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## The total tax on labour income and financial crisis risk

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# MEMORANDUM

No 05/2007

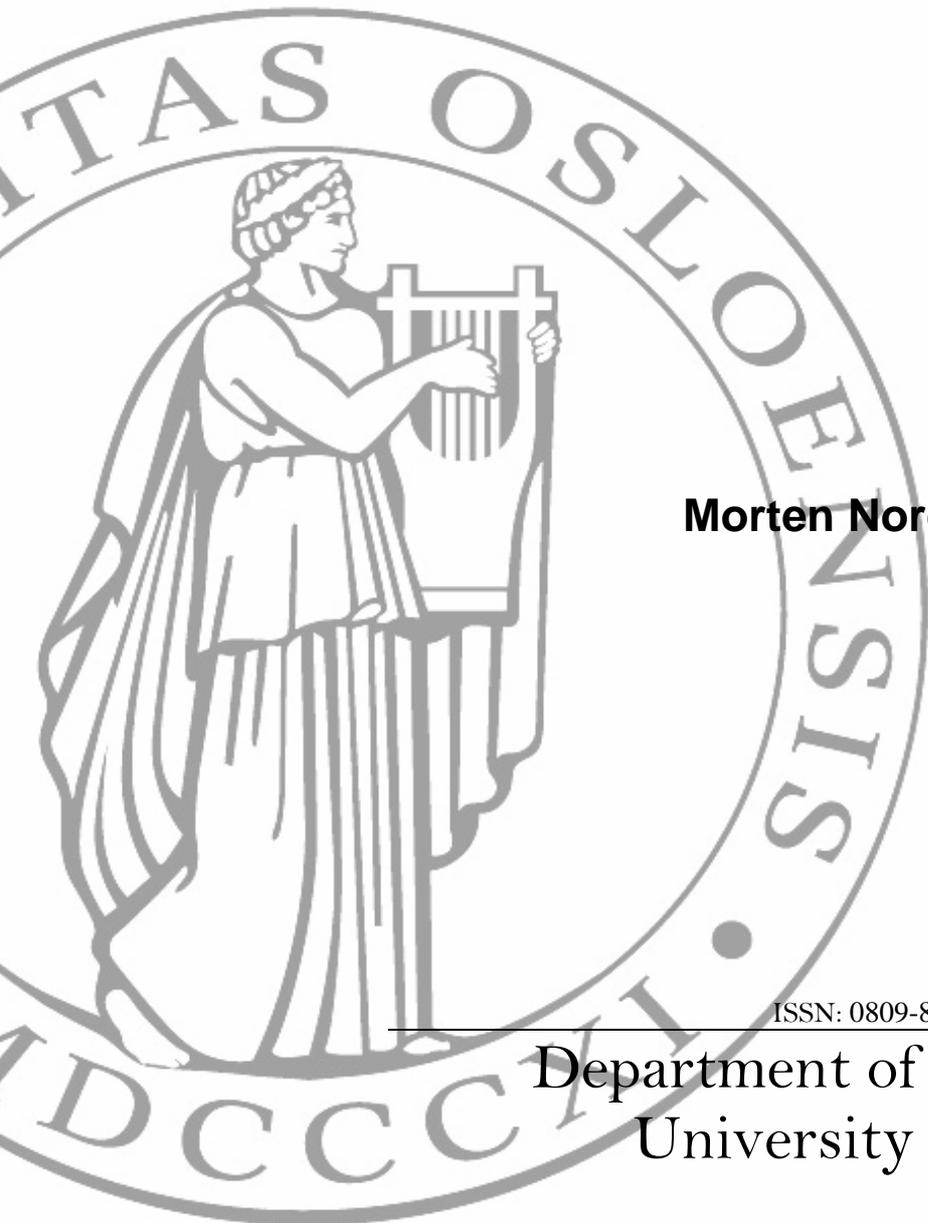
## The Total Tax on Labour Income

**Morten Nordberg**

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# The Total Tax on Labour Income

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## Abstract

In the present paper we examine the economic incentives to work for persons receiving benefits in Norway. We take into account how the tax- and benefit systems interact. For a large part of the population social security transfers ensure that the income if not working is far from zero. These benefits are typically curtailed if a person works. By including this benefit loss in the tax measure we compute what we call “total” tax rates for all benefit claimants in Norway. We estimate that benefit receivers on average would gain about 70 000 NOK if working full-time instead of not working at all. The total tax rate is about 70 percent for full-time work. About 4 percent will be economically worse off if working full-time instead of not working at all. In addition we find that the tax reform intended to improve economic efficiency by cutting the highest marginal taxes, will worsen the economic incentives for benefit receivers if the lower top-rates are financed by higher taxes at lower incomes. Instead we indicate that reforms making the overall progressivity of the formal tax system stronger would improve the incentives to work for these groups.

**Keywords:** *Work incentives, Taxation, Benefit entitlements*

**JEL classification:** *H21, H55*

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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). In a standard labour supply model a tax wedge implies that mutually advantageous opportunities for trade in labour services are forfeited. The associated dead-weight loss to the society as a whole is larger the higher is the top marginal tax rate; see e.g. Stiglitz (1986, p.481). 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. According to The Economist (2005), nine Eastern European countries have already implemented a flat tax regime.

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 means-tested transfers and 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 a very unpredictable way.

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 direct tax system, and the “total” tax rate, which measures the total wedge between the employer’s payment and the employee’s ultimate reward, when all taxes and transfers are taken into account. The aim of the paper is to evaluate empirically the relationship between “formal” and “total” tax rates confronting potential workers in a typical welfare state economy. For this purpose, we 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 the actual tax and benefit legislation, and prediction models for individuals’ incomes in labour market states that have not actually been chosen, these data facilitate 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 incentives for marginal workers. 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 marginal 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. 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. 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

benefit eligibility, because transfers are tapered off quickly against earned income. For that reason, the present paper is not restricted to evaluating marginal tax rates. On the contrary, the paper focuses on the taxes associated with part-time and full-time jobs, and on those associated with a transition between these two alternatives. More generally, the tools proposed in this paper can be used to look at total tax rates associated with any kind of adjustment in work-hours<sup>2</sup>.

The remainder of this paper is structured as follows: Section 2 describes the Norwegian tax and transfer system. In Section 3, we 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 presents 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. in 2001 a tax of 13.5 % is levied on gross incomes exceeding around 36,000 Euro, and this top-rate tax is increased to 19.5 % for incomes above 100,000 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.

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<sup>2</sup> The marginal tax rate appears naturally as a “special case” of such an adjustment.

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 strengthened by a special rule implying that retired people with low incomes pay no tax at all; moreover 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 rule for married couples, who can choose to have their incomes taxed together with a higher threshold for the top-rate tax and larger deduction. 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 reflected in the individual tax rates. A more striking example appears when we look at benefit receivers. In Norway the number of such receivers is 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.

The benefit system is typically means-tested in the sense that there is a cut-off against income. 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 so-called “base amount” determined by the parliament on a yearly basis (in 2001 one base amount was around 6 250 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 40,000 Euro in 2001)	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 Assistance	Subject to caseworkers' assessment; average payments in 1999 was approximately 3,700 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

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, in other words they are means- tested. This is done to avoid that some receive both social insurance and ordinary wages; which would give very strong incentives to claim benefits.

### 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  $GI_k - T_k = 0$ , 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 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 change in the tax that applies for other household members as a result of a persons shift from state  $j$  to state  $k$ .

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

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 work-hours of the Norwegian labour force.

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 for state  $j$  and state  $k$ , where the main difficulty lies in the calculation of labour income. More precisely we predict wages for the year 2001, based on observed labour market states at the end of 2000. 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.

Income prediction is in general a tricky task, and even harder for persons with a loose connection to the labour market. In addition we do not observe hourly wages in our data. We observe only yearly income, and hours worked (in broad categories). One way to predict wages is to find each person's previous income and assume that this is a good proxy for future income also. Another method is to estimate future income based on observed characteristics. We have tested several approaches and techniques, and in this paper we briefly present the income prediction based on two different methods. Common for both income measures is that they are a combination of the two techniques described above: We assume that previous income, corrected for general wage growth and for the loss associated with the current "marginal" state,

is the best prediction of future income. If a fulltime job (more than 30 hours pr week) is observed we base the prediction on this income. If such an income is not observed this *previous* income (interpreted as future income potential) is estimated from a regression model. The main reason for this, at first sight, cumbersome method is that we get a more individual based wage measure. For most benefit-groups there is a larger share observed with an income prior to the benefit spell than after the spell. Basing the prediction on prior income will therefore reduce the selection problem. The difference between the two measures described here is that the estimation method differs. In the first model we try to control for selection bias whereas in the second model we use an OLS method. However, because a large fraction of the persons studied here have experienced a period of absence from the labour market the predicted income potential might be higher than the actual wage offer. Therefore we compare the predicted potential income with the realized income *two* yeas later for those where such an income is observed. The divergence between the predicted income potential and the realized full-time income is used to scale down the income potential. This downscaling is done separately for each of the five groups of benefit receivers, and within each group separately for men and women. This might of course introduce another selection problem, if those who return to work are a (positively) selected group. If this is the case the downscaling should be even larger than reported in Table 3. We report average income, dispersion and the “average reduction factor” for both income measures in Table 3. The predictions from the two models are rather close<sup>3</sup>. The exception is for receivers of social assistance and the fully disabled. The reason for this difference is that the large fraction censored (previous fulltime income unobserved) in this group prevent us from estimating the model controlling for selection bias, and we use the coefficients from the regression on the group participating in “Medical- or vocational rehabilitation” programs instead.

Before we move on we need to specify the two regression models more exactly. The first model is a selection correction model where we build on Heckman

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<sup>3</sup> Even though we strongly suspect that there are selection mechanisms 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.

(1976, 1979)<sup>4</sup>. In equation (1) below  $w_i$  is the individual wage potential,  $h^*$  is the hours related to fulltime work.  $h^*w_i$  is the income potential at fulltime work.  $y^*$  is a latent variable reflecting being observed with a full-time income, and  $y$  is a dummy for whether such an income is observed or not.  $M$  includes the variables we assume affect this previous fulltime labour income, while  $N$  is all the variables included in  $M$  plus some variables only assumed to affect whether previous income is observed or not, (the instruments).  $\mu$  and  $\varpi$  are unknown coefficients

$$(1) \quad \log h^*w_i = M_i\mu + v_i,$$

$$(2) \quad y_i^* = N_i\varpi + u_i,$$

Let  $y_i = 1$  if  $y_i^* > 0$  and  $y_i = 0$  otherwise. We observe  $y_i$  but not  $y^*$ .

$(v_i, u_i)$  are assumed to be jointly normally distributed with expectations equal to zero.

If previous income is not observed we predict the fulltime income potential to be

$$(3) \quad \overline{h^*w_i} = M_i\hat{\mu} + \psi m_i$$

where  $\psi = \rho\sigma$ ,  $\rho = \text{corr}(v, u)$ ,  $\sigma$  is the standard deviation of  $v$ , and  $m$  is the inverse Mill's Ratio. Note that we include  $\psi m_i$  in the predictions, since the information that a person has been employed in the past contains valuable information regarding that individual's wage prospects in the future. It is the conditional wage predictions that is relevant our model, since the conditioning only relates to the past labour income.

The second earnings potential measure is based on an OLS model

$$(4) \quad \log h^*w_i = N_i\beta + \varepsilon_i,$$

and the predicted fulltime income potential is simply  $\overline{h^*w_i} = N_i\hat{\beta}$ .

We use a very rich set of Norwegian register data to estimate and predict wage income. 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

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<sup>4</sup> We estimate a "Full-Information Maximum Likelihood" model where we estimate the wage- and participation (worked full-time last five years) equations separately. In this case the error terms are allowed to be correlated.

into several categories including recipients of sickness benefits, disability pensions, vocational- and medical rehabilitation, (early) retirement pension, and general (cash) social assistance. We take advantage of the possibility to distinguish between these different kinds of social insurance payments, and between the lengths of the payment periods. We also include demographical information such as gender, marital status, region of living, educational attainment, income, and age of children and more. Income history (represented by pension points) is available back to 1967, and is used to create the work experience measure. Which variables that are included in the wage- and participation equation are summarized in Table 2.

Table 2

<b>Variables included in income estimation</b>	<b>Variable</b>		<b>Number of dummy variables</b>
	<b>in <math>M_i</math></b>	<b>in <math>N_i</math></b>	
Work experience	X	X	21
County	X	X	19
Education	X	X	12
Immigrant from non-OECD country	X	X	1
Spouse's income		X	8
Months experienced unemployment	X	X	4
Length of sick-leave payments	X	X	4
Length of rehabilitation programme	X	X	4
Labour market programme participation	X	X	4
Age	X	X	35
Married		X	1
Children in different age categories		X	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. We divide benefit receivers into 6 different groups: Receivers of social assistance, unemployed, rehabilitation benefit receivers, disabled less than 2/3, disabled more than 2/3, and eligible for early pension. The regression models are ran separately for the mentioned groups and separately for men and women. The OLS model is estimated for 12 different groups, but because of the large selection problem for receivers of social assistance and receivers of more than 2/3 of full disability pension, we are not able to estimate the selection model for these groups. We solve this by using the estimated parameters from the regression for the group participating

on rehabilitation programs for these two groups, based on the assumption that this group is likely to be similar, to the extent that they are able to work.

Table 3 shows average income for different groups for the two income calculation methods. The average reduction factor is negative, which is in line with the expectation that being out of the labour force reduces income<sup>5</sup>. We see from Table 3 that the reduction factor differs between groups, and between estimation methods used.

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<sup>5</sup> According to the estimation model being unemployed or sick 12 months during the last three years would decrease the predicted income by about 5%.

**Table 3**

<b>Estimated full-time labour income (2001)</b>							
	Number	Fraction with a previous fulltime job	Fraction observed working fulltime in 2002	Average reduction factor (Percent)	Income measure I	Income measure II	
					(OLS)	Average reduction factor	(Heckman selection model)
					Predicted gross income (1000 NOK). Average (10. and 90. percentile)		Predicted gross income (1000 NOK). Average (10. and 90. percentile)
Social Assistance	19954	8.2	3.6	-0.4	211 (182, 279)	13	245 (177, 307)
Unemployed	60942	57.1	25.5	7.8	259 (184, 351)	10.9	265 (190, 360)
Medical- or vocational rehabilitation	76539	49.1	10.1	9.5	242 (183, 310)	13.8	251 (192, 336)
Disabled, partly (less than 2/3)	36618	38.2	2.5	15.8	228 (177, 274)	21.1	227 (186, 271)
Disabled, fully (more than 2/3)	218486	15.1	0.1	0.5	241 (196, 296)	12.2	254 (213, 302)
Eligible for early retirement	54627	80.2	20.4	12.6	392 (208, 407)	12.9	397 (214, 407)
Comparison:							
Full-time employed 2002 <sup>6</sup>	1188689					3.4	343 (226, 502)

The next part needed to calculate total tax rates is the benefits. The basic assumption we make is that medical ratification cannot be obtained at will, but once a certification is obtained, the individual can choose to keep it. This implies that individuals claiming benefits can choose to do so in the near future as well, provided that they do not change their labour supply. Individuals eligible for early retirement, on the other hand are entitled to choose for themselves. We are able to calculate potential benefits accurately for this group, since we observe income from national insurance, (supplementary) social assistance, and vocational pension.

If we have reliable predictions of gross labour incomes and pensions, we are ready to predict taxes. The data help us to calculate taxes rather accurately. This is because we identify most of the variables affecting taxes for workers, such as age,

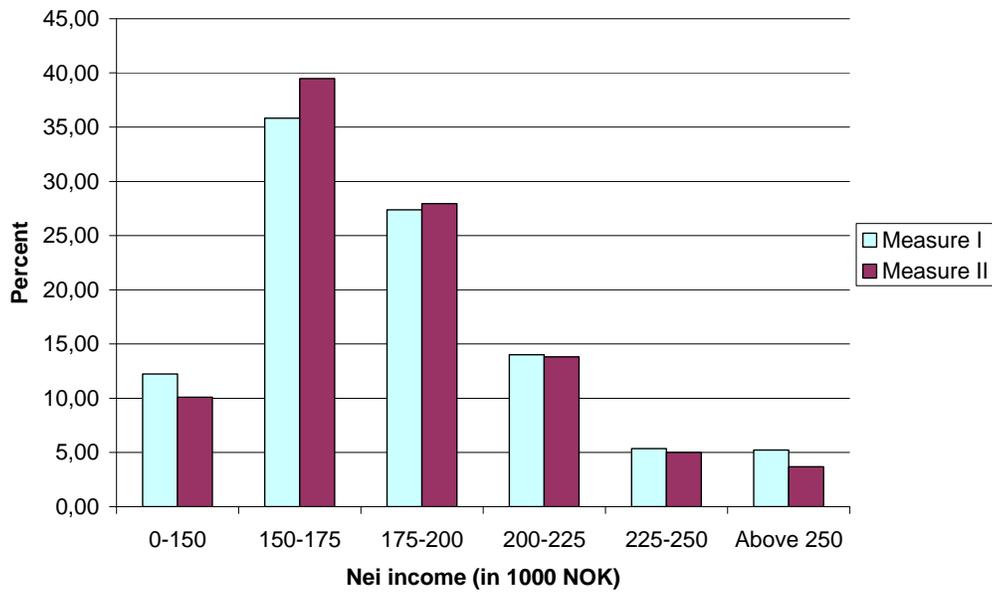
<sup>6</sup> The numbers (incomes) for the full-time employed are observed and not predicted.

marital status, municipality of residence, pension and spouse income. Taxes are determined by interactions of the different characteristics. One 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 also affects taxes through deductions depending on working capacity and age. Disability and age is a criterion for separate tax rules ensuring tax exemption if the income is sufficiently low. Payroll taxes differ with region of residence. There are 5 different regions and payroll taxes vary from 0 to 14,1% (2001). Since we observe municipality of residence we are able to include this effect. The point is that we take into account the different rules and limits and calculate taxes (rather) precisely for each person.

In Figure 1 we report the net income distribution if working full-time according to the two wage calculation methods described above. The distributions are very similar, and it looks like measure I (based on the OLS model) has slightly heavier tails. We also see that predicted potential labour income varies significantly, and the majority, almost 40 percent for measure II (based on the selection model), lies between 150- and 200 000 (NOK). Figure 2 shows the net-gain distribution by working full-time compared to not working for the entire population. The distribution does not depend (much) on the estimation method used, and for most workers gain is somewhere between 50 000 and 100 000 NOK. We also see that the economic gain from working varies a lot, and according to both measures more than 25 % of the population gain less than 50 000 NOK by working full-time.

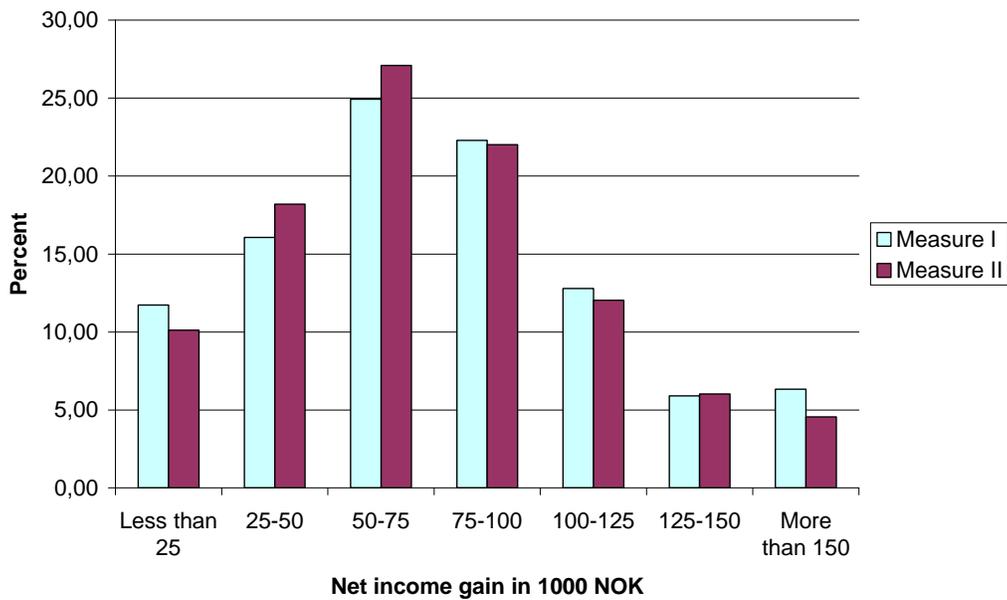
**Figure 1.**

**Income distribution full-time work, income measure I (OLS based method)  
and measure II (selection based method)**



**Figure 2**

**Net gain distribution full-time work, income measure I (OLS based method)  
and measure II (selection based method)**



## 5. Analysis and Results

In the following we will look at the five groups of benefit receivers in detail. All in all we have 432 898 persons in the different categories described in Table 3, with the exception that we exclude persons eligible for, but not receiving, early retirement pension. This is done because we calculate future benefits from previous benefits. To make the results comparable, we only include persons receiving benefits. The five groups in focus are the unemployed, persons on rehabilitation (medical or vocational), persons with early retirement pension, the disabled, and receivers of social assistance. Let us first look at how formal and total tax-rates depend on which of the previously described income measures we use. The Tables 4-6 show the formal- and total averages tax rates for each of the groups. Table 4 looks at the alternative of going from no work to full-time work, Table 5 the alternative from no work to half-time, and Table 6 reports the rates when the alternative from half-time to full-time is considered.

**Table 4**

Average formal- and total tax-rates for the full-time alternative				
	Income measure I		Income measure II	
	Formal tax-rates	Total tax-rates	Formal tax-rates	Total tax-rates
All groups	35.6	76.0	36.0	74.8
Social assistance	35.5	74.1	36.1	71.5
Unemployed	35.8	63.2	36.0	63.2
Medical- or vocational rehabilitation	35.4	76.1	35.9	75.1
Disabled, partly (less than 2/3)	34.8	64.2	35.0	63.8
Disabled, fully (more than 2/3)	35.5	80.7	35.9	79.1
Receiving early retirement pension (N=24970)	37.3	83.5	37.4	82.8

**Table 5**

Average formal- and total tax rates for the half-time alternative				
	Income measure I		Income measure II	
	Formal tax rates	Total tax rates	Formal tax rates	Total tax rates
All groups	30.0	73.2	31.0	72.7
Social Assistance	29.5	79.6	30.4	81.6
Unemployed	29.7	57.0	30.0	57.7
Medical- or vocational Rehabilitation	30.9	74.6	30.9	72.7
Disabled, partly (less than 2/3)	28.5	39.1	30.7	40.8
Disabled, fully (more than 2/3)	29.7	81.5	31.2	80.4
Receiving early retirement pension (N=24970)	31.4	82.0	33.3	81.9

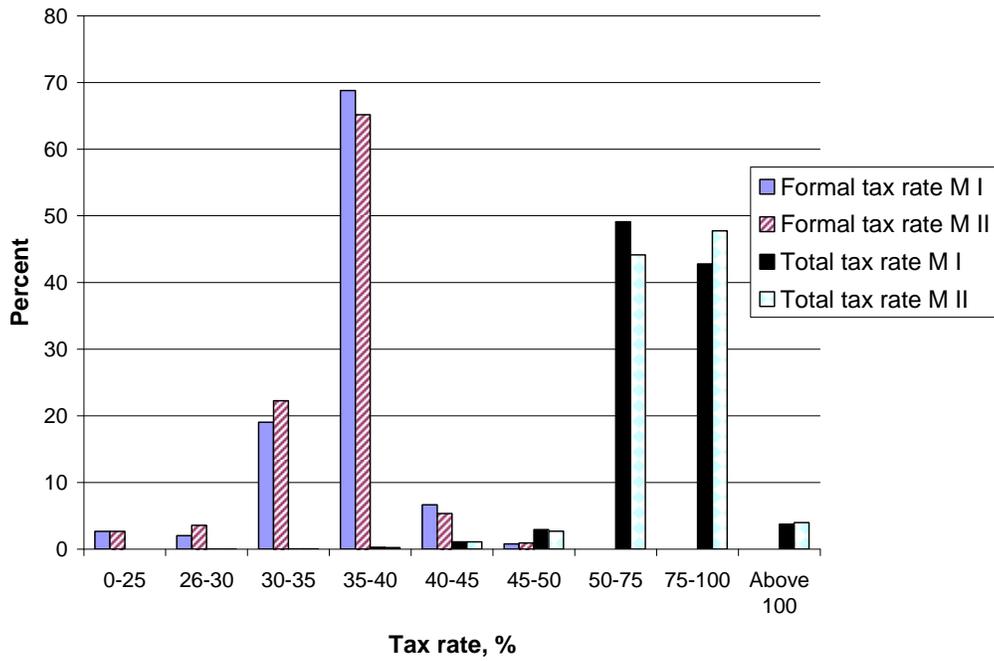
**Table 6**

Average formal- and total tax rates. half-time to full-time				
	Income measure I		Income measure II	
	Formal tax rates	Total tax rates	Formal tax rates	Total tax rates
All groups	41.3	78.1	40.9	76.8
Social Assistance	41.4	58.8	41.9	61.2
Unemployed	42.0	67.8	42.1	68.6
Medical- or vocational Rehabilitation	40.0	77.7	40.8	77.6
Disabled, partly (less than 2/3)	41.1	89.3	39.3	86.7
Disabled, fully (more than 2/3)	41.4	79.9	40.7	77.8
Receiving early retirement pension (N=24970)	43.1	85.0	41.5	83.7

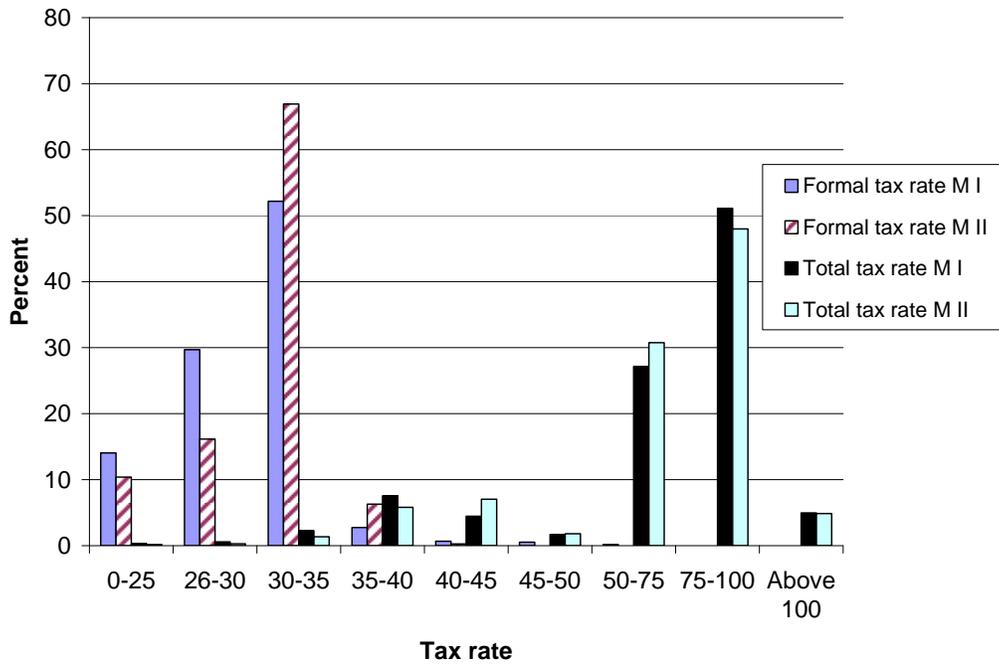
As mentioned, the tax system is complicated when taking into account the interacting rules, deductions etc., and which factors that dominates for the different groups is hard to spot. Let us nevertheless give some brief comments on what causes the differences between the different groups.

We see from the Tables 4 to 6 that the average differences in tax rates are not very sensitive to whether we use the wage estimation from where we control for selection (wage measure II) or the OLS regression (wage measure I). The formal tax rates for the fulltime alternative do not differ much between the different groups regardless of income estimation method used. The progressivity of the formal system is reflected in higher average tax rates for full-time than for half-time work. The early retired have the highest formal tax-rate (for full-time work) reflecting that they on average have high income if working. However, the high total-tax rates indicate that the net pension is high compared to their income if working. The lowest average total tax rates is for the unemployed and the less than 2/3 disabled. Young persons who on average have lower wage income are overrepresented among the unemployed, in addition it is possible to receive unemployment benefits of less than one base amount (BA), or about 40 000 NOK in year 2001, and unemployment benefits are taxed at a higher social security contribution tax rate. It might be worth mentioning that persons receiving social assistance on average face high total tax rates for the half-time alternative. This is mainly caused by the assumption that all social insurance is lost if working half time, unless the person has children. This is also the reason why the extent to which average total tax rates go up from part time to full-time (Table 6) is relatively moderate for this group.

**Figure 3. Distribution of formal and total tax rates, full-time work, based on the OLS- method (M I) and then selection model (M II)**



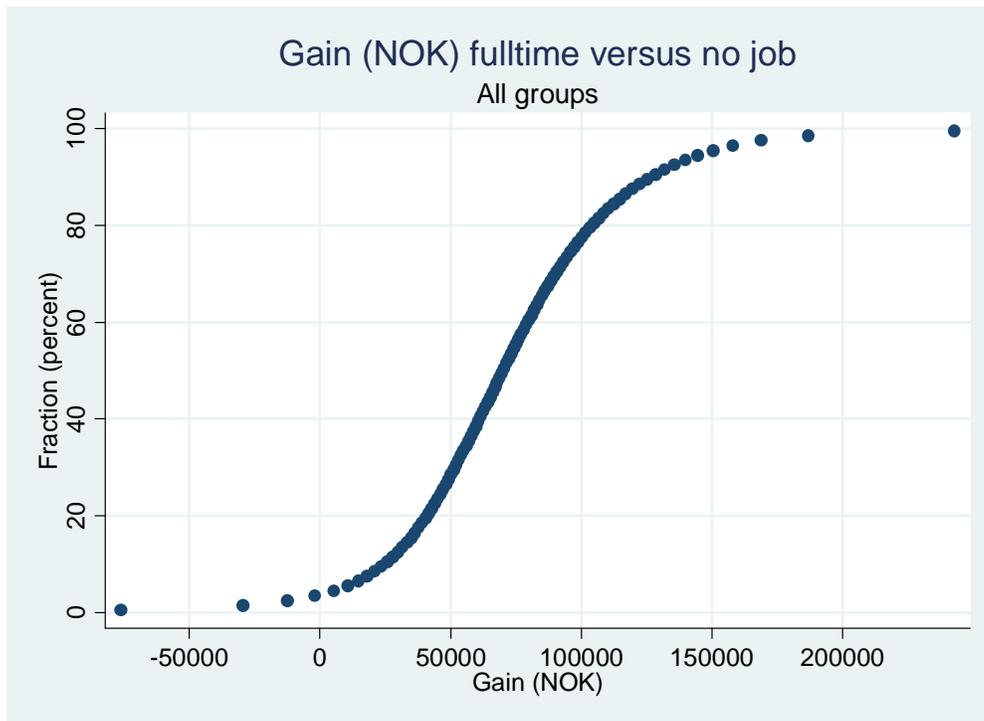
**Figure 4. Distribution of formal and total tax rates, half-time work, based on the OLS- method (M I) and then selection model (M II)**



In Figure 3 and 4 we see there are not large differences in tax rate distribution between the two income measures. In the following we report the results only from the selection based estimation method (income measure II). Next we study in more detail the distribution of taxes and the gains from working. We measure these incentives by the net gain from working (in NOK), and in a person's return relative to the employers cost. The latter measure is what we call total tax rate (see equation (2)): The part of the wage cost that does not come to the employee because of tax- and benefit loss. First, the results for all groups (aggregated) are presented. We look at the gain-distribution according to the measures above, the association between gross income and total tax-rates, and the association between formal- and total tax rates. Second, we report the same results for each of the five groups.

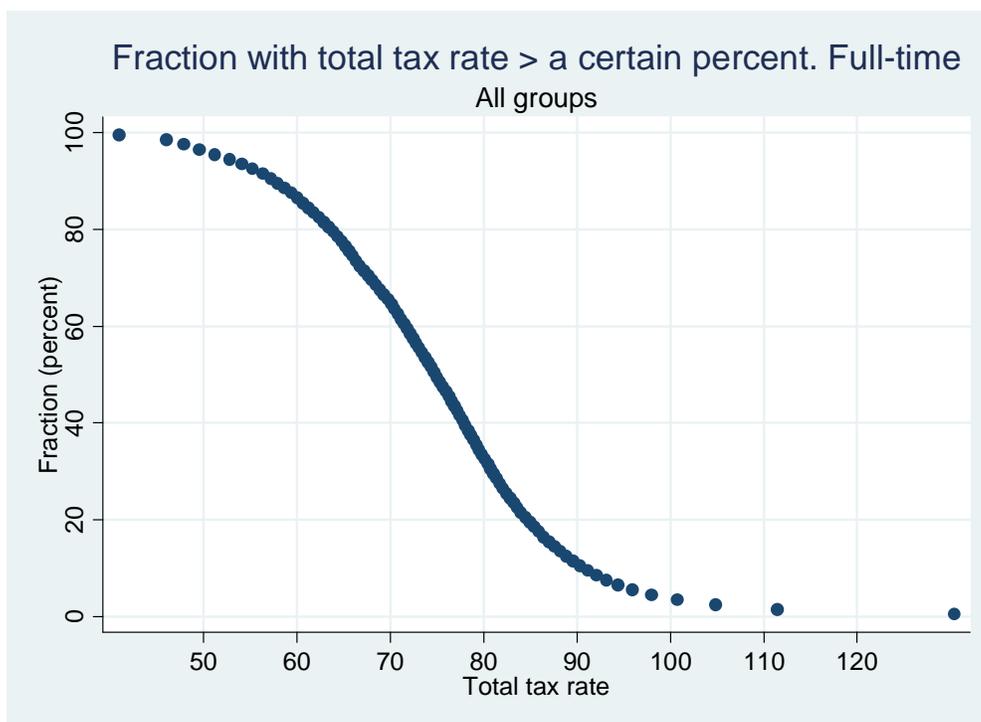
The population is divided into percentiles according to their predicted gain. Figure 5 and 6 show the cumulative gain-distribution according to the two measures. Each dot represent one percent of the population. We observe from Figure 5 that one percent of the population will have an income loss, if working full-time, of more than 50 000 NOK. We also see from Figure 5 that about 4 % will be better off if not working (fulltime), and that about 80 percent of the population gain less than 100 000 from working fulltime.

Figure 5



Similarly we describe the distribution of the total tax rates in Figure 6. We see that only about one percent of the population face a total tax below 40 %, 65 percent of the population face a total tax rate above 70 percent, etc. Like in Figure 5 we see that about 4 % of the population is better off if not working, that is, they face tax rates above 100%

Figure 6

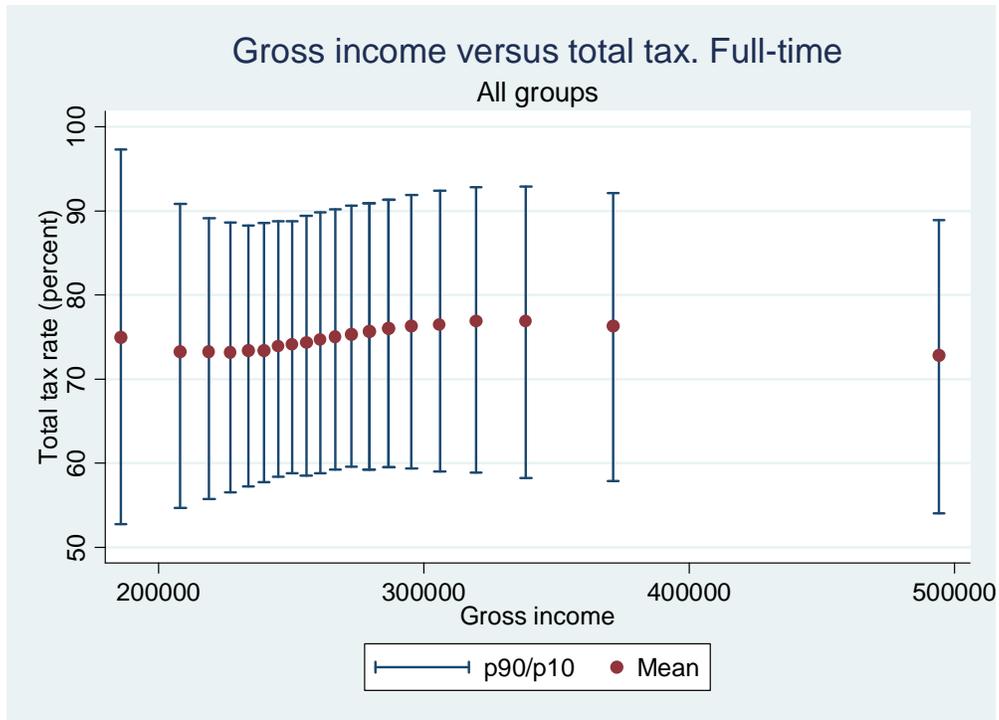


Next we turn to how total tax rates correlate with gross income, and with formal tax rates. This is done to study whether or not it is those with the highest wage incomes that face the highest total tax rates, and related to this, whether those with the highest formal tax rates also face the highest total tax rates. If the persons facing the highest formal rates also face the highest total rates, a tax reform aimed at cutting the highest formal tax rates, is expected to cut the highest total taxes as well. We will simulate the effect on economic incentives of such a reform in Section 6.

We divide the population into 20 groups according to predicted full-time income (Figure 7) and formal tax rate (Figure 8). For each of the 20 groups we report the average total tax rate and the within-group dispersion (10. and 90. percentile). The first data-point from the left in Figure 7 shows that the 5% group with the lowest predicted income, on average earn less than 200 000 NOK if working, and that this group on average face a total tax rate of about 75 %. In addition we notice that the variation in total tax-rates is large for this group. The 80 % mid interval ranges from below 55 % to above 95 %. Further we see from Figure 7 that on average the tax rate first decreases with income, then it increases slightly, until it decreases again. This variation in mean tax rates between the different income groups is very small. It is

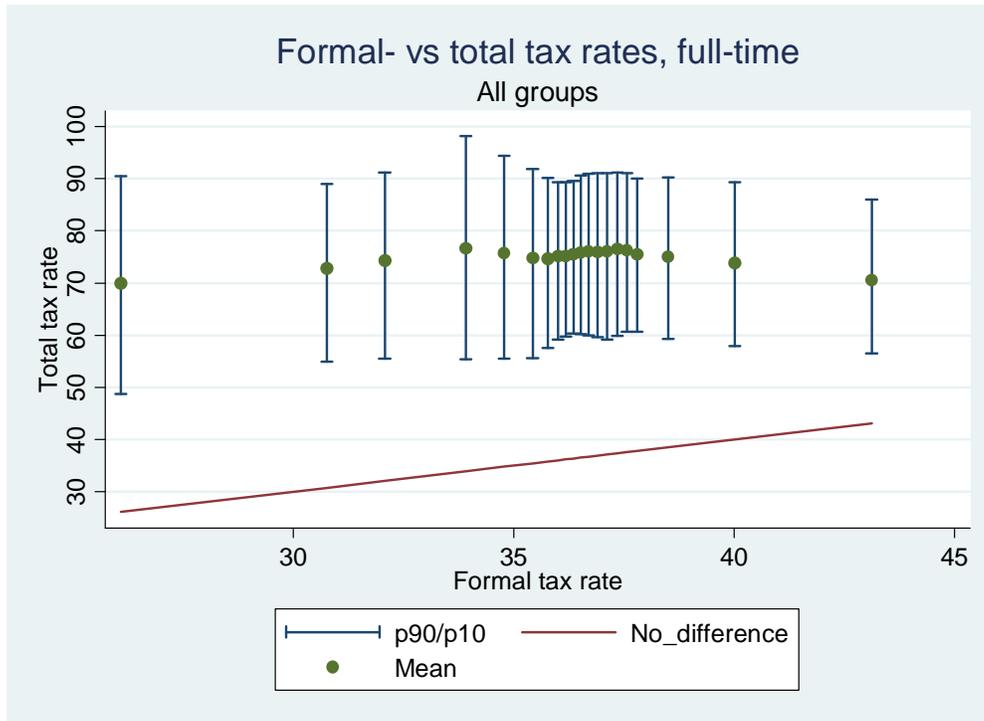
worth noting that the 5 % group with the highest income on average faces the lowest total tax rates!

**Figure 7**



The variation between income and total tax rates is reflected in the variation between formal and total tax rates in Figure 8. The line labelled “No\_difference” in the figure indicates where total taxes equal formal taxes. Figure 8 also shows that there is no clear connection between total and formal tax rates. Persons facing the highest total tax rates are in the middle of the formal tax distribution.

Figure 8



For many individuals the most realistic alternative is to (continue to) work part-time, and therefore it is interesting to study the incentives associated with half-time work. If a person receives more than 50 % of “full benefit” (the benefit received if not working at all), we assume that she will receive 50 % of full benefit if working half time.<sup>7</sup> We see from Figure 9 that about 70% gain less than 50 000 from working half-time, and only 3 % gain more than 100 000.

From Figure 10 we see that quite a large fraction will face high tax rates if working half-time. Less than 40% face tax rates below 70 %.

<sup>7</sup> If a person receives less than 50 % of full benefit, we assume that this benefit is kept constant if working half-time.

Figure 9

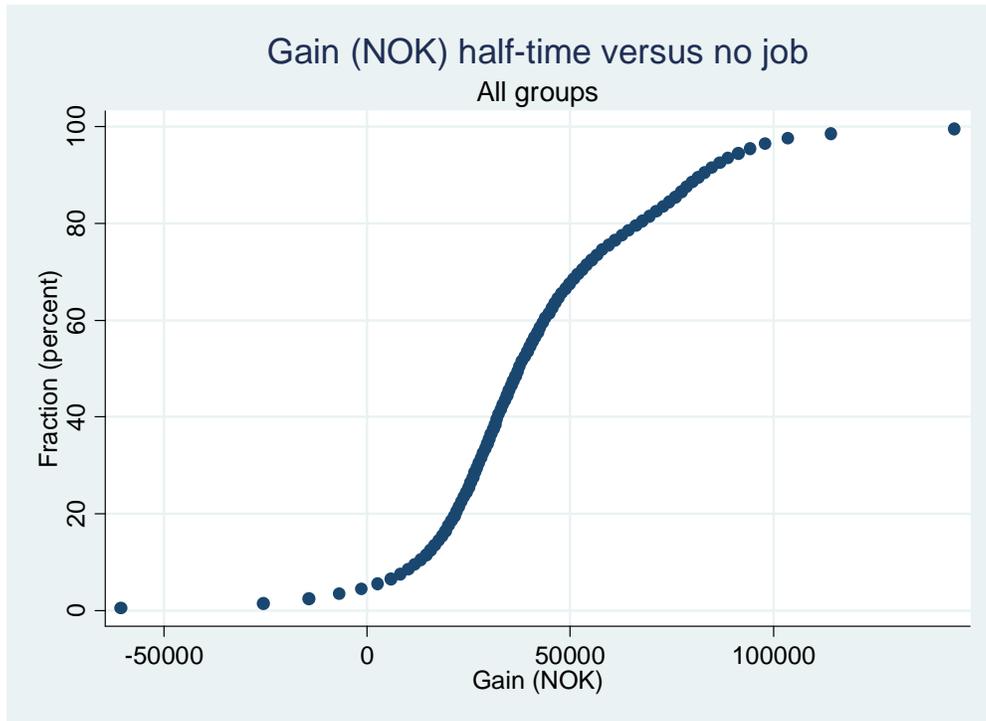
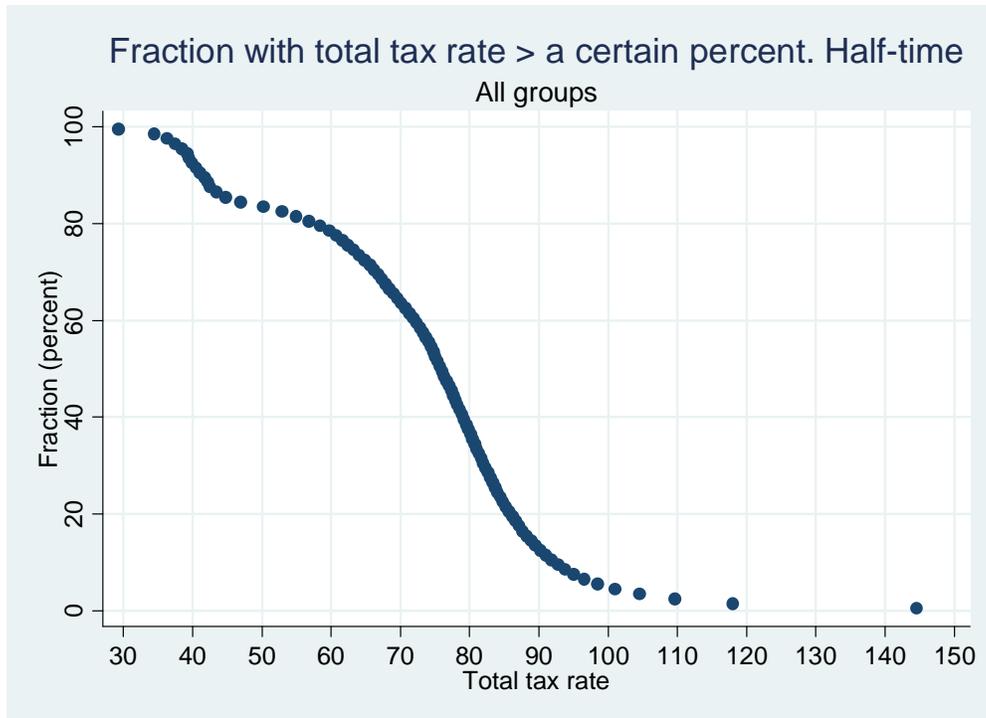


Figure 10



So far we have presented results for all five benefit receiving groups aggregated. We expect that there is a significant variation between the different groups, and that these aggregate numbers are driven by the large group of disabled. One might argue that other groups are more interesting because work is a more realistic option. We therefore report similar figures as above for each of the five groups, and comment rather briefly on the results.

### Unemployed.

This group consist of persons who receive unemployment benefits by the end of December 2000. About 54 percent was fully unemployed, 34 percent partly unemployed, while 13 percent participated in some kind of labour market programmes. Figure 11 show that the gains for fulltime work is high for the unemployed (compared to the aggregated numbers). Only about 1 % have an economic loss of working fulltime. Only 10 percent gains less than 50 000 and 20 % gains more than 150 000.

Figure 11

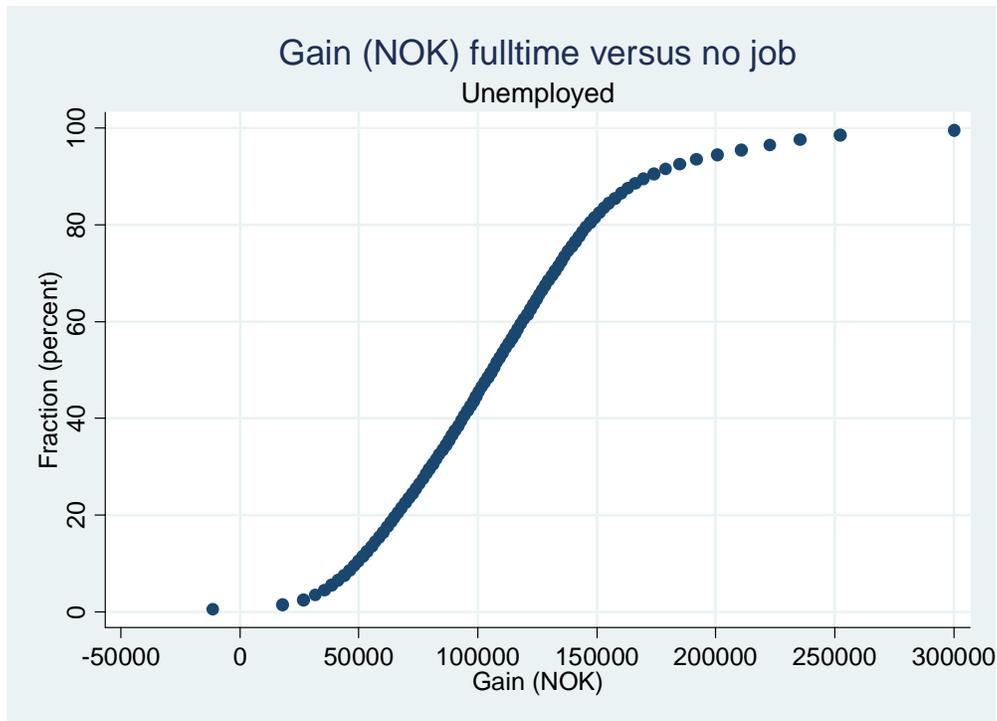
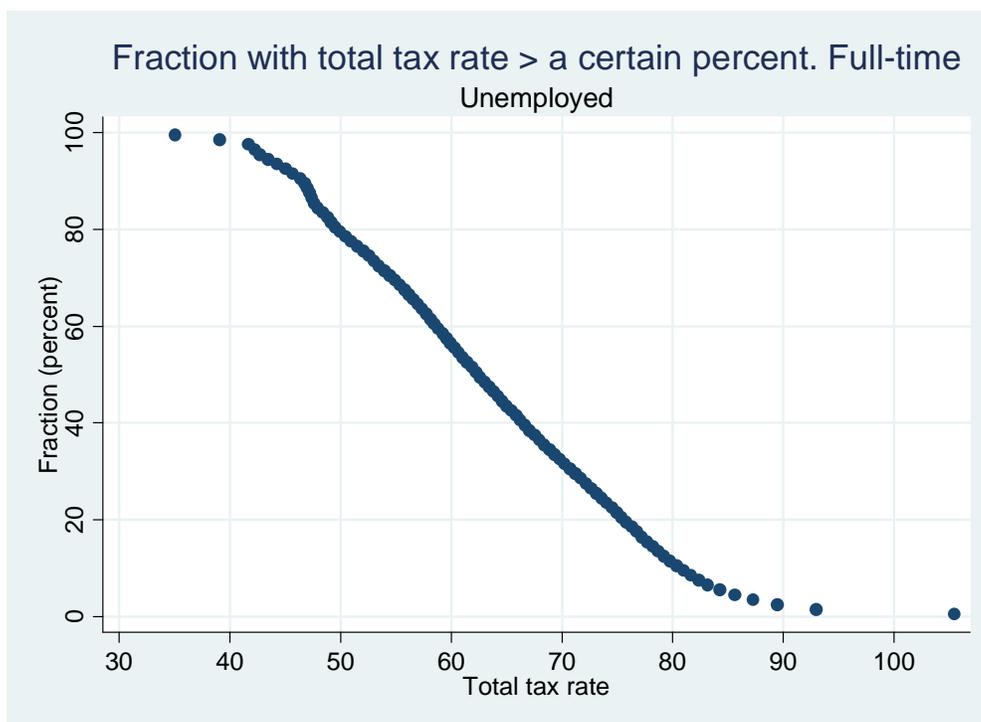


Figure 12



From Figure 12 we see that about 60 percent face a total tax rate above 60 %, while for the whole population of unemployed 60 percents have tax rates above 70 %. There might be several reasons for this. First, unemployment benefits are taxed at a higher rate than most other benefits (it is taxed as labour income). Second, a person might be eligible for very low unemployment benefits. And third, predicted wages are higher than for some of the other groups. When comparing total taxes and gross income we find clearer than for the aggregate group that the tax rates are highest for those with the lowest incomes. The average tax-rates falls until a gross income level about NOK 270 000, thereafter they rise until about NOK 350 000. Beyond 350 000 they fall again, and we see that those with the highest incomes on average face the lowest tax rates. The huge variation within each wage group is mainly driven by two factors. First, there is variation in benefits, which is calculated from last year's income or average income the last three years. Second, payroll taxes vary depending on municipality of living.

Figure 13

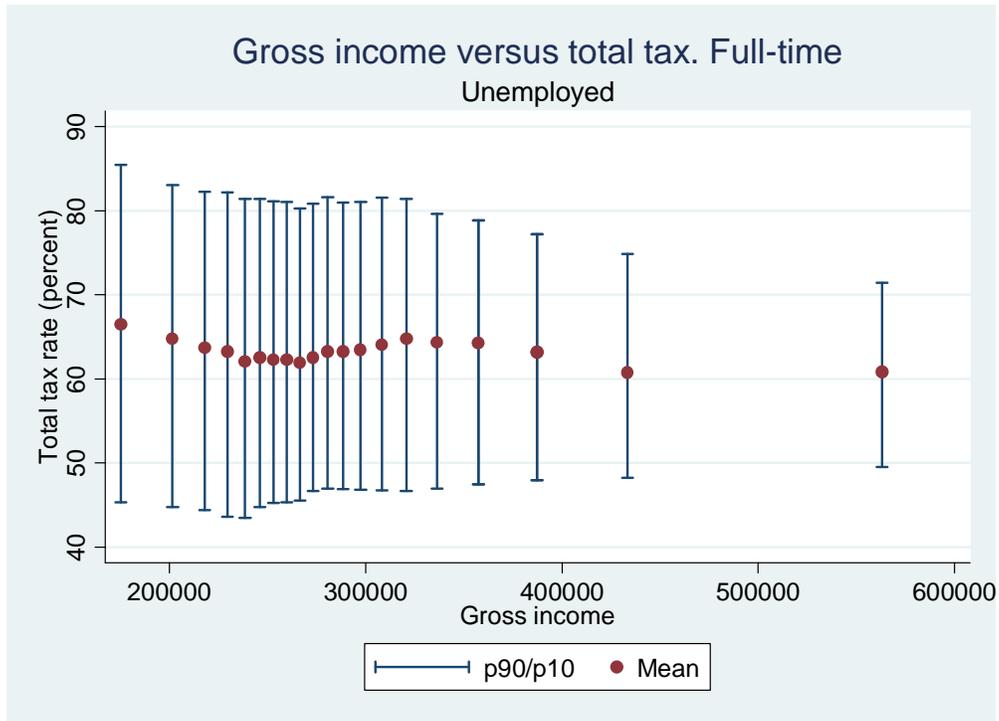
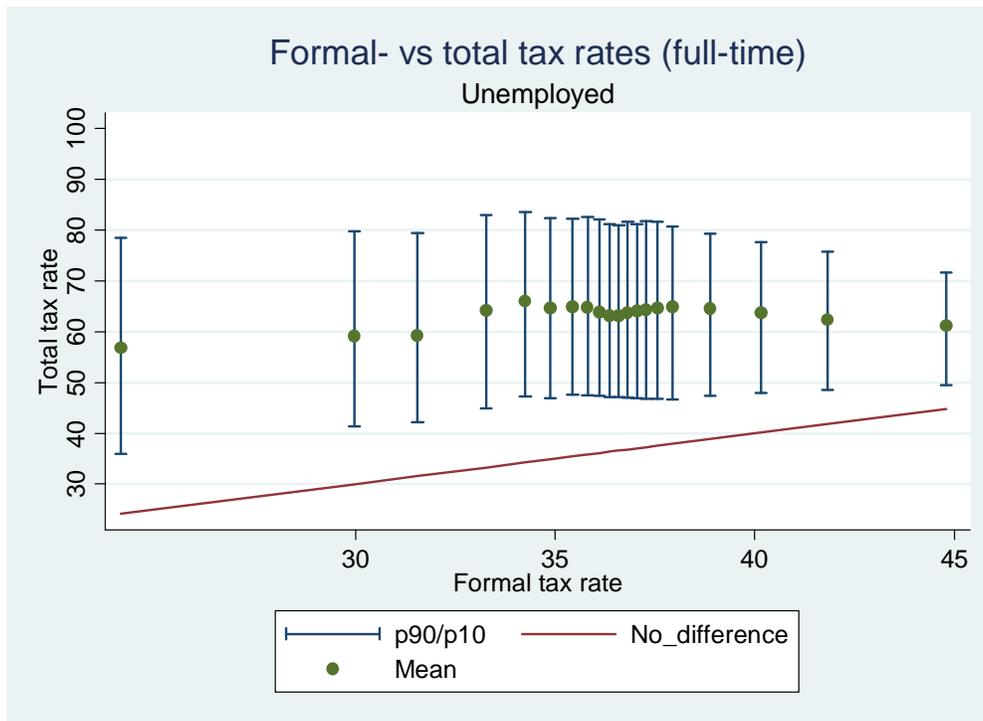


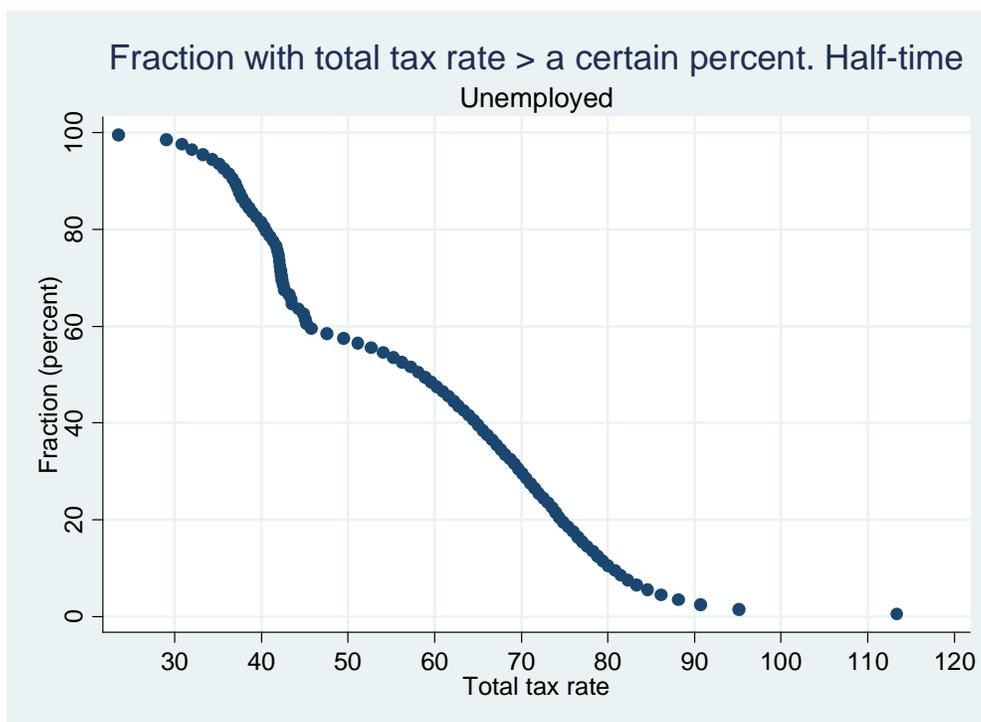
Figure 14 show that there is no clear connection between formal and total tax rates. The highest total rates are for person with medium formal rates.

Figure 14



From Figure 15 we find that a large fraction of the unemployed (compared to all groups all benefit receivers) face low tax rates related to half time work. As much as 40 percent have tax rates below 40 percent, primarily caused by a large fraction having low benefit entitlements.

Figure 15



### Social Assistance.

Social assistance is typically considered the last layer of the social security, intended to secure some income for person not “caught” by other part of the social security system. Immigrants typically receive social assistance for some time after arrival in Norway, and immigrants from outside the OECD area make up about 32 percent of this group. As pointed out in Section 4 this makes the labour income estimation particularly difficult. In addition this benefit is not based on “rights” in the same way as other part of the benefit system, and the assumption that one might get the same benefits next year as the present year might be unrealistic. We assume that social assistance receivers lose the social assistance if working half- or full-time, unless they have children. If they have children (below 18 years old) they get half the amount if working half-time. We see from Figure 16 and 17 that a large fraction (7-8 percent) will experience an income loss if working. As good as no one will gain more than 200 000 NOK. There is a very large variation in total tax rates, from 40 to more than 130 percent.

Figure 16

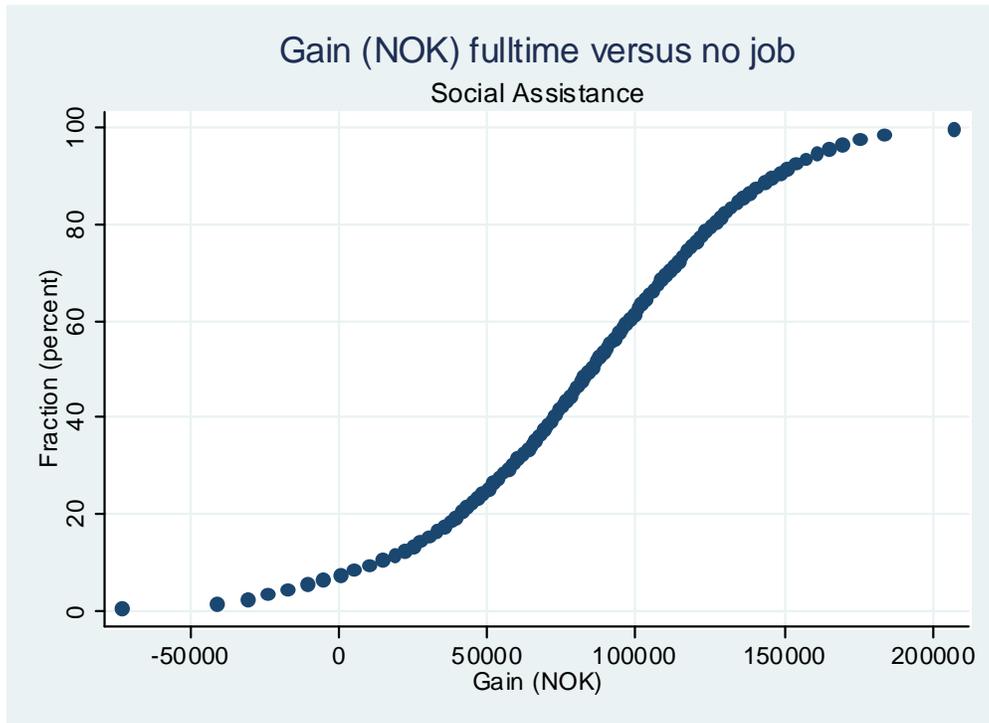
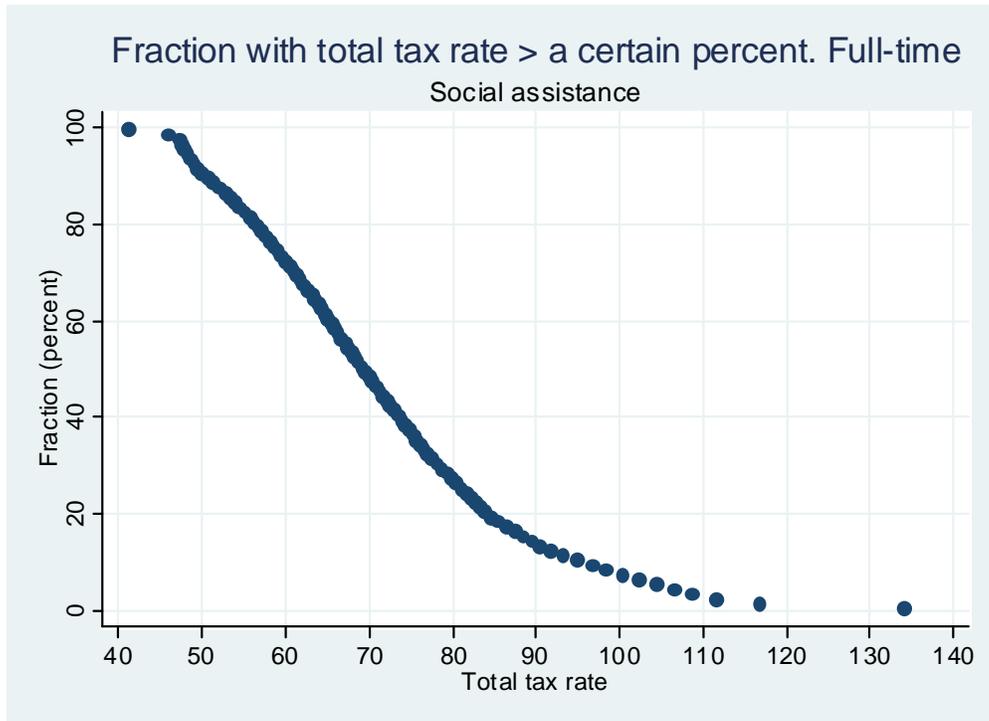


Figure 17



The correlation between gross income and total tax rates shows the large variation in tax rates for each income category. For the lowest income groups it varies from 50 to more than 100 percent for the middle 8 deciles. The highest total tax rates are for persons facing formal rates around 35 percent.

**Figure 18**

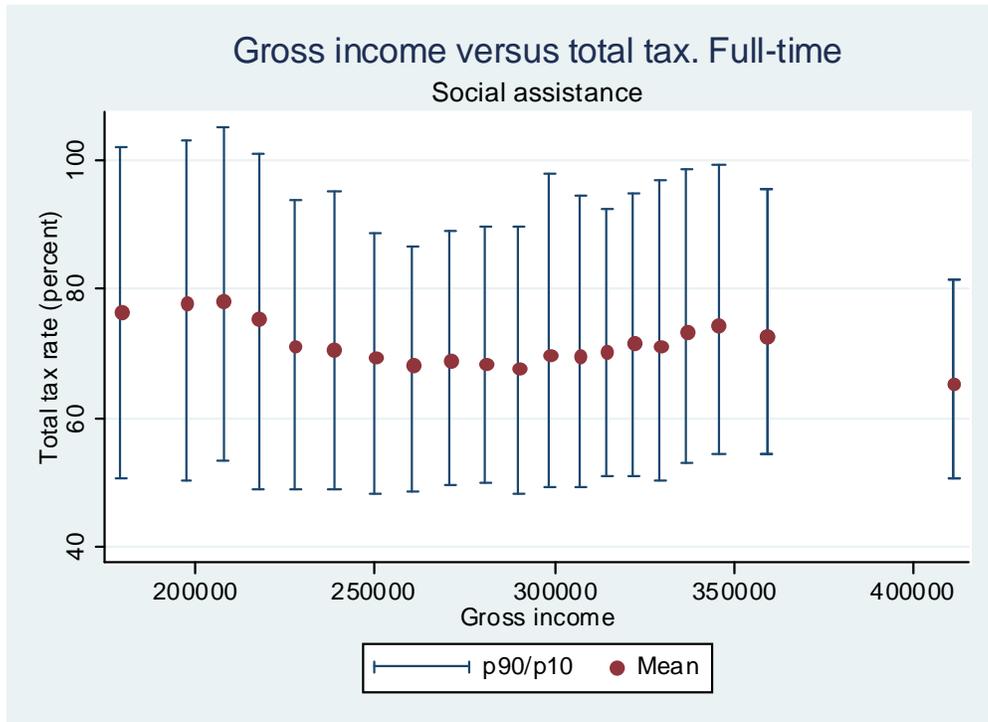
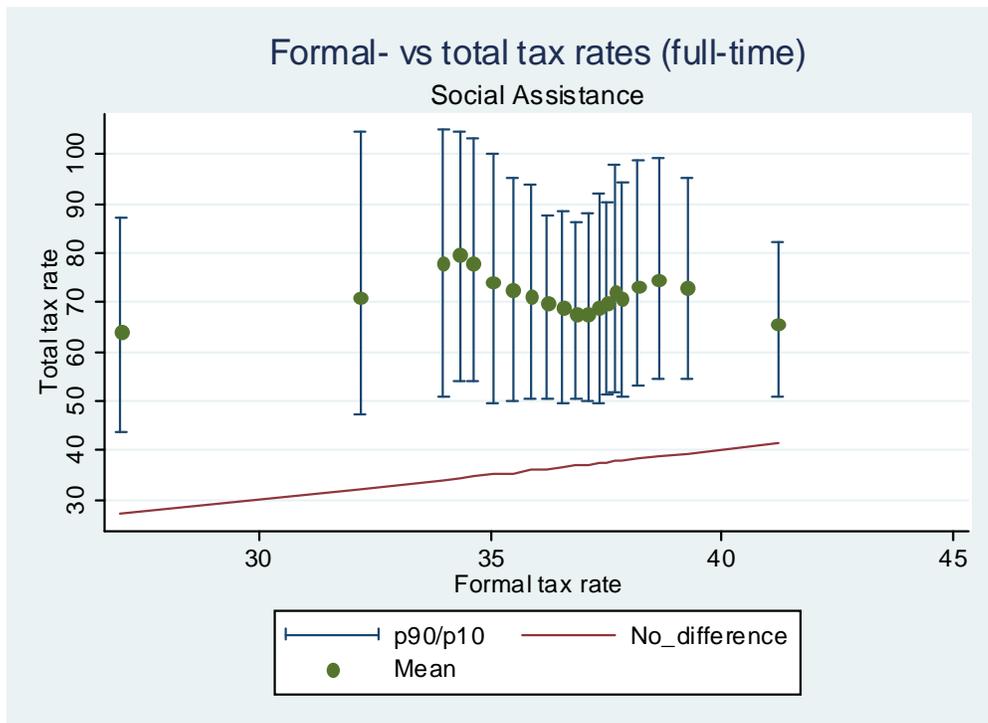
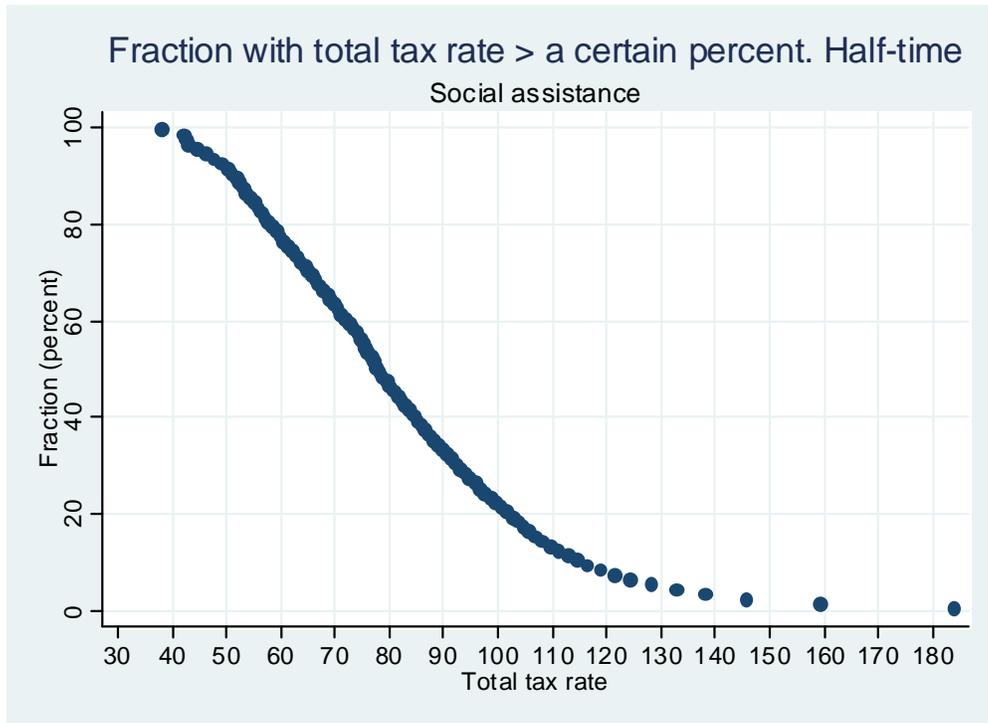


Figure 19



The transition to half-time gives small economic gains for the present group. Only about 10 percent face tax rates below 50 percent, and about 20 percent have tax rates above 100 %. These results are strongly affected by the assumption that for a large fraction (those without children) all benefits are lost if working half time.

**Figure 20**



**Participants on medical- or vocational rehabilitation programs.**

In 2001 rehabilitation benefits are calculated in the same way as disability benefits (though the tax system differs slightly). We see that for this group the gain from working full-time is small. Almost 80 percent gain less than 100 000 if working, and about 30 percent face tax rates above 80 percent.

Figure 21

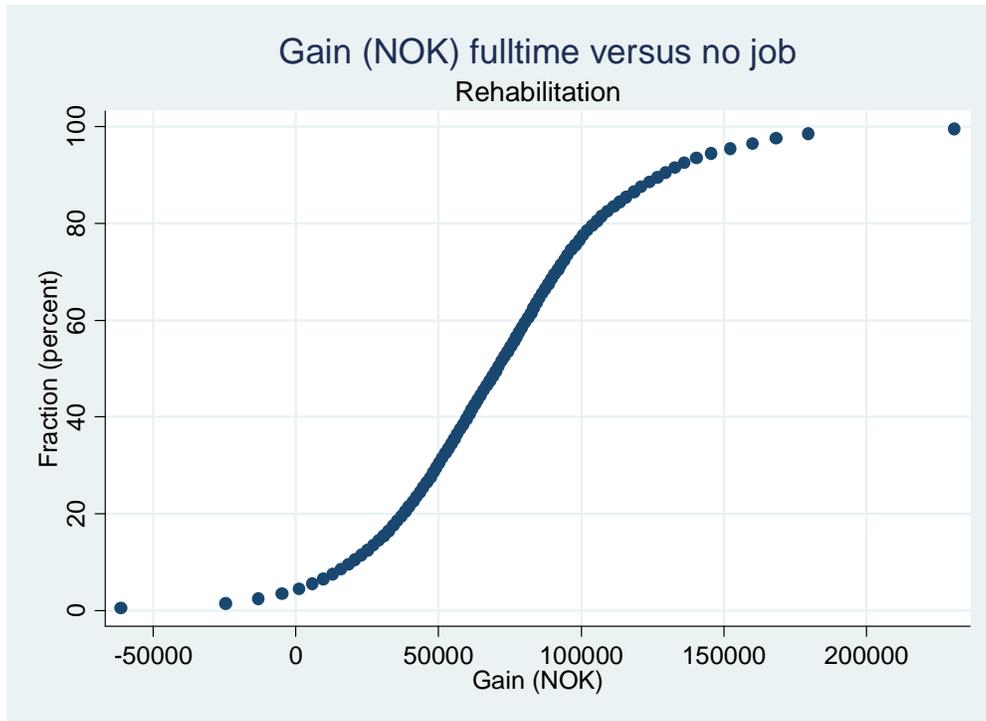


Figure 22

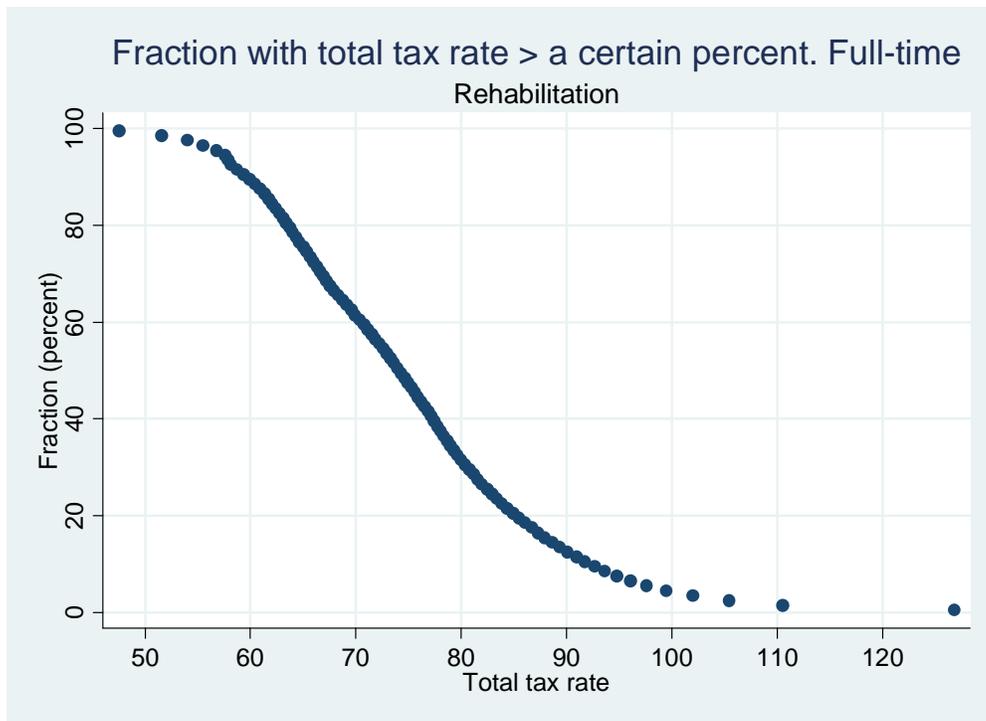


Figure 23 shows that for this group, in average, total tax rates are falling with gross income. The 5 percent fraction with lowest income in average face the highest tax rates, whereas the 5 percent with highest predicted wages face the lowest tax rate. The variation in tax rates is very large for this group in general and particularly for the low income group.

**Figure 23**

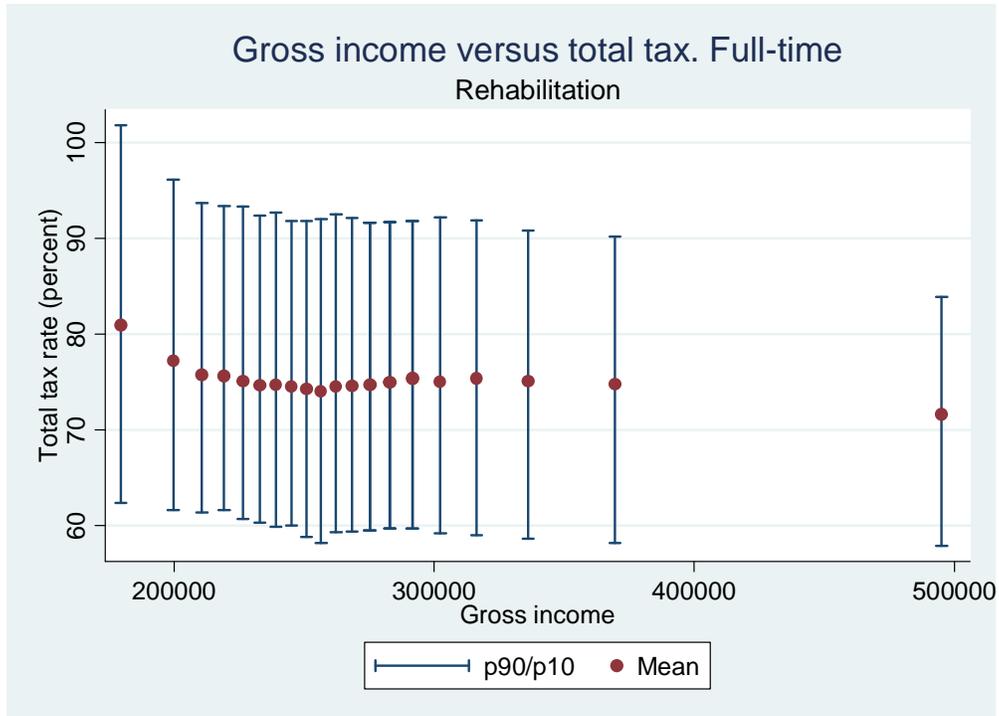
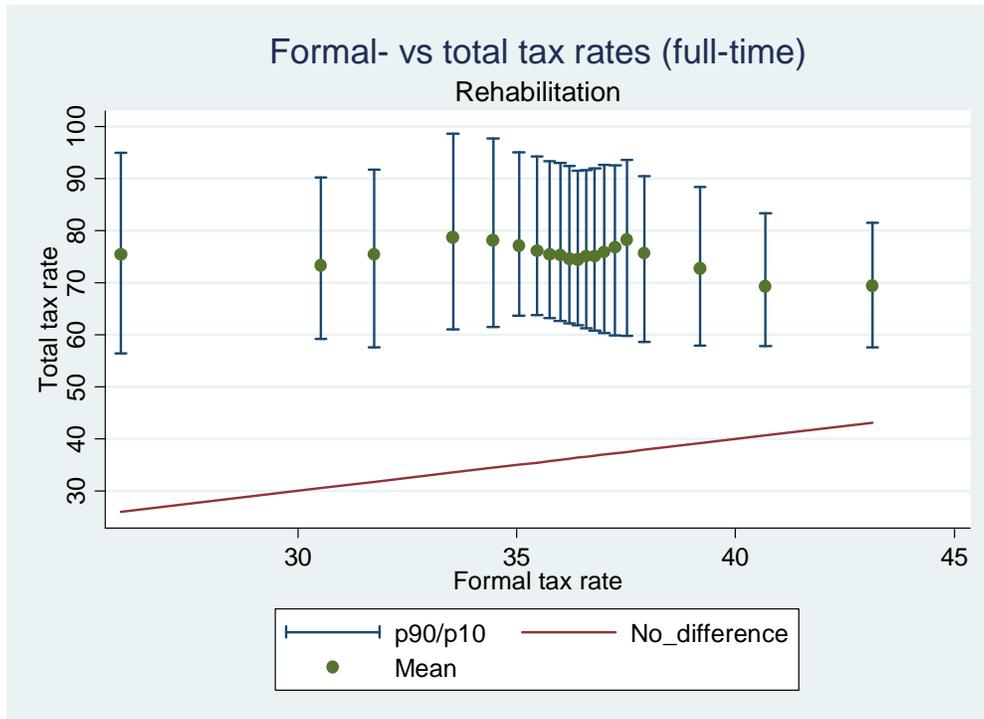
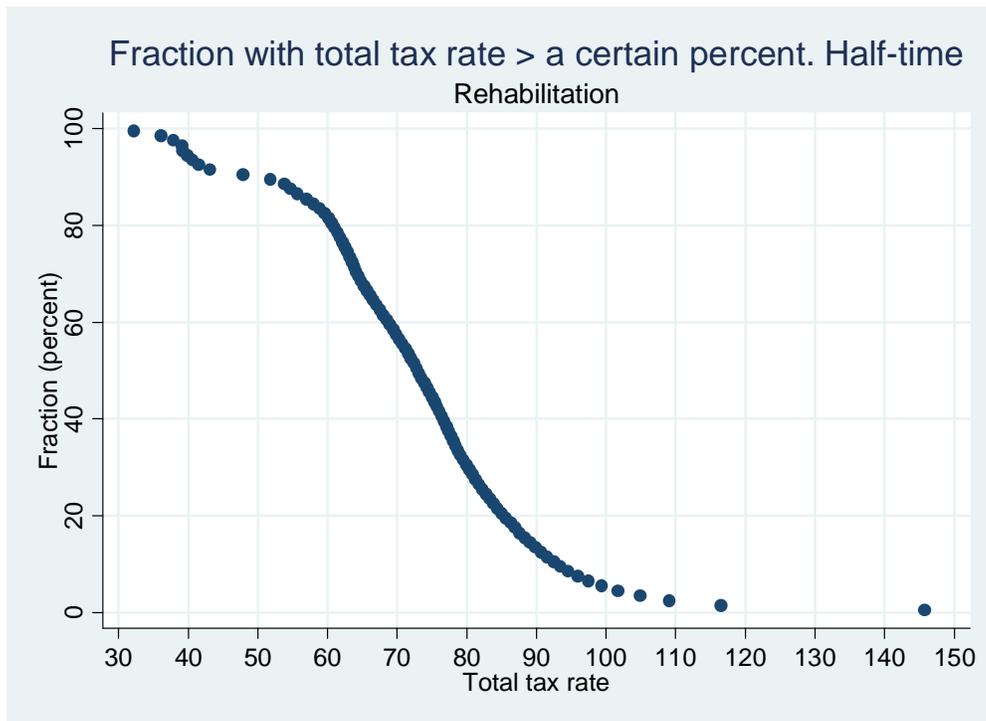


Figure 24



Most participants on rehabilitation programmes gain something if working halftime. However, the median person in this group faces a tax rate close to 75 percent from part time work.

Figure 25



### Disabled.

The largest, and fastest growing, group of benefit receivers is persons receiving disability pension. Disability pension is calculated in the same way as rehabilitation benefits, but the tax rules are more favourable for the disabled. This is a group that typically has left the labour market permanently, in the sense that the return rate is close to nil. One might ask whether talking about economic incentives for this group is meaningful, since they are considered unable to work by a general practitioner. However, one might argue that because the return rate is so low it is important to highlight the economic incentives. Even though a large fraction have no realistic job offers, one might suspect that for some persons economic incentives might be one of several factors affecting whether a return to the labour market takes place or not.

We see from Figure 26 and Figure 27 that about 4 percent of this group will have an income loss if returning to work. As good as none will gain more than 200 000 from returning to fulltime work and the tax rate for the median person in this group is about 75 percent.

Figure 26

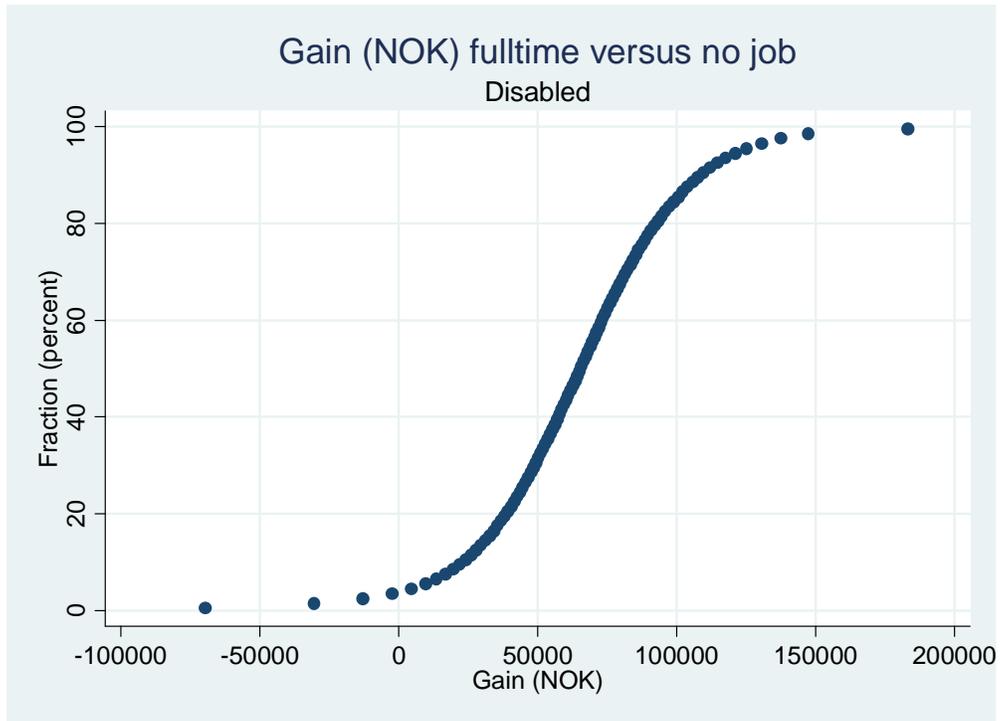
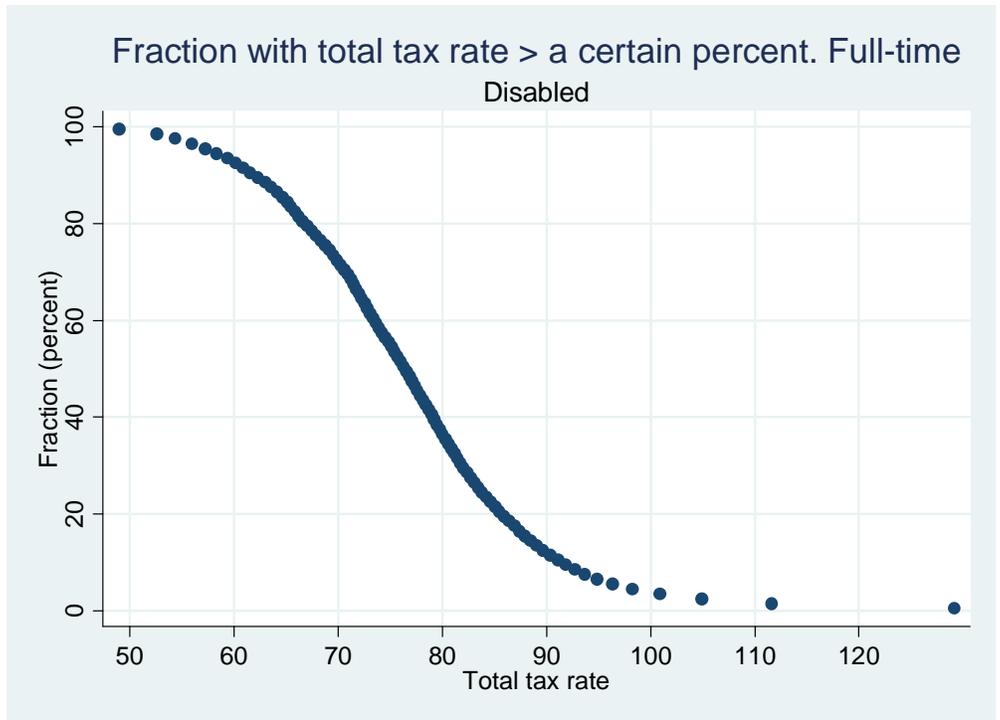


Figure 27



It is hard to see a clear connection between income and total taxes, and between formal and total tax-rates for the disabled.

Figure 28

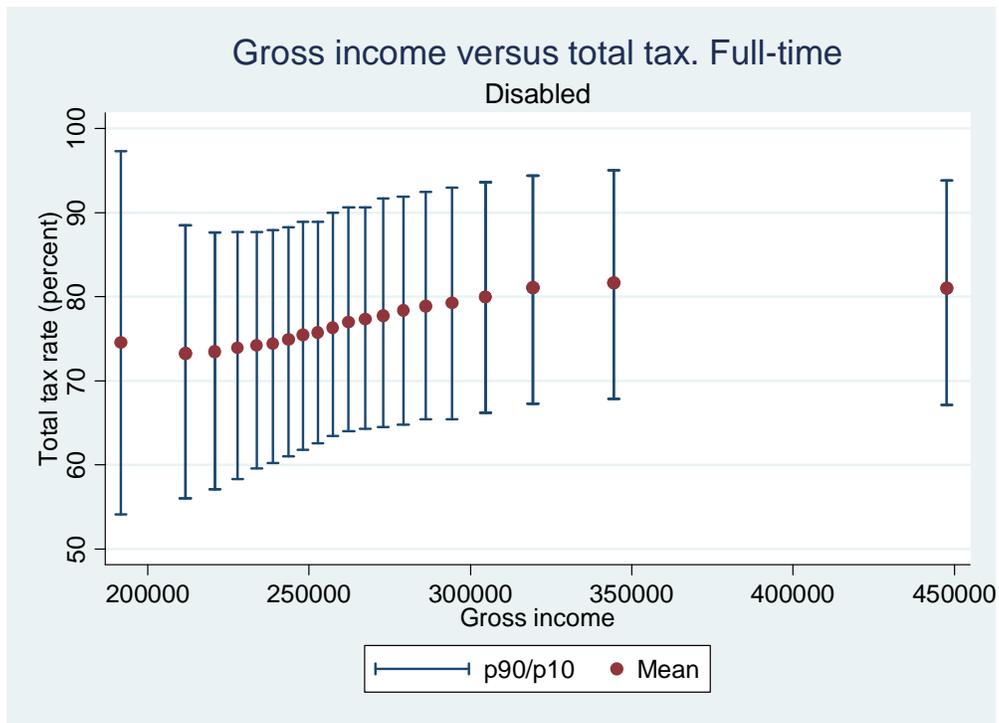
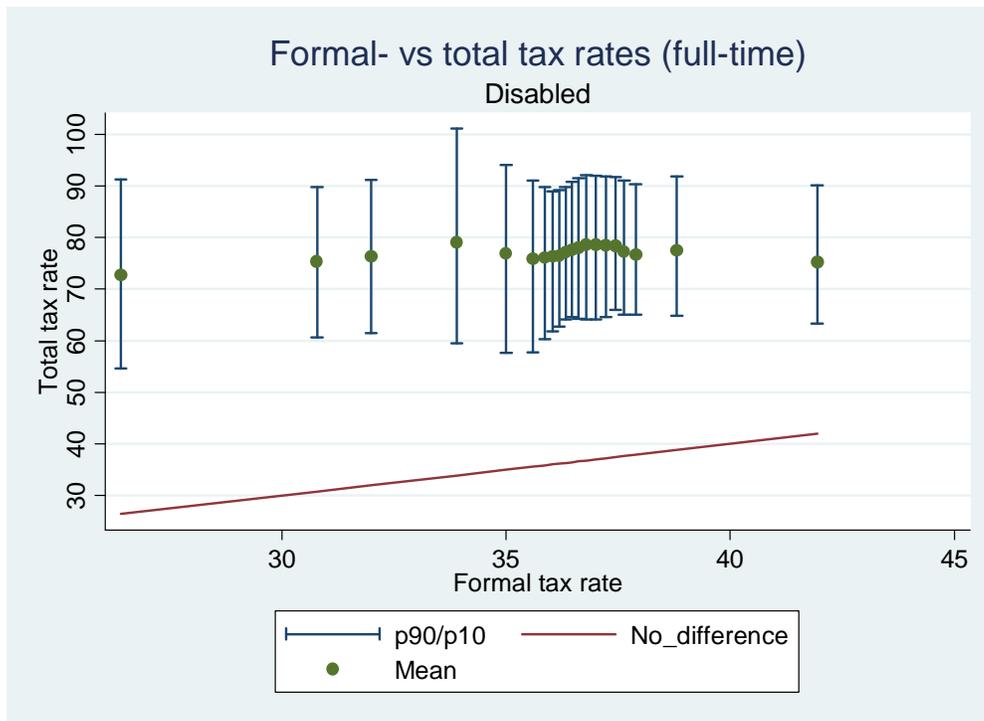
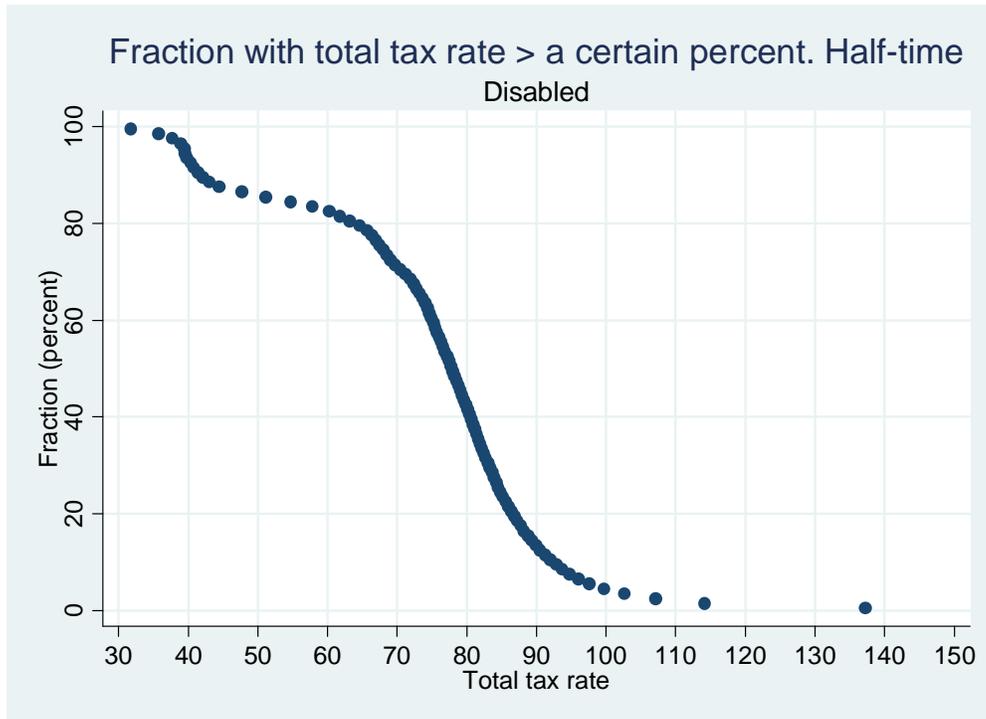


Figure 29



Part time work might be the (only) realistic option for many individuals in this group. For the median person this alternative would cause a total tax rate of above 75 percent. This is slightly higher than for those participating in rehabilitation programmes. One important reason for this is probably that disabled is eligible for special tax treatment, so that pension below a certain amount is not taxed at all.

Figure 30



### Early retirees.

The group “eligible for early retirement benefits” is from a policy point of view a particularly interesting group, both because it is predicted to grow rapidly due to demographic developments, and because the extent of choice in the labour supply decision is considered less controversial than for other benefit claimants. In contrast to many of the other benefit receiving groups, most of the early retirees are observed with a previous full-time labour income, making the wage prediction less uncertain. Since we look at persons already retired, the interpretation of the figures below would be related to the distribution of economic gains if not retired. We see from Figure 31 that the gain from (continuing) work is relatively small for the early retired. In spite of the high gross income for this group, only one percent gains more than 200 000 from working fulltime compared to not working at all. Around 6 percent lose money if working, and half the group gain between 50 000 and 100 000 from working. We further see from Figure 32 that about 60 percent face a tax rate of more than 80 percent.

Figure 31

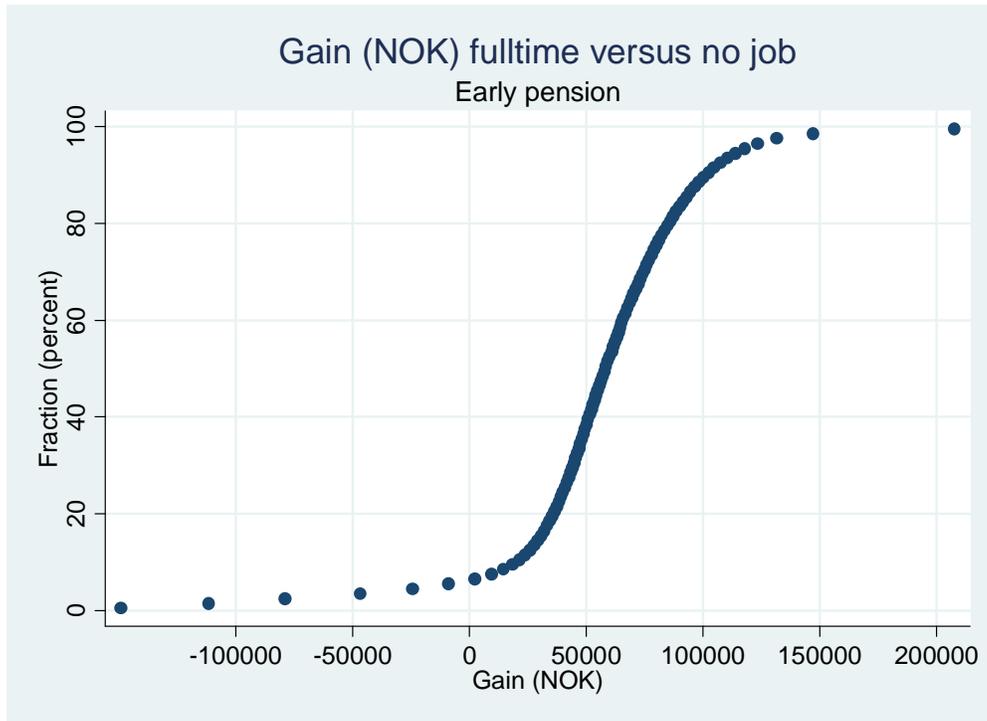
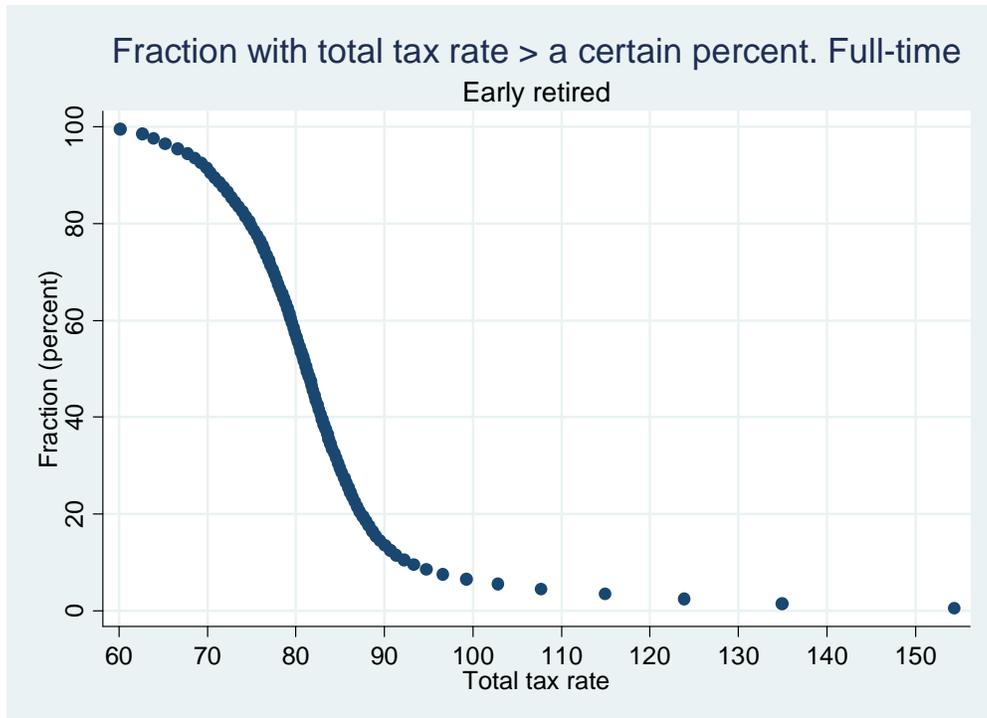


Figure 32



Again, we find no clear correlation between gross income if working and the total tax rate, and those facing the lowest wages face the highest tax rates. From Figure 34 we find no clear correlation between formal- and total tax-rates.

**Figure 33**

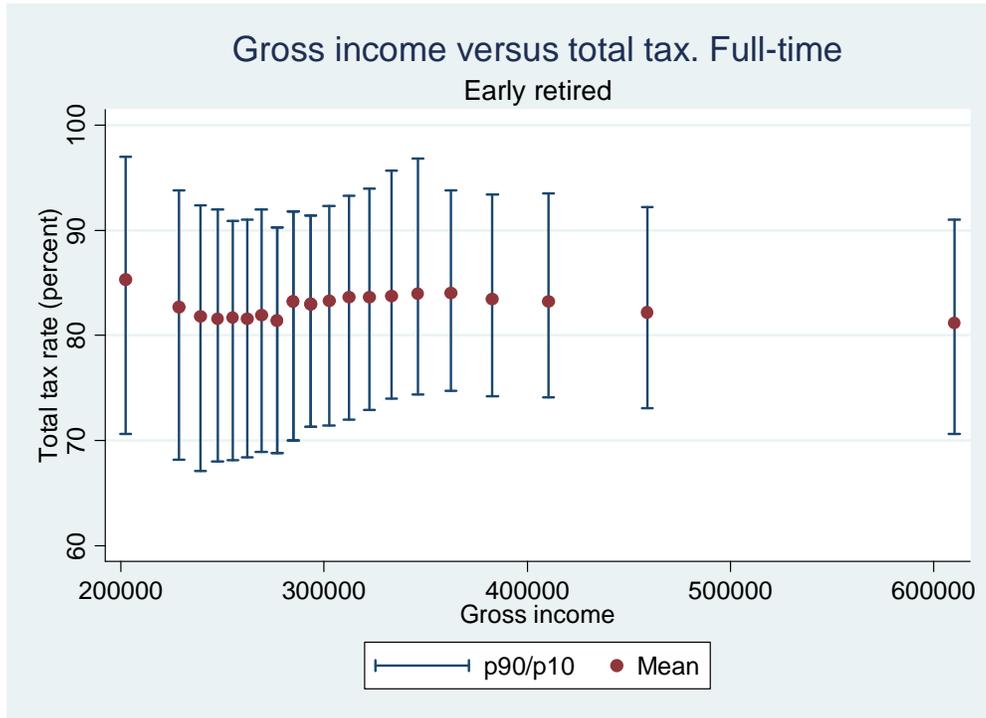


Figure 34

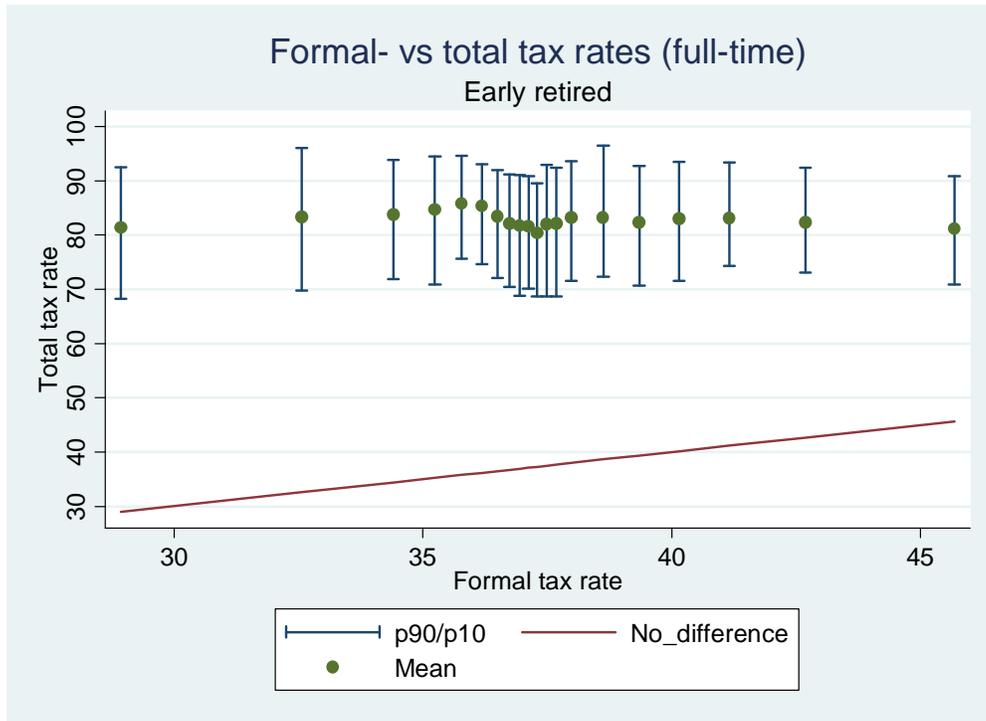
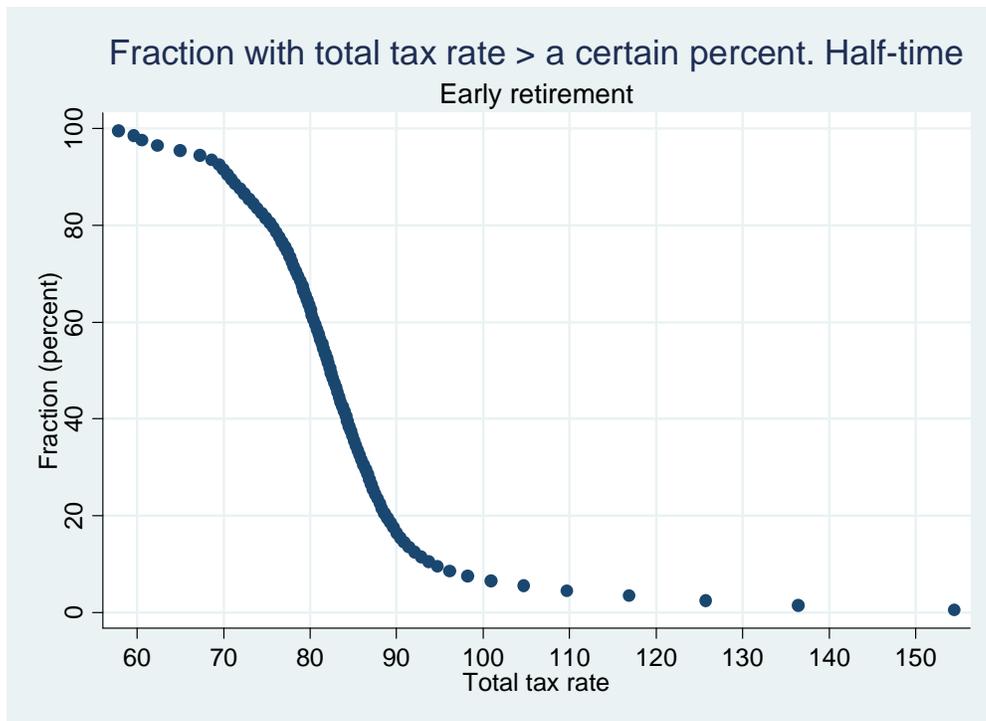


Figure 35



For the early retirees the total tax rates, associated with half-time 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 for many elderly, part time work would be a more realistic alternative than full time work.

## **6. Reforms of the formal tax system**

In this section, we investigate how two hypothetical revenue neutral reforms of the formal tax system may affect the distribution of total tax rates. The first reform is a flattening of the formal tax system, whereas the second is introducing in-work tax credits.

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 by increasing the 28 percent tax rate on “ordinary” income accordingly. Based on a rough calculation from a population of persons between 20 and 67 years old<sup>8</sup>, this would lead to an increase in the tax rate on ordinary incomes (including payroll taxes) of 2.7 % to 30.7 (27.2% in northern Norway), (where labour supply is regarded as given).

The main motivation for a flatter tax regime would be to “make work pay”, that is to increase the incentives to work (more). Taxing the (low) benefits harder would reduce the value of the benefits, and we might suspect that such a flattening tax reform would increase the incentives to work for the benefit receivers. This turns out *not* to be the case. In Table 7 we report the fraction of the benefit claimants where the flattening reform would improve incentives –as measured by the total tax rate- to work half- and full-time. From the first line we see that 9.2 percent of the benefit

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<sup>8</sup> Based on a population containing the whole labour force and all benefit receivers in 1998, assuming that labour supply is unaffected by the tax change. Persons older than 66 years old are not included (we might think that they are compensated in one way or another)

receivers would get their incentives to work full-time improved from this reform, while the corresponding number for half-time is 2.6 percent. In other words more than 90 percent will be subject to a higher tax wedge after such a reform. The main reason for this is that benefit claimants normally are predicted to obtain a full-time income well below the top-rate tax threshold. The revenue neutrality applies for the whole population, whereas for the benefit receivers the reform simply implies a higher tax rate. The highest fractions with improved work incentives are among the unemployed and those receiving early retirement pension. This reflects that the fraction with high predicted income is largest among these groups.

**Table 7 Fraction benefiting from a tax reform toward a less progressive tax system**

	Total tax rate	
	Fraction with reduced tax, full-time (%)	Fraction with reduced tax, half-time (%)
All benefit claimants	9.2	2.6
Social Assistance	3.2	0.0
Unemployed	15.2	2.3
Medical- or vocational Rehabilitation	12.7	2.9
Disabled, partly (less than 2/3)	2.4	1.4
Disabled, fully (more than 2/3)	6.5	2.1
Receiving early retirement pension	20.5	11.1

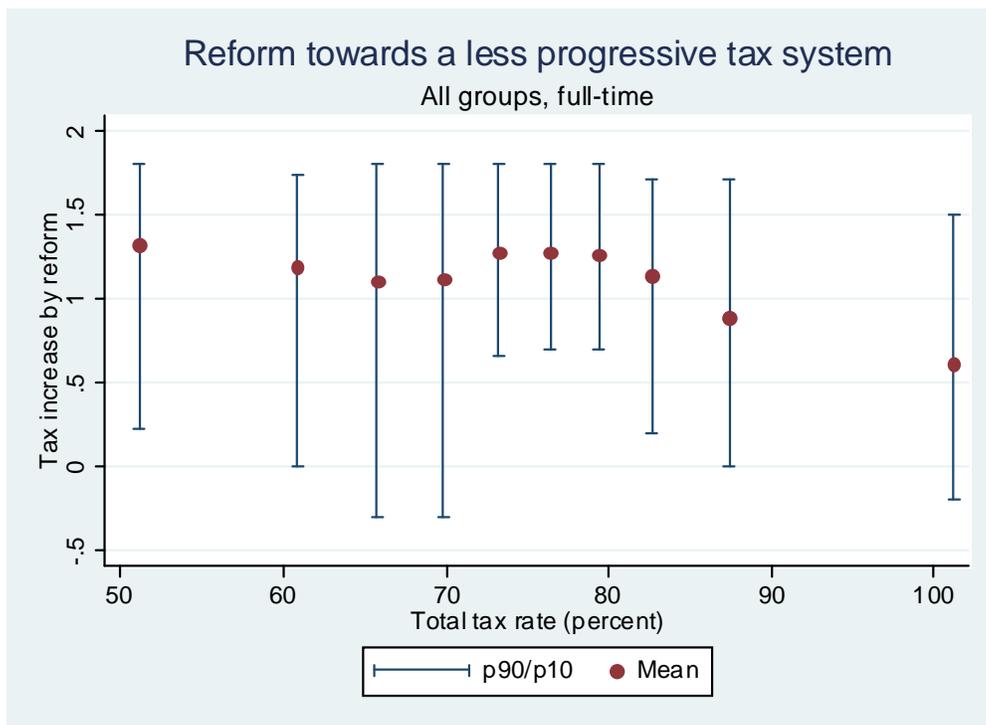
Table 8 shows the size of the average tax increase for the different groups, showing that the unemployed, participants in rehabilitation programs, and persons receiving early retirement pension on average would be affected less than the other groups (measured in percentage points) by such a reform.

**Table 8 Average increase in tax rates from a tax reform towards a less progressive tax system**

	Total tax measure	
	Average increase in tax rate, full-time, percentage points	Average increase in tax rate, half-time, percentage points
All benefit claimants	1.1	1.5
Social Assistance	1.4	1.0
Unemployed	0.8	1.3
Medical- or vocational Rehabilitation	0.7	1.0
Disabled, partly (less than 2/3)	1.3	2.0
Disabled, fully (more than 2/3)	1.3	1.8
Receiving early retirement pension	0.9	0.6

Figure 36 shows how the effect of the reform towards a less progressive tax system depends on the initial total tax rate. Notice that those facing the highest total tax rates, typically persons with a high benefit/ labour income ratio, on average have the smallest tax increase by the reform.

**Figure 36**



The reform described so far does not improve work incentives for most benefit claimants, in addition it involve a net income reduction for benefit receivers because benefits are taxed according to the new higher tax rate on ordinary income. Since there has been no political will to seriously downgrade the social security safety net in Norway, this would be an unrealistic reform. If a similar reform were to be carried out in practice, we would expect these groups to be compensated in one way or another. This leads us to the second hypothetical revenue neutral reform, which does not involve an income loss for persons with benefit entitlement. The second simulated revenue neutral<sup>9</sup> reform is an in-work tax credit, a deduction of 6500 NOK *if working* (the same for full- and part-time), whereas the tax rate on ordinary income still is assumed to be 30.7 percent (27.2 percent in Northern Norway). As seen from Table 9 a large majority of the benefit receivers will experience a reduced tax wedge from this reform, and virtually everyone have improved incentives for working half-time compared to not working. From Table 10 we see that the average tax rate decrease from working fulltime is 1.2 percentage points, whereas the corresponding number for working half-time is 3.2 percentage points. Knowing that the potential income for the benefit receivers is typically estimated to be below the high income tax limit, it is no surprise that a tax reform removing this tax does not improve benefit receivers' incentives. On the other hand, the low wage potential for the benefit receivers is the reason why an extra deduction related to labour income has a larger effect for benefit receivers than for those not entitled to benefits.

**Table 9**

In-work tax reform	Total tax measure	
	Fraction with reduced tax, full-time (%)	Fraction with reduced tax, half-time (%)
All groups	94,7	99,6
Public Assistance	90,6	100,0
Unemployed	90,3	99,3
Medical- or vocational Rehabilitation	93,4	99,7
Disabled, partly (less than 2/3)	98,1	99,5
Disabled, fully (more than 2/3)	94,5	99,8
Receiving early retirement pension	86,5	98,8

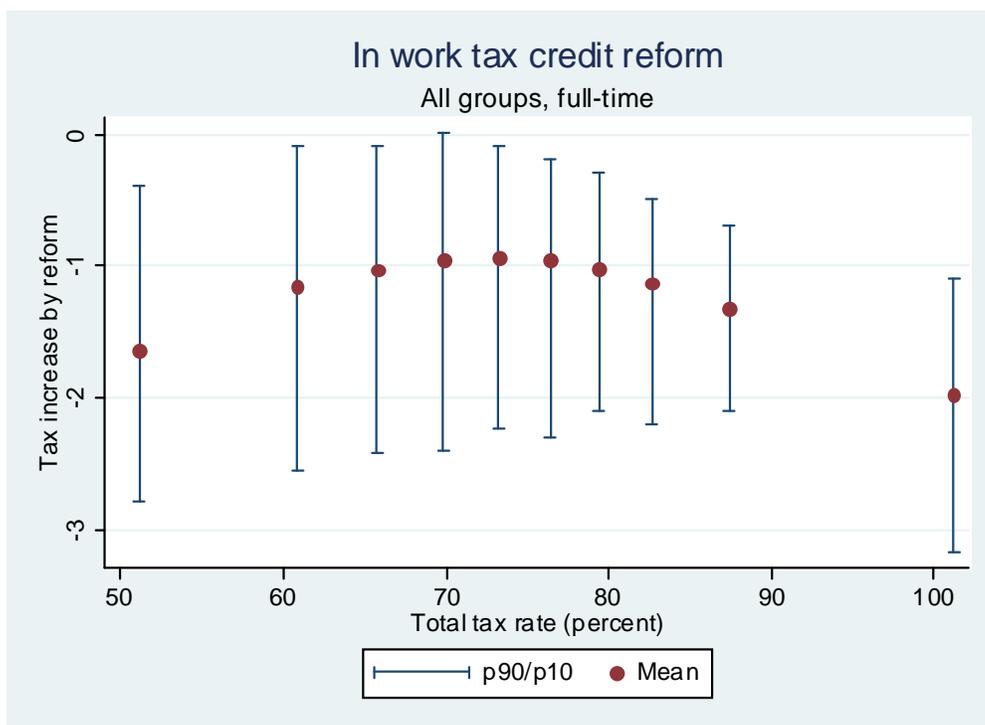
<sup>9</sup> Calculated with the same population as for the first reform.

**Table 10**

Total tax measure		
	Average <i>decrease</i> in tax rate, full-time, percentage points	Average <i>decrease</i> in tax rate, half-time, percentage points
All groups	1,2	3,2
Public Assistance	0,7	3,7
Unemployed	2,7	3,3
Medical- or vocational Rehabilitation	1,3	3,8
Disabled, partly (less than 2/3)	1,2	3,2
Disabled, fully (more than 2/3)	0,9	2,8
Receiving early retirement pension	0,7	3,4

Figure 37 shows that those facing the highest total tax rates before the reform, on average obtain the largest tax reduction from the in-work tax credit reform. This improvement in work-incentives for marginal workers is, however, achieved at the cost of higher marginal tax rates for workers already fully integrated in the labour market.

**Figure 37**



## **7. Conclusion**

We have constructed a tax measure which includes the loss in benefits if working for different groups of benefit receivers. We define total tax rates as the fraction of the employers wage cost *not* gaining the employee, as fraction of the total wage cost. Due to the means testing of benefits the total tax rates are typically much larger than the formal tax rates. The average total tax rate for the studied benefit claimants in Norway is calculated to be about 70 percent when comparing full-time work and no work. Most workers will gain from returning to work, but about 24 percent face total tax rates between 80 and 100 percent, and 4 percent is economically better off as benefit receivers. Further, 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. 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.

Whether, and for whom, an improvement in incentives would cause a transition from non-employment to employment is a(n) (complicated) empirical question. Note that reducing the total tax rates can be done either by reducing the benefits or by increasing net income if working. The problem with the first strategy is that it may increase poverty, and so far it has not been a political will to downgrade the social security system in Norway. Increasing the net income if working could be (attempted) done in several ways. One could give wage subsidies to particular groups, arrange and motivate for training and education to increase the market value of these workers, or change the tax system in such a way that the incentives are improved for these workers. In this paper we study the effect of some simple tax reforms on the distribution of total tax rates. A revenue neutral reform, removing the “top rate tax” on high incomes and increasing the tax on “ordinary income”, would on average *decrease* incentives for work for persons receiving benefits. The reason for this is first of all that a low fraction would receive high enough wages, in the sense that yearly income from a fulltime job would not be affected by the tax rates on high incomes. This means that a partial tax 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 in-work tax credit for everyone, will improve

work incentives for marginal workers, in particular the incentives to work part time. Whereas only a few benefit claimants can derive any benefit from the flattening tax reform, the in-work tax credit is much more targeted at this group.

This paper focuses on the economic incentives to work for marginal workers. There might of course be several other (more important) factors affecting whether potential workers actually return to work or not. If these groups are heavily restricted in their choice set, in the sense that they have very few (if any) job offers, improving economic incentive are not expected to have effect. On the other hand it might be very hard to motivate people for work if they have little, or no, economic gain from it.

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