non-distortionary marginal source of finance.

3.3. Is MCF rising over time?

The design of the Norwegian welfare state combined with an aging population creates a substantial and growing need for public revenue in Norway far into the future, see Perspektivmeldingen (2013). At the same time, corporate income taxation is declining in most European countries as a result of tax competition to attract investment and to prevent transfer of profits, see Devereux et al. (2008). In dual tax systems, however, such a tax reduction increases the incentive to circumvent the tax on labour income by reporting such income as corporate income. It can therefore be costly and difficult to meet the tax revenue requirement by using direct income taxation in the long run. The alternative is to increase the indirect taxation (VAT, excise tax etc). However, it may be difficult to satisfy future revenue requirements by means of indirect taxation because a growing share of the income earned in Norway is spent in other countries. In particular, the extent of migrant workers who spend their income in their home country is growing. The number of retired workers living abroad may also increase in the long run. These arguments suggest that the marginal cost of public funds will increase over time. This raises a number of complex issues. Should MCF used in cost/ benefit analyses of public projects increase over time, or should an average MCF based on current and future tax financing costs be implemented? Should the government collect more tax revenue in early periods for efficiency reasons to fund future public consumption? Future generations are expected to be significantly richer than current generations. Should future generations finance a share of current public projects for distributional purposes? A policy where MCF differs between projects implies that it is possible to increase welfare by reallocating public funds to projects evaluated with a larger MCF. Such reallocations, however, may imply reallocation from current generations to future generations that are richer. Hence, distributional concerns suggest that MCF should increase over time.

4. Concluding comments

The purpose of this report at the outset was to analyse whether the Norwegian practice in cost-benefit analysis, assuming that MCF is 1.2, is reasonable or whether there are reasons to recommend another practice. Given the discussed aspects and arguments in this report, we do not have firm ground to suggest a point estimate of MCF. Rather, we provide a broad overview of the contributions to the large MCF literature, as well as own computations by means of a CGE model for Norway. The purpose of this is to illuminate how estimates of MCF is influenced by different approaches and arguments. The literature gives a large number of estimates of MCF that point in different directions. The main arguments and approaches are summed up in the following.

The single consumer approach in Bjertnæs (2014) provided estimates of MCF close to 1.05 for VAT and income tax, while the MCF of the corporate tax was app. 1.2. Other recent CGE-studies by Dixon et al. (2012) or Barrios et al. (2013) tend to find higher estimates. Dixon et al. (2012) found MCF-estimates for Finland in the interval 1.30 – 2.22 while Barrios et al. (2013) found MCF to be in the interval 1.30 - 2.41 with regard to labour income taxation and 0.62 – 1.42 with regard to energy taxes. Although the MCF estimates for energy taxes in Barrios et al. (2013) are relatively low, the other estimates in that study are significantly above the estimates found in in Bjertnæs (2014). However, Kleven and Kreiner (2006) found MCF in the interval 0.85 – 0.93 when considering intensive margins only. These disagreements reflect that parameter values and country specific settings have a large impact on the real costs of taxation. For example, empirical research shows that labour supply are less elastic to day than previously, which means that MCF has been declining.

All CGE-studies that we are aware of that have provided estimates of MCF have simplified the tax system to include proportional (flat) taxes only, as incorporating progressivity makes it more complicated to construct and solve the models. At the same time, Ballard and Fullerton (1992), Kleven and Kreiner (2006) and numerical examples presented in section 2 showed that progressivity of the type applied in the Norwegian taxation of labour income could significantly increase the MCF. Seen in isolation, this means that CGE-studies tend to provide too low estimates of MCF.

Progressive taxes are motivated by distributional concerns. An estimate of MCF should not only include the distortionary effects of the high marginal tax rates in a progressive tax system but also the distributional benefits of progressive taxes. The latter draws in the direction of a lower MCF. Several theoretical studies of optimal non-linear (progressive) tax systems identify conditions where MCF equals one, see e.g. Christiansen, 1981; 2007 and Kaplow, 1996. Sandmo (1998) identify cases where MCF can be above or below one.

Different types of externalities are likely to influence the real MCF. Environmental externalities of consumption and the race for status are two aspects here. Ignoring such externalities could lead to overestimation of MCF. However, it is not clear whether this is an important factor and leads to significant overestimation of MCF. Ng (2000) finds that such externalities favour an increase in public spending, and hence, a reduction of MCF.

Except for the study by Kleven and Kreiner (2006), all MCF-studies that we are aware of ignore entry-exit to the labour market even though this is an important factor behind changes in labour supply. Moreover, Kleven and Kreiner (2006) found that incorporating such exit and entry decisions into their model increased their estimates of MCF significantly. Seen in isolation, this also means that most MCF-estimates are too low. However, the relatively high participation rate in Norway combined with a large share of part time work suggests that these results might be of less importance in our country.

There is an increasing need for tax revenue as well as evidence for increasing tax competition among countries. These characteristics of the global economic development are not always taken fully into account when MCF estimates are calculated. It is also likely that the public revenue requirement is going to increase with the aging population. This draws in the direction of underestimation of the MCF. One may, however, argue that an increase in the applied estimates of MCF in cost benefit analyses should be postponed until that actually materializes.

Administrative costs of collecting tax revenue should also be accounted for.

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