The Total Tax on Labour Income[*]

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1. Introduction

It is a well-established fact that income taxes distort labour supply decisions (see e.g. Liebfritz et al, 1997, for a recent overview). The mere existence of a tax wedge entails that mutually advantageous opportunities for trade in labour services are forfeited. And the associated dead-weight loss to the society as a whole is larger the higher is the marginal tax rate. This fact has constituted the intellectual foundation for tax reforms in several countries; all aiming at cutting the highest marginal tax rates and instead broaden the tax bases. The ruling line of thought has been that a given amount of tax revenues is collected with a smaller dead-weight loss the larger is the tax base and the lower are the (marginal) tax rates. Although top-rate reduction appears to be a simple and straightforward policy strategy, its practical implications may depend heavily on the precise definition of the tax wedge. In typical welfare state economies, there are number of reasons why the reward of labour services deviates from what is actually paid by the employer. One of them is of course the existence of an income tax. Others are related to various forms of incomes tested transfers and price subsidies. As a result, tax reforms that are *partial*, in the sense that they address the parameters of the formal tax system only, may end up affecting the overall distribution of tax wedges in very unpredictable ways.

The present paper focuses on the distinction between the 'formal' tax rate, which is the tax rate generated by the parameters of a country's tax system, and the 'total' tax rate, which measures the total wedge between the employer's payment and the employee's ultimate reward. The aim the paper is to evaluate empirically the relationship between 'formal' and 'total' tax rates confronting workers (and potential

workers) in a typical welfare state economy. For this purpose, I have collected data from administrative registers in Norway, containing information about labour and transfer incomes for the whole Norwegian population. Coupled with a detailed account of actual tax and benefit legislation, and prediction models for individuals' incomes in labour market states that have not actually been chosen, these data facilitates a complete description of the distributions of both 'formal' and 'total' tax rates associated with alternative labour supply decisions. By comparing the distributions of formal and total tax rates, it is possible to assess the consequences of alternative partial tax reforms for the overall distribution of labour supply distortions. For example, one can consider the extent to which a modification of the tax progression embedded in the formal tax system (e.g. by cutting the highest income tax rates and increase the general tax rate accordingly) will modify the progression of the total tax system in the same (intended) direction. Now, for most workers there is likely to be little or no difference between formal and total tax rates, since benefit entitlements are not generally accessible. However, for a large – and strongly increasing – part of the working-age population, various forms of benefits do seem to constitute a realistic alternative to work. At any given point in time, it will typically be the case that at least 25 per cent of the potential labour force in Norway does not participate actively in the labour market for reasons of e.g. early retirement, health-problems or unemployment. In addition, it is suspected that a number of married women do not participate (or participate only through occasional work or part-time work) due to the interaction of spouse taxation, incomes-tested child-care payment systems and cash-for-care subsidies. The (potential) workers for which formal and total tax rates are likely to deviate much are, in a sense, the 'marginal' workers in the labour market. However, given the demographic challenges facing Norway – as well as many other countries – with dramatically increasing old-age dependency ratios, there has been a growing interest in the design of policies that can integrate marginal workers more stably into the labour force. So far, this change in focus has materialised in the form of more 'activity oriented' welfare policies. But, given that there is no political will to seriously downgrade the social safety net in Norway, this 'activity orientation' has failed to improve individuals' work incentives.

The existing literature offers convincing evidence that economic incentives do have a strong impact on the employment behaviour of marginal workers, even among persons that are disabled or unemployed (Holmlund, 1998; Meyer, 2002; Barmby et

al, 2002; Røed and Zhang, 2004). Some "marginal" workers, such as married women and individuals with low labour income potential, are indeed known to have exceptionally elastic labour supply behaviour (Blundell et al, 1998; Eissa and Liebman, 1996; Aaberge et al (2000); see also Røed and Strøm, 2002, for a recent survey). Hence, tax distortions that hit marginal workers relatively strongly may have a particularly detrimental effect on economic efficiency.

An important aspect of the labour supply decisions faced by the 'marginal' workers is that they contain a strong element of 'discreteness'; i.e. they involve the question of whether or not to take a job at all, or whether to take a part-time or a full-time job. The discrete aspect of the labour supply decision is typically reinforced by transfer eligibility, because transfers are tapered off quickly against earned income. For this reason, the present paper is not restricted to evaluate marginal tax rate. On the contrary, the paper focuses on the taxes associated with part-time and full-time jobs, and on those associated with a change from part-time to full-time (or vice versa). More generally, the paper looks at formal and total tax rates associated with any kind of adjustment in work-hours, and the marginal tax rate appear naturally as a 'special case' of such an adjustment.

The remainder of this paper is structured as follows: Section 2 describes the Norwegian tax and transfer system. In Section 3, I define the formal- and total tax measures relevant for alternative choices of labour supply. These measures depend on income, taxes and benefits associated with alternative work-hours decisions. Since these variables can only be observed for the choice actually made, they must be predicted for other (hypothetical) choices. The way this is done is described in Section 4. Section 5 shows the main results, section 6 shows the effects of hypothetical tax reforms and section 7 concludes.

2. The tax and transfer system in Norway

The Norwegian income tax system was subject to a large reform in 1992, which indeed entailed a strong reduction of the highest marginal tax rates and a broadening of the tax base. Since then, the system has been relatively 'stable'. Broadly speaking the current tax system consists of four parts: First, there are social security contributions, which amounts to 7.8% of gross labour income and 3% of income from pensions. Second, there is a tax rate of 28 % on all 'ordinary' income, which

comprises labour and pension income after different kinds of deductions, and capital income. Third, there is an extra tax on 'high' labour and pension incomes; i.e. a tax of 13.5 % is levied on gross incomes exceeding around 40,000 Euro, and this top-rate tax is increased to 19.5 % for incomes above 80,000 Euro. Fourth, there is a payroll tax ranging from 0 to 14.1%, depending on geographical location. What complicates the system is a variety of exemptions and interacting deductions. These are related to e.g. marital status, responsibility for children, age, disability, and municipality.

Like in most other countries, the Norwegian tax system is designed to redistribute income from persons with very high incomes to persons with low incomes. This redistributive role is strengthen by a special rule implying that retired people with low incomes pay no tax at all, and that there are special deductions for disabled and elderly persons who pay tax. Still, this apparent progressivity does not give an appropriate description of the incentive structure for a large fraction of the Norwegian population. There are several reasons for this. One is the special tax rules for married couples, where the starting point for what is considered as high level incomes are higher, and deductions in the tax base for 'ordinary incomes' are higher when their joint income are considered. For some, typically those couples where one person has high income and the other person very low (or no) income, an increase in the low income, e.g. because the person starts to work, will change/remove these favourable deductions. This will make the real 'marginal' tax rates higher than at first sight. A more striking example appears when we look at benefit receivers. In Norway the number of such receivers are large compared to almost all other countries, and the number has risen rapidly. One reason for this might be that the loss (or reduction) of benefits if entering the labour force entails very high real marginal tax rates. It is important to remember that for a large fraction of the potential work force, the income is far from zero when not working, and the economic gain from working is consequently far less than the after-tax income.

For the working-age population the benefit system includes a means-tested and a rights-based part. The means-tested part might be considered the final layer of the social safety net, meant to secure a minimum living standard for everyone. The major part of the transfer system is the rights-based payments. These include unemployment insurance, sick leave- and rehabilitation payments, disability pension, and early retirement pensions. The major parts of the benefit system are listed in table 1, describing typical replacement rates and limitations. Both payments and rights are based on a base amount determined by the parliament on a yearly basis (in 2003 one base amount was around 6800 Euro).

Table 1

Overview of the main factors in the Norwegian benefit system

Type of benefit	Replacement ratio	Qualifying restriction	Time limitation
Unemployment benefit	62.4% of income up to 6 times a base amount (approximately 40000 Euro in 2004)	Labour income above 1.5 times the base amount last year, or average above 1 times the base amount during the last three years.	two years
Sick leave payments	100 % (only of income up to 6 times a base amount for some workers)	Employed two weeks before sickness occur.	One year
Disability pension	Typically around 66 %	Permanent loss in the ability to obtain labour income caused by sickness or injuries. Medical or vocational rehabilitation should be attempted.	Until recently until the age of 67. Recently for a period of 1-4 years if there is a chance for recovery.
Medical rehabilitation	Typically around 66 %. Minimum 1,6 times the base amount.	No longer rights to receive sick leave payments, receiving medical treatment, chance of improving the working capacity.	One year, possible to apply for exception from this rule
Vocational rehabilitation	Typically around 66 %. Minimum 1,6 times the base amount.	Permanent loss in the ability to obtain labour income caused by sickness or injury.	While waiting for, or participating in, vocational training. Also given while searching for work when the training is finished.
Lone mother/father benefit	1,85 times the base amount	Being a lone parent for a child less than 9 years old.	Three years continuously
Social security payment	Subject to caseworkers' assessment; average payments in 1999 was approximately 3700 Euro. Minimum 80% of minimum pension on a yearly basis	No other possibilities to income/support according to caseworkers' assessment	No definitive limitation, but intended to be temporary
Early retirement pension	Typically around 66 %	Age above 61 years. Working in an establishment included in the AFP agreement. Average income during the ten best years of income above two times the base amount.	Until the age of 67

Lately the literature has focused on different kinds of in-work-benefits created to counteract the unintentionally incentives effects from the out of work benefits. These kinds of benefits are more or less absent in Norway. The social insurance system in most countries is organised so that recipients of national insurance benefits or retirement pension have a curtailment in their benefits if they choose to work. This is done to avoid that some receive both social insurance and ordinary wages; witch would give very strong incentives to claim sick.

3. Constructing formal and total tax rates

In order to assess the sources of labour supply distortions arising from tax and transfer systems, we construct two alternative tax-wedge measures: The formal and the total tax rates. Both these tax rates are defined such that they measure the tax associated with a change in labour supply from one particular selection of work-hours (state j) to another (state k). They can be calculated for discrete shifts in labour supply (e.g. from no work to part-time work or from part-time to full-time), as well as for marginal shifts (one extra hour); hence they may be considered generalisations of marginal tax rates.

The formal tax rate is given in equation (1). The parameter t_{kj} is the tax rate associated with a change in labour supply from state j to state k. T_k is the amount of taxes paid in state k, while T_j is the amount of tax paid in state j. GI is the gross income in the two states, as paid by the employer (including payroll taxes). The standard concepts of average and marginal tax rates arise naturally as special cases of equation (1); the former when $GI_j = T_j = 0$, the latter when state k represent a marginal increase in labour supply compared to state j.

$$(1) \quad t_{kj} = \frac{T_k - T_j}{GI_k - GI_j}$$

The *total* tax rate, r_{kj}, is defined similarly to the formal tax rate, with the exception that the change in taxes appearing in the numerator of equation (1) is replaced by a term containing both the change in taxes ($T_k - T_j$) and the change in e.g.

incomes based transfers ($B_k - B_j$). The benefit term is here defined in a broad sense; i.e., it not only includes directly incomes tested transfers, but also elements of the tax system that cause deviations from the 'normal' tax rate structure. In particular, we include in this term the preferential tax treatment of income earned by a person with low-income (or no-income) spouse.

$$(2) \quad r_{kj} = \frac{T_k - T_j - (B_k - B_j)}{GI_k - GI_j}$$

In principle, one could calculate an infinite number of different tax rates for each individual (i.e. for all possible combinations of j and k). In this paper, we focus on the tax rates associated with the alternatives of no job, half-time job and full-time job. This is done both for expository reasons (the pattern of distortions disclosed for these alternatives is likely to be relevant for other similar alternatives as well), and because half-time and full-time work account for a very large fraction of the Norwegian labour force, to some extent for institutional reasons.

Since no person can be observed in more than one state at a time, the tax rates in (1) and (2) cannot be calculated based on observed data only. Predictions have to be made regarding incomes, taxes and benefits in states that are not observed. The next section explains how this has been done.

4. Income, Tax and Benefit Construction

In the present design we don't observe each person in each state, but we compare counterfactual labour market states. This means that we have to construct income, taxes and transfers both in state j and in state k, where the main difficulty lies in the calculation of labour income. More precise we predict wages for the year 1999, based on observed labour marked states at the end of 1998. Given a prediction for labour income, we use the correct rules/regulations to calculate state-specific taxes and benefit entitlements. Because of the rich data available we can calculate both hypothetical taxes and transfers rather precisely.

How potential income should be constructed is far from obvious, and several approaches and techniques are tested. In this paper we first present two main methods. The first is based on yearly income at full time work shortly before the period

examined (if such an income is observed). In the lack of an observed fulltime income potential earnings are estimated from an OLS regression. The second method is to construct hypothetical earnings based on the highest yearly income that has been observed previously for each individual. That income compared to others with similar years of work experience, gender and education, is used to predict earnings. Details and the reason for this approach are given later on.

Let us start with the first alternative. For persons already recorded in a full time job (during the last three years), I assume that the income associated with this full time job is generated by the standard number of work-hours (37.5 hours each week), and that the resulting hourly wage rate is the one also applying for future work (adjusted for general wage growth). Persons observed in full-time jobs also constitute the dataset required to estimate the wages for persons who's wages are not observed. The presented results are based on a standard OLS model, though several attempts to control for the selection problem were made. The predictions from these models were anyway rather close[1].

I use a very rich set of Norwegian register data to estimate and predict wages. The register data contains monthly observations of all unemployment benefits and social insurance (SI) payments in Norway, during a period of 6 years prior to the year for which wages are to be predicted. The SI payments are divided into several categories including recipients of sickness benefits, disability benefits, vocational- and medical rehabilitation, (early) retirement pension, and general public assistance. I take advantage of the possibility to distinguish between these different kinds of social insurance payments, and between the lengths of the payment periods. I also include demographical information such as gender, marital status, region of living, educational attainment, income, sector of work, age of children and more. Income history (represented by pension points) is available back to 1967.

(Log) wage is estimated with the dummy variables listed below.

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[1] Even though we strongly suspect that there are selection mechanism present meaning that those who work are not a random selected group from the population, and that we have potential instruments in our data the OLS method is preferred. The Full Information Maximum Likelihood Selection Model estimation shows a negative correlation between the error terms in the wage- and participation equation. This result is not affected by choice of instrument or composition of the population. The fact that "hours worked" are only available in broad categories and affected by measurement errors might cause this result. Comparison of the prediction results show that for 90 % of the population the estimated wage difference was less than 10 percent.

Table 2

Variables included income estimation	Number of dummy variables
Work experience	21
County	19
Education	14
No-OECD immigrant	1
Spouse's income	8
Months of unemployment last three years	4
Months of sick-leave payments	4
Months of rehabilitation	4
Programme participation	4
Disability	3
Age	47
Children in different age categories	4

The explanatory variables might have different effect on wages and the participation decision depending on benefit eligibility. This will accordingly affect the predicted wages. To deal with this we divide benefit receivers into 3 different groups, unemployed, rehabilitation benefit receivers, and disabled. Potential incomes for disabled are predicted from the estimation of those receiving rehabilitation benefits. Those not receiving benefits are considered another group. The estimation is done separately for men and women[2]. This means that we estimate the model for 6 different samples. Having done this we predict yearly income at full time work for the entire potential labour force based on observed income, if available, and based on prediction from the regression otherwise.

The second method used to predict income is based on previous maximum income over several years. First, we find the year of highest income for each person in the period 1967-1998 (deflated for general wage growth). We then group the population after education, experience and gender, find the mean maximum income in each group, and calculate each persons fraction of this mean. Finally we find average income for those working in 1999, and calculate income for those not working if their relative income position were retained. This method serves several purposes. First, we get a more individual based wage estimation. Second, since we use maximum income we are less likely to get an income affected by measurement error in hours worked[3].

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[2] The estimations are done with Stata 7.
[3] One drawback is that this method could not be used for those never worked (fulltime). These are excluded when the results from this method are presented and therefore the results are not completely comparable.

Table 3 shows average income for different groups for the two income calculation methods. Potential income is higher when predicted from maximum previous income. Both prediction methods show that those receiving benefits will on average have lower earnings if working, than those who actually work. We also see that relative differences between those not receiving benefits and the benefit claimants are smaller when the latter measure is used. Since we might expect an effect on income from being out of the labour force this is not unexpected and in line with findings from the estimated wage model where being unemployed or sick 12 months during the last three years would decrease the predicted income by 5 and 5.1 %.

Table 3

Average full time income in 1999 from two different wage predictions

	Last three years or regression	Maximum income
Not receiving benefits	286000	298000
Unemployed	221000	252000
Social Security	223000	240000
Sick leave	251000	275000
Rehabilitation	228000	258000
Disabled less than 2/3	228000	255000
Disabled more than 2/3	224000	251000
Receiving or eligible for early retirement	252000	290000

If we have reliable predictions of gross incomes we are ready to predict taxes. The data help us calculate taxes rather accurately. This is because we identify most of the variables affecting taxes for workers, such as age, martial status, municipality of residence, pension received and spouse income. Taxes are determined by interactions of the different characteristics. Marital status might affect the level of a deduction, but only if the spouse's income is sufficiently small. The size of this deduction also varies with the municipality of residence where the deductions is larger for those living in the northern part of Norway. At the same time, marital status and spouse income are affecting the tax rate through other channels, since the base of the top rate tax is also affected. We take this effect into account when calculating total potential tax rates for currently non-working spouses. Since starting to work half- or full time will affect the amount of taxes paid by the spouse there is an extra disincentive effect for this group. We have defined this effect as not a part of the formal tax rates but included it only in the total tax rates. Another example is the effect of incomes from different kinds of

benefits, which are taxed differently because of different rates of the social security contributions. The extent of disability is also affecting taxes through deductions depending on working capacity and age. Disability and age is also a criterion for separate tax rules ensuring tax exemption if the income is sufficiently low. Payroll taxes also differ with region of residence. There are 5 different regions and payroll taxes vary fro 0 to 14,1% (1998). Since we observe municipality of residence we are able to include this effect. Taking into account the different rules and limits we calculate taxes rather precisely.

The last part needed for the total tax rates is the benefits. The basic assumption we make is that individuals who already receive benefits can choose to keep these benefits, as long as they do not change their labour supply. But individuals who do not currently receive benefits cannot simply choose to do so, since they have to meet certain eligibility criteria related to, e.g., sickness or involuntary unemployment. We also assume that it is not possible to choose to raise ones disablement and thereby ones benefit payments. The only exception from these assumptions is individuals eligible for early retirement, who are entitled to choose for themselves. We are able to calculate potential benefits accurately for this group, regardless of their current status, since we have information to the full pension point accumulation history.

5. Analysis and Results

We start with observing a population in December 1998. The main work/benefit categories, constructed as mutually excluding groups, at this point in time is presented in table 4.

Table 4

Main Status December 1998 (2624881 individuals)		
	Men (N=1327834)	Women (N=1297047)
Not registered	19.64	21.13
Unemployed	2.6	3.45
Social Security	1.48	0.88
Sick leave	3.21	4.88
Rehabilitation	1.99	2.60
Less than 2/3 disabled	0.82	2.00
More than 2/3 disabled	7.38	9.27
Receiving early retirement pension	1.14	0.79
Working half time	4.25	20.43
Working fulltime	57.49	34.55

In the following we will look at four groups of benefit receivers or potential benefit receivers in detail, and compare these groups with those not entitled to benefits. The four groups in focus are the unemployed, persons on rehabilitation (medical or vocational), persons with early retirement entitlement and the disabled. Later we well then se how the progressivity of the total tax-system is affected when the basis population – those not entitled to benefits - is expanded to include these groups. Let us firs look at how formal and total tax-rates, on average, depends on which of the previously described income measures we use.

Table 5

Average total and formal tax rates depending on income construction method, fulltime				
	Income last 3 years if observed, otherwise regression		Potential wage based on max incomes' position in conditional distribution	
	Formal	Total	Formal	Total
Not entitled to benefits	38.1	38.7	38.8	39.5
Unemployed	35.2	65.1	36.4	63.8
Rehabilitation	34.8	69.5	36.1	67.3
Disabled less than 2/3	34.7	58.4	35.9	57.6
Disabled more than 2/3	33.6	75	34.8	73.3
Afp eligible	37.2	69.5	38.7	66.9

We see from table 5 that the average differences in tax rates are not very sensitive to the wage prediction method. For expository reasons presentation of results will be based on only one method. We choose the simplest, OLS- based, measure for this purpose.

The group "eligible for early retirement benefits" is from a policy point of view a particularly interesting group, both because it is growing rapidly and will continue to grow for several years, and because the extent of choice in the labour supply decision is considered less controversial than for other benefit claimants. We therefore take a particularly close look at the tax incentives facing the members of this group. Those eligible for early retirement can choose several combinations of work and pension. The less a person work the greater is the pension received, so the formal- and total tax rates differ for all members of this group (in average the difference is 32 percentage points, see table 5). We first look at how the formal tax rates depend on income for the AFP eligible in figure 1.
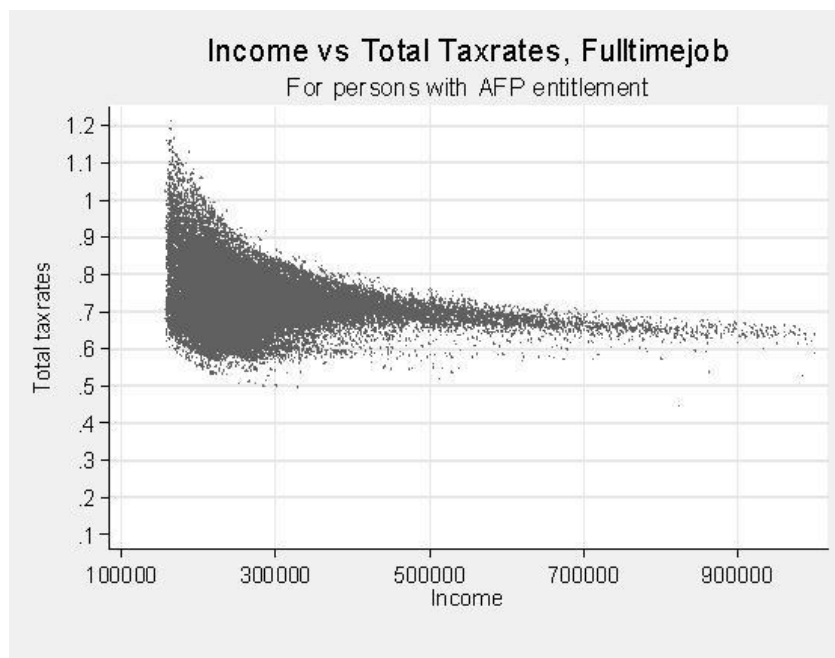
Figure 1
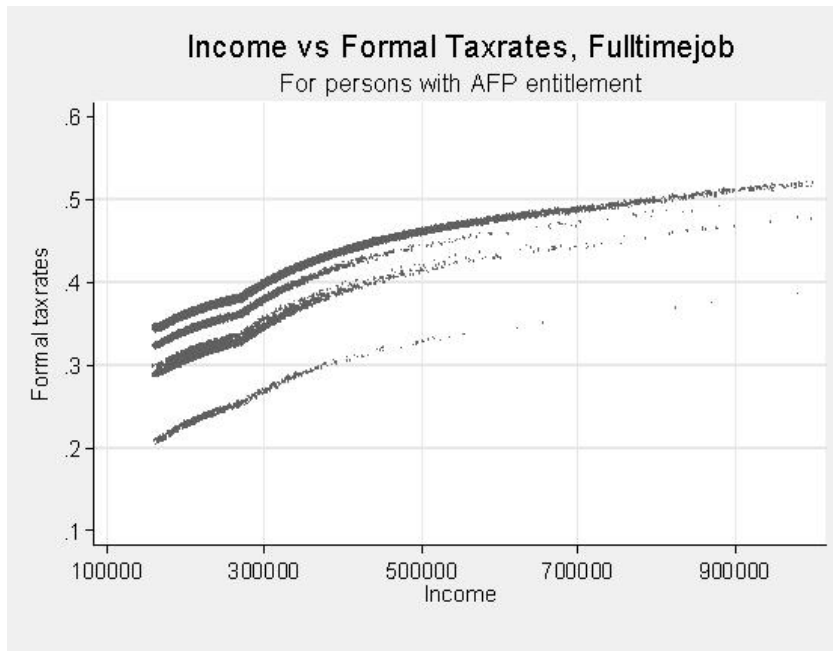
We see from figure 1 that for the early retirement eligible, taxes increase with income. This is what we expect from an ordinary progressive tax system (average tax increase

with income). We see that there are several "paths" depending on payroll tax area, and that the average tax at fulltime work varies from just above 20% to more than 50% when payroll taxes are included[4].

When we replace the formal tax rates by the total tax rates the picture changes dramatically. Those with the highest wages no longer face the highest tax rates. In fact it's those with the lowest income if working that face the highest rates, and the high-wage-workers are now in the middle of the tax rate distribution. We see that some, 0.8 % of the AFP eligible (2123 persons), faces tax rates above 100 %, and all of them are among the low wage earners.

Figure 2

In figure 3, we plot the total tax rates against the formal fax rates. We see that those who according to the formal tax rates are in the middle of the formal tax rate distribution face the highest total tax rates, and, for most of the AFP eligible, the formal tax rates do not provide a good description of the actual work incentives for this group. The correlation coefficient between the two rates are –0.037, saying that, on average, those facing the highest formal tax rates face the lowest total tax rates. We also see from the figure that those facing the highest formal tax rates face the

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[4] Incomes above 1 million Norwegian kroner are not reported in the figure.

lowest total tax rates, some face total tax rates above 100%. There reason for this very high rate is that the affected persons would have a low income if working (according to our predictions). At the same time benefits would be relatively large because of higher income in previous years. The solid line in figure 3 is the linear regression line.

Figure 3

Formal vs Total Taxrates, Fulltime
For persons with AFP entitlement
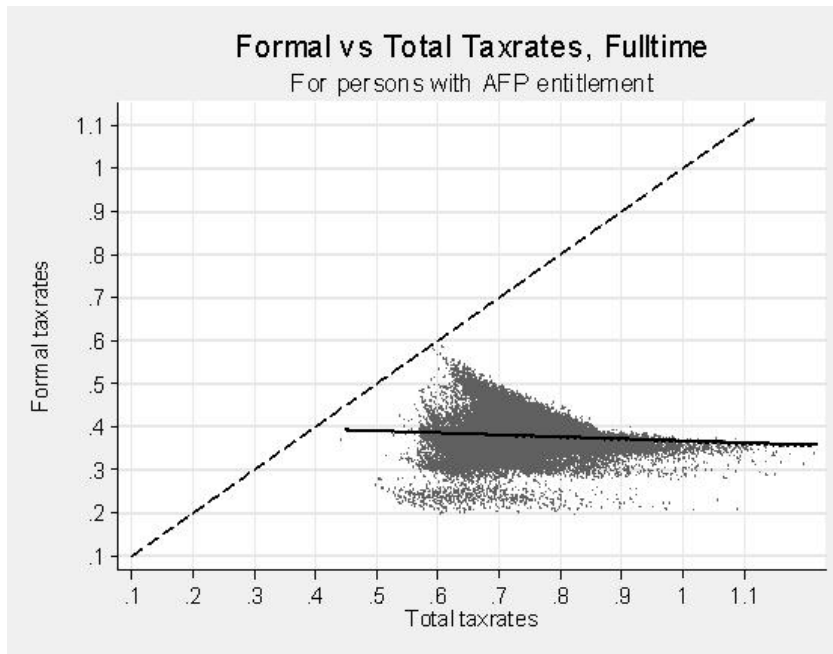
This result is strengthened when we compare the tax rates related to half time work. Because of the progressive tax system where taxes increase with income (and not by wage), part time work is taxed relatively low. This should apparently give incentives for this kind of work. However the existence of early retirement benefits turn this picture upside down. The total tax rates, associated with fulltime work are much higher than indicated by the formal rates. In fact the tax rate is doubled for most persons, and for some more than tripled. This is an interesting result since we would expect that many elderly and persons with health related problems that don't participate in the labour force, part time work would be a more realistic alternative than full time work. The correlation coefficient between formal- and total tax rates related to halftime work is –0.07. The linear regression line is shown as the solid line in the figure.

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Figure 4

Formal vs Total Taxrates, Halftime
For persons with AFP entitlement
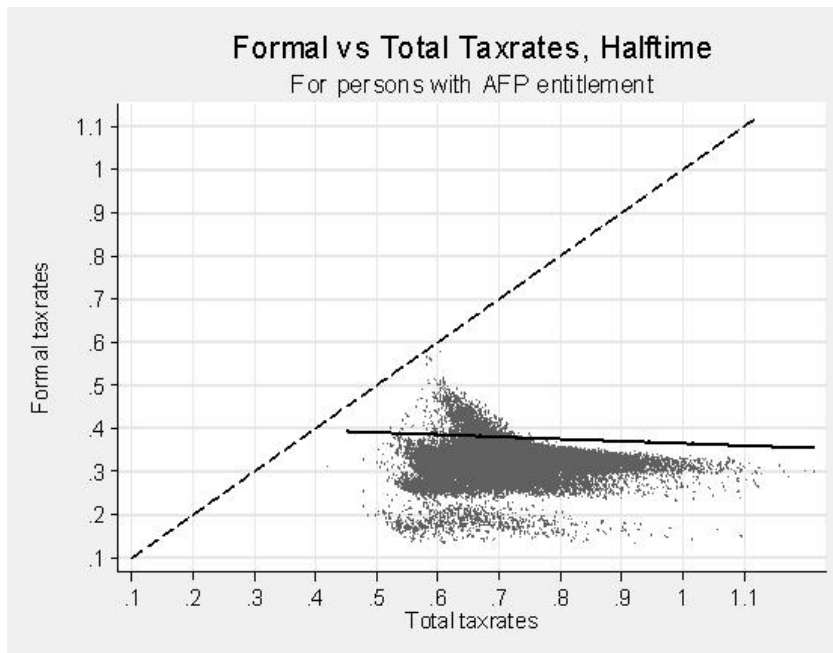
We conclude this section of AFP eligible by comparing the distributions of the two tax rates for this group. From figure 5 we see that according to the formal tax rules, more than 60 % face a tax wedge between 36 and 40 %. When the effect of income tested benefit loss is included more than 80% face a wedge between 51 and 76 % while nearly 20 % has a tax rate of more than 76 %.
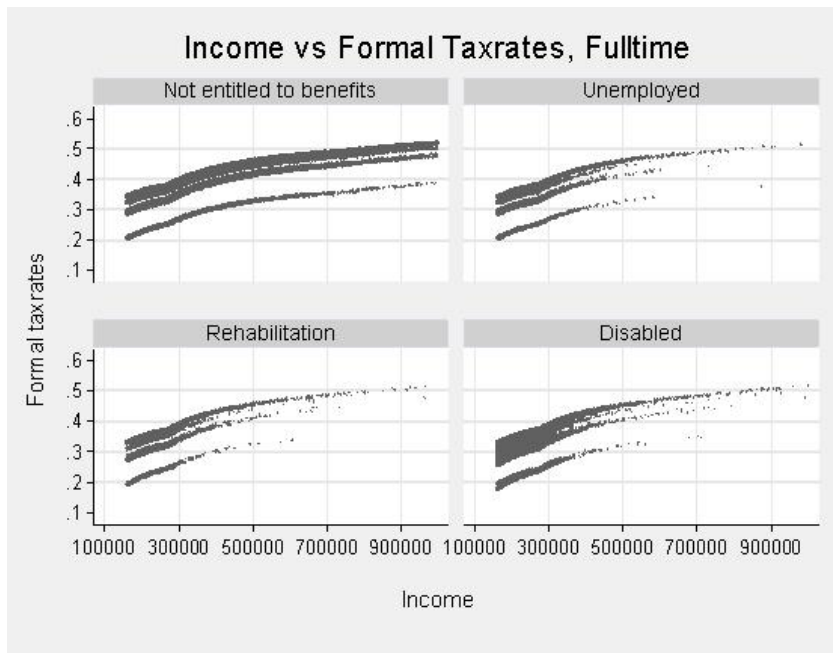
Figure 5

Distribution of formal and total tax rates for persons with AFP entitlement in fulltime work
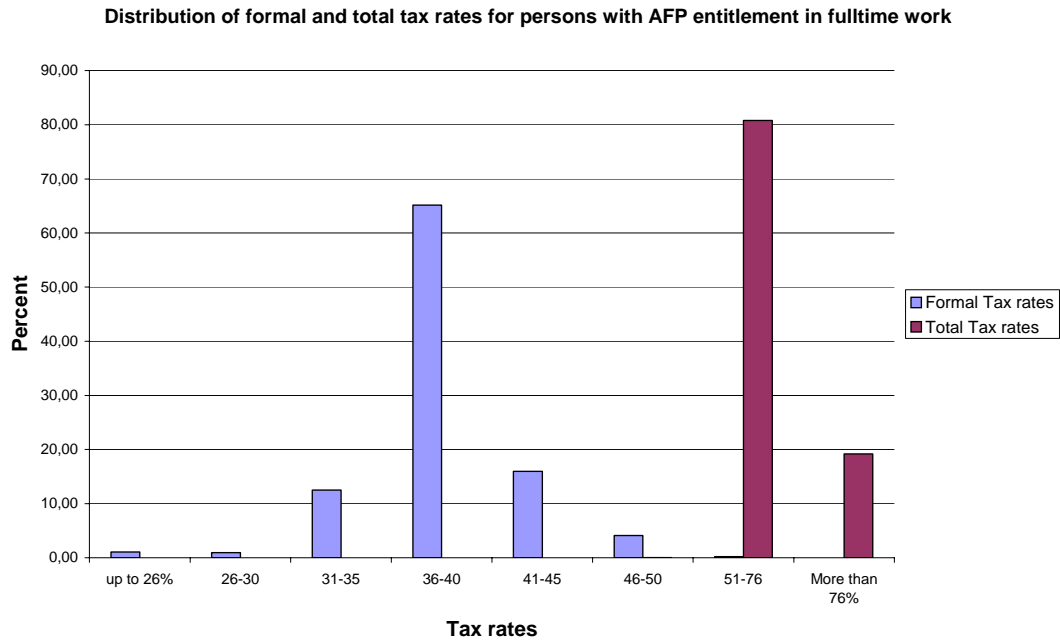
For other benefit recipients there would also be a difference between formal and total tax rates. To what extent these groups actually can choose to work is highly relevant for the interpretation of these results, but the answer to that question is beyond the scope of this paper. We will only focus on the economic *incentives* for these groups.

The following figures consist of four groups: i) those not entitled to benefits, ii) the unemployed, iii) those participating in medical or vocational rehabilitation, and iv) the disabled. Let us first look at the plot between formal tax rates and income for these groups.

Figure 6

When comparing income and formal tax rates in figure 6 we recognise the pattern for the AFP eligible. Tax rates increases with income reflecting the intended progressivity of the Norwegian tax system. Very few of the benefit claimants face high incomes if they work full time, and therefore very few face high tax rates. When turning to total tax rates in figure 7, however, the picture changes completely. For those not entitled to benefits, the picture changes only because if a married person who is voluntary non-employed in the original state starts to work, the couple loose eligibility to the favourable tax regime when one of the spouses has very low (or zero) income. This effect is not very large. For the benefit recipients we find that low-income-individuals are represented with all kinds of total tax rates, and the highest total tax rates are among those with lowest income if working fulltime. Those with the highest predicted potential income are in the middle of the tax rate distribution according to the total tax measure. The correlation coefficient is positive (0.49) for those not entitled to benefits, while its negative for the benefit recipients. –0.13 for the unemployed, -0.14 for the rehabilitation benefit receivers, and –0.19 for the disabled. In average for each of the benefit entitle groups we could say that the larger the income potential the lower the tax rate according to the total measure.

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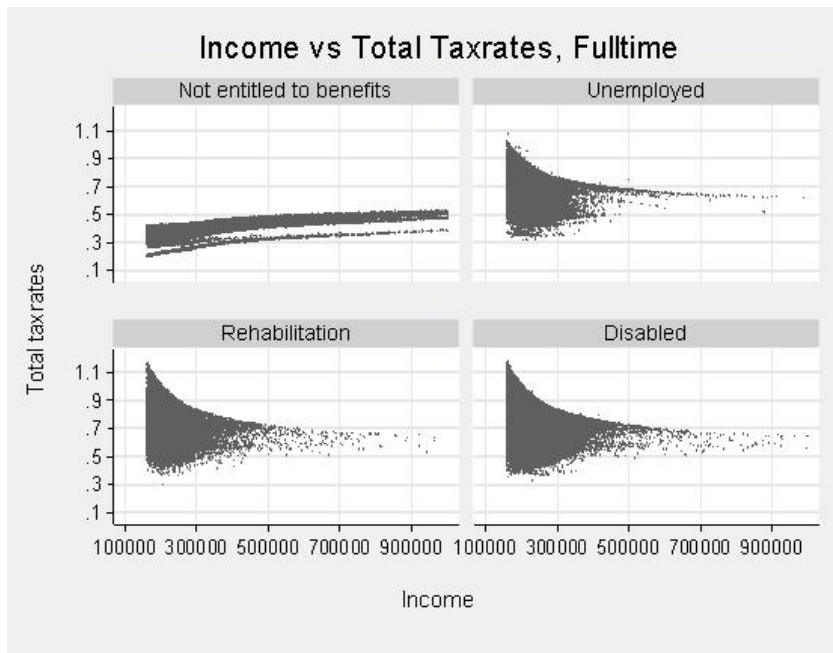
Figure 7

When comparing the two tax rates for these groups in figure 8 we find that it is only for those not receiving benefits that we find a close positive correlation between formal and total tax rates. For the benefit claimants those with the highest formal rates are in the middle of the total tax rate distribution. Some, which according to the formal rate have an average tax if working of around 30 %, might according to the total measure, face tax rates above 100%. This fraction is however very small: 0.1 % of the unemployed, 0.5 % of rehabilitation benefit receivers, and 0.8 % of the disabled. The overall picture is very similar for all the benefit receiving groups. In the two tax rates were equal the correlation coefficient between them would be one. For those not entitled to benefits the correlation coefficient between the two tax rates are 0.98, showing that the extra deduction related to no working spouses are very small for this (large) group. Both because this favourable deduction is not very large, and because the actual group is not a very large part of the 'not entitled to benefits' group. For the unemployed the correlation coefficient is 0.0069 and not significant different from zero at the 5% level. For the rehabilitation benefit receivers the correlation is –0.031 and for the disabled it is –0.095.

Figure 8
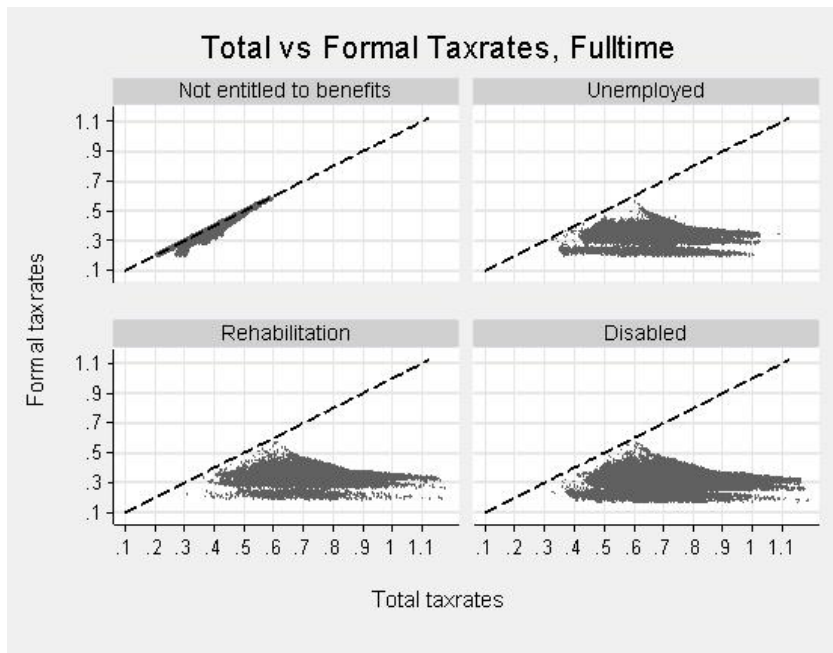
A consequence of tax progressivity is that those working half time will face a smaller tax wedge than those working full time. In other words the part of the income paid in tax is a larger part of the income attained from working fulltime rather than halftime, than it is from the part working halftime rather than not working. Since half time work is more likely to be a manageable task for the benefit receivers, progressivity should improve the incentives for this group. But as we see from table 9 this conclusion is affected by the inclusion of benefits in the tax concept. According to the formal rates there should be strong incentives effects for half time work for the benefit groups, while according to the total rates the incentives are weak.

Figure 9

Total vs Formal Taxrates, Halftime
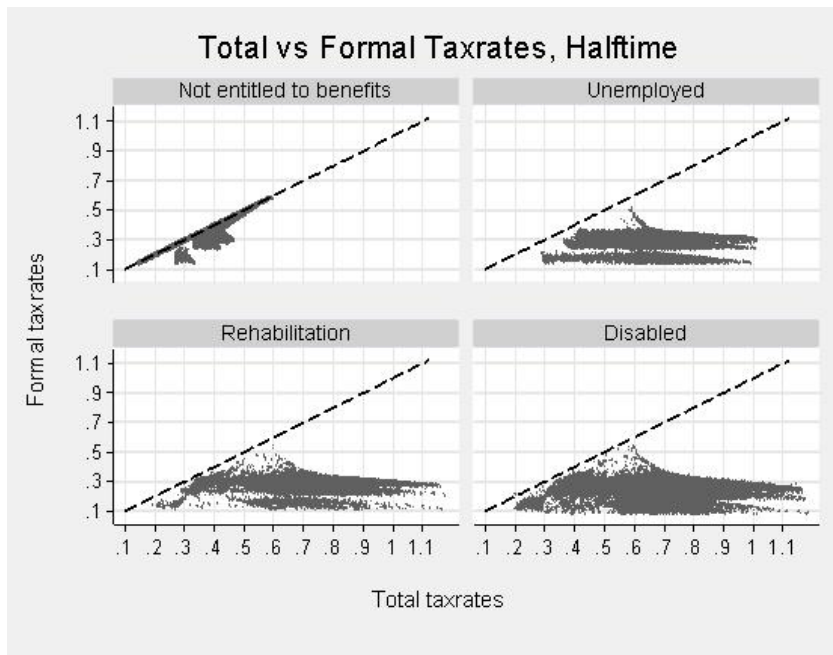
Let us now turn to the overall effect of extending the tax term to include income tested benefits. From figure 10 we recognise the paths describing the ordinary tax rates, but the result that those with the lowest income potential face the highest income tax if working sustain. It is only persons with very low potential income who face tax rates above 100 %.

Figure 10

Income vs Total Taxrates, Fulltime
For the entire population
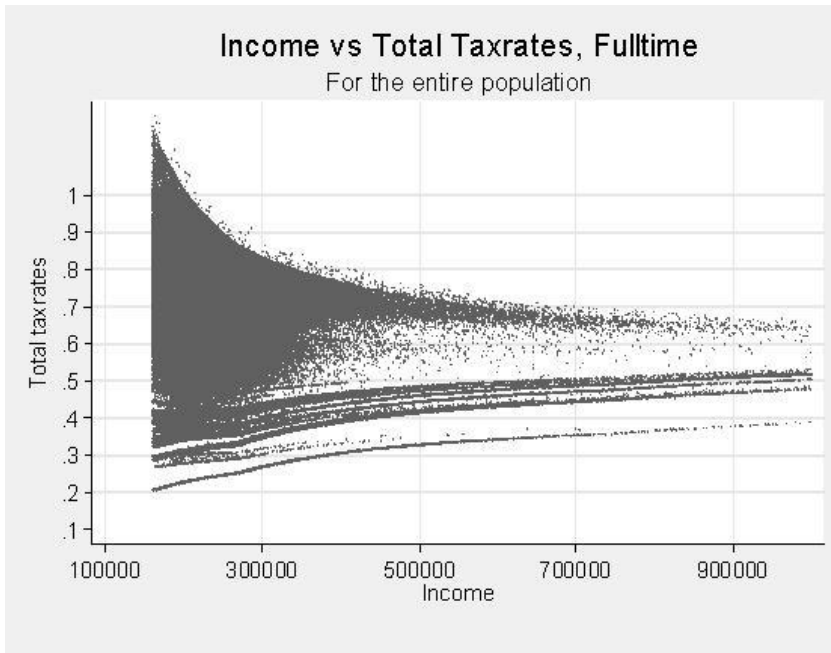
When comparing total and formal tax rates for the entire population we recognize that, for many, formal and total rates coincide. For a lot of individuals they do not. We see that a lot of persons facing low or medium tax rates according to the formal system face very high rates when we use the total rate instead. The solid line in figure 11 is the linear regression line. The correlation coefficient is close to zero.

Figure 11

Formal vs Total Taxrates, Fulltime
For the entire population
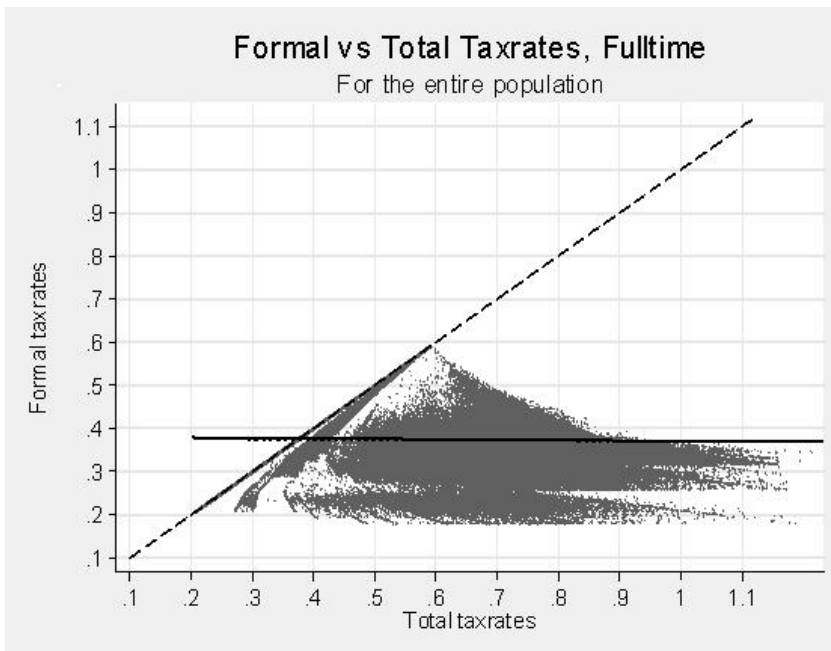
As already, seen adding the benefit loss to the tax cost affects the total progressivity of the Norwegian tax system. Extending the tax term to include benefit loss indicate that it is not always those facing the highest income that face the highest tax wedge. The distributions of the two measures illustrate the difference in progressivity. Figure 12 depicts the distribution in tax rates if working fulltime according to the two measures. According to the formal measure, around 60 % face a rate between 35 and 40 % and only a minor fraction (3%) face rates above 50 %. If we look at the distribution according to the total measure the fraction between 35 and 40 % has fallen to 50 % and nearly 20 % face tax rates above 50 %. The main problem in this setting is of course that we do not know for whom (if any) working is a realistic alternative. If all benefit receivers face an empty job opportunity choice set, a discussion of tax incentives is uninteresting.

Figure 12

Distribution of formal and total taxrates for the entire population,if working fulltime

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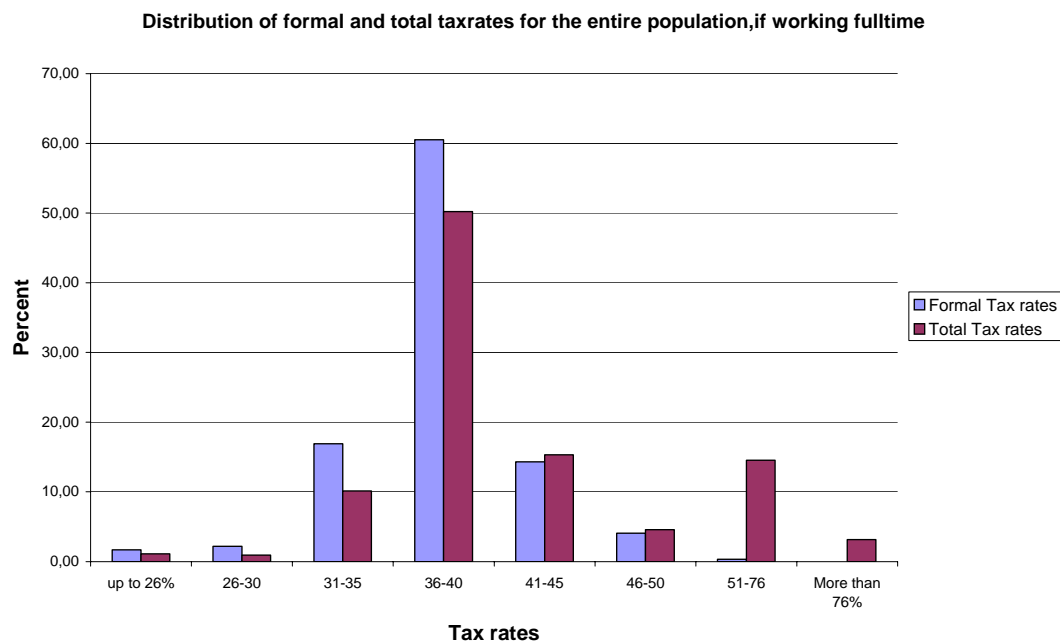
6. Reforms of the formal tax system

In this section, we investigate how hypothetical reforms of the formal tax system may affect the distribution of total tax rates. Tax reforms are discussed and implemented from time to time. Lately the focus has been on reducing the progressivity (and broaden the tax base). In Norway there have been two tax commissions (NOU (1999), NOU (2003)), and both proposed to reduce the progressivity of the tax system by cutting the tax rates on high incomes. A simple way to reduce progressivity is to remove the extra top rate tax of 13.5 or 19.5 percent on high incomes. This could be done in a revenue-neutral reform (where labour supply is regarded as given) by increasing the 28 percent tax rate on "ordinary" income accordingly. Based on the calculations from the present population this would lead to an increase in the tax rate on ordinary incomes of 2.7 % to 30.7 (27.2% in northern Norway). If we compare initial tax-rates with these hypothetical tax rates, we see from table 6 that the incentives of working full time – compared to not working at all- is reduced for a majority of the population. For those not entitled to benefits such a reform would increase the tax if working fulltime for 75% of the group. For benefit receivers, we see that these numbers are larger, meaning that the economic incentives of working are weakened for almost everyone when progressivity declines. This is not a result of the interaction of the tax- benefit system, the results do not depend much on whether formal or total tax rates are used, but caused by the fact that most benefit claimants would earn a low wage if there were to enter the labour marked.

Table 6

Fraction with increased tax rate, and average decrease in total tax rates, if working

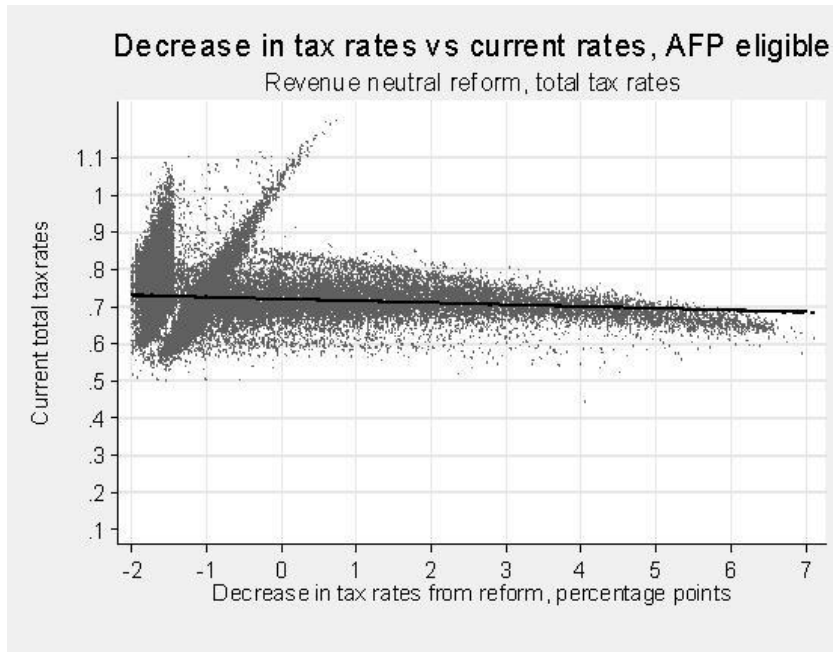| Group	Fraction with increased (or unchanged) tax rate if working fulltime, %	Fraction with increased (or unchanged) tax rate if working halftime, %	Average decrease in tax rates if working fulltime, percentage points	Average decrease in tax rates if working halftime, percentage points
Not entitled to benefits	75.76	95.63	-0.64	-1.21
Unemployed	94.53	99.91	-0.98	-1.09
Rehabilitation	96.58	99.87	-0.93	-1.05
Disabled less than 2/3	96.80	99.91	-1.80	-1.25
Disabled more than 2/3	97.3	99.96	-0.49	-1.25
Afp eligible	86.65	97.49	-1.12	-0.57

Figure 13

Figure 13 shows the decrease in taxes for the group we started out with; the AFP eligible. It illustrates that the total tax cut associated with the reform is smaller the higher is the total tax rate to start with. The linear regression coefficient is shown as the solid line in the figure. In average this effect is small. In figure 14 we see the effect of the reform for the entire population. The linear regression does not find a strong correlation but it is positive when we look at both the average affect among the entire Norwegian population.

Figure 14
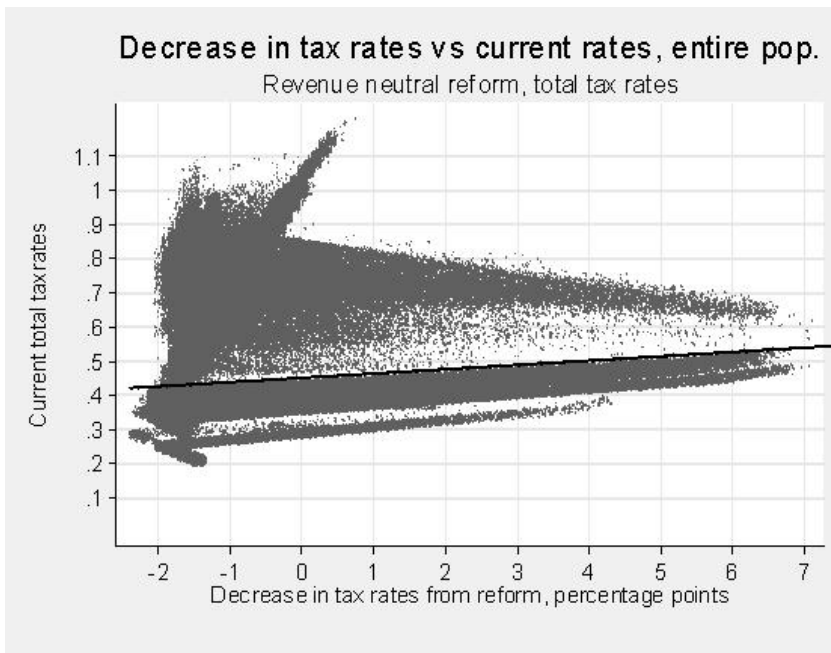
These results are not surprising; in fact the whole idea with such a reform would be to reduce the highest marginal tax rate (and thereby the dead weight loss). But as shown it is not obvious who has the highest (marginal) tax rates. If we look at the effects of the revenue neutral reform among the 10% with the highest tax rate at fulltime work according to the *formal* tax measure we find that tax rate decreases by 7.5 % on average (3.3 percentage points). If we look at the effect on the 10% with the highest tax rate according to the *total* tax rate we find that the reform *increases* the tax rate by 1.3 % (1 percentage point).[5]

From time to time tax cuts are discussed. We look at two different ways of reducing the overall tax level. First, following the discussion above we look at a cut caused by a removal of the extra top rate tax on high- level incomes. Second we look at a tax reform that according to our data would reduce total tax income for the government by the same amount, (we still consider labour supply as given). This is an increased tax deduction for labour income of 6000 kroner. We look at two hypothetical reforms; one that will reduce progressivity and one that will increase progressivity. In table 7 we compare the effects of the two reforms on tax rates if

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[5]If we look at the 20% highest tax rate group the results would still indicate a tax reduction according to the formal measure and on average be neutral according to the total measure.

working. We see that the incentive effect for all the different groups is much larger from a deduction in labour income. For the benefit receivers, this reform reduces the tax rate if working fulltime by around 2.5 percentage points. The tax reduction from working fulltime is around 5 percentage points for the benefit receivers.

Table 7

Average decrease in total tax rate for different group from reforms, percentage points

	Removing the high income tax		Deduction on labour income	
	Fulltime	Halftime	Fulltime	Halftime
Not entitled to benefits	1.18	0.22	2.09	4.18
Unemployed	0.25	0.08	2.53	5.07
Rehabilitation	0.19	0.03	2.49	4.90
Disabled less than 2/3	0.18	0.01	2.45	4.91
Disabled more than 2/3	0.15	0.01	2.50	5.00
Afp eligible	0.60	0.09	2.25	4.49

Since potential income for the benefit receivers are typically estimated to be below the high income tax limit, it is no surprise that a tax reform removing this tax has an insignificant effect on benefit receivers incentives. On the other hand, the low wage potential for the benefit receivers are the reason that an extra deduction related to labour income has a larger effect on benefit receivers than on those not entitled to benefits.

7. Conclusion

We find that it is not those facing the highest formal tax rates but those in the middle of the formal tax rate distribution that face the highest overall tax wedges. Those with benefit entitlement have particularly poor work incentives, due to the income testing of benefits. Since the group of potential benefit receivers is large, and their work incentives are poor, we find that the overall distortions of the tax system cannot be properly assessed without taking the benefit system into account. We find that partial reform of the formal tax system designed to reduce progressivity by cutting the highest formal tax rates, might lead to exactly the opposite result when it comes to the total tax rates. An increase in formal tax progressivity, by introducing an extra deduction in labour income for everyone will improve work incentives for marginal workers, in particular the incentives to work part time.

References

Aaberge, R., Colombino, U. and Strøm, S. (2000)
Labour Supply Responses and Welfare Effects from Replacing Current Tax Rules by a Flat Tax: Empirical evidence from Italy, Norway and Sweden. Journal of Population Economics, Vol 13, pp. 595-621.

Barmby, T. A., Ercolani, M. G and Treble J. G (2002)
Sickness Absence: An International Comparison. The Economic Journal, Vol. 112 F315-F331.

Bingley, P. and Walker, I. (1997) The Labour Supply, Unemployment and Participation of Lone Mothers in In- Work Transfer Programs. The Economic Journal, Vol. 107, No. 444, pp. 1375-1390.

Blundell, R., Duncan, A. and Megir, C. (1998) Estimating Labor Supply Responses Using Tax Reforms. Econometrica, Vol. 66, No 4 pp.827-861.

Brinch, Christian, Erik Hernæs and Steinar Strøm (2001) Labour Supply Effects of an Early Retirement Programme, CES ifo Working Papers No. 463

Eissa, N. and Liebman, J. B. (1996) Labor Supply Response to Earned Income Tax Credit. The Quarterly Journal of Economics, Vol. 111, No. 2, 605-637.

Faverealt, M.,Ratcliffe, C. and Toder, E. (1999) Labor Force Participation of Older Workers: Prospective Changes and Potential Policy Responses. National Tax Journal. Vol. 52 no. 3 pp. 483-504.

Hernæs, Erik, Zhiyang Jia and Steinar Strøm (2001) Retirement in non-cooperative and cooperative families, CESifo Working Paper No. 476

Holmlund, B (1998) Unemployment Insurance in Theory and Practice. Scandinavian Journal of Economics 100 (1), 113-141.

Kay, J. A. (1990) Tax Policy: A Survey. The Economic Journal, Vol. 100, No 399 pp. 18-75.

Kell, Michael and Wright, Jane (1990) Benefits and the Labour Supply of Women Married to Unemployed men. The Economic Journal, Vol. 100, No 400, Conference Papers, pp. 119-126.

Liebfritz, W., Thornton, J., Bibbee, A. (1997) Taxation and Economic Performance, OECD Economics Department Working Paper, 176.

Lumsdaine, R. L. and Mitchell, O. S. (1999) New Developments in the Economic Analysis of Retirement. In Ashenfelter, Orley and Card, David (red.) Handbook of Labor Economics, Vol. 3, Elsevier Science B. V. 1999.

Meyer, Bruce D. (2002) Unemployment and Workers Compensation Programmes: Rationale, Design, Labour Supply and Income Support. Fiscal Studies vol. 23, no 1 pp.1-49.

NOU (1999) Flatere skatt. No 7.

NOU (2003) Skatteutvalget. Forslag til endringer i skattesystemet. No 9.

Røed, Knut and Haugen, Fredrik (2003) Early Retirement and Economic Incentives - Evidence from a Quasi-Natural Experiment, *Labour* , forthcoming

Røed and Strøm (2002). Progressive Taxes and the Labor Marked: Is the Trade-off between Equality and Efficiency Inevitable? Journal of Economic surveys, vol. 16, No.1.

Røed, K. and Zhang, T. (2004) Unemployment duration and economic incentives - A quasi random-assignment approach. European Economic Review, Forthcoming.