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The Norwegian Tax Reform; Distributional Effects and the High-income Response

Abstract:
Are we better or worse off after the Norwegian tax reform of 1992 and how has the reform influenced the income sizes and the distribution of total income? This question denotes our twofold analysis in this paper. We first examine the trends in average income and income distribution in the period from 1991 to 1994. Second, we ask whether the tax reform can explain parts the observed income changes. Calculations from a tax-benefit model, assessing the direct distributional effect by applying post-reform tax rules on pre-reform data, do not predict any substantial increase in income inequality due to the tax reform of 1992. However, we find a significant post-reform increase in observed income inequality, while average income is about unaltered in the period. The increased inequality might be explained by the high income earners' response to large reductions in marginal tax rates. By applying panel data for 1991-1994 and a methodological approach developed by Feldstein (1995a), we find no evidence in support of significant behavioral responses due to decreased marginal tax rates on income. In fact, the overall elasticities are around zero, which differ substantially from Feldstein's estimate of 1.04, based on US-data. Other explanations, as the changes in the taxation of dividends, are discussed.

Keywords: Tax reform, Income distribution, Social welfare, Personal tax

JEL classification: D31, D63, H2, H31

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1. Introduction

The recent tax reforms in the OECD-countries have mainly focused on an improvement in economic efficiency, to reduce the deadweight loss from taxation. The means to increase the efficiency have been to reduce marginal tax rates and to broaden tax bases. According to Whalley (1990), both common intellectual forces and the impact from the US Tax-Reform-Act of 1986 (TRA86) triggered tax-rate-cut cum base-broadening reforms in a lot of OECD countries, among them Norway.

The major step in the Norwegian tax reform was taken in 1992, fairly late compared to UK and USA. The inequality issue was surprisingly little focused in the Norwegian tax reform debate, especially considering the major changes in tax rates and tax bases and the importance of egalitarian values in the Norwegian society.[1] However, in the latest years, the distributional effects from the tax reform has been an important issue.

If we compare the estimated direct distributional effect of the tax reform with the actual outcome, we find that post-reform inequality is higher than predicted by the tax-benefit model simulations. On the other hand, average income is about unaltered. One possible explanation to the increase in inequality might be behavioral responses to the reductions in marginal tax rates. By using an approach suggested by Feldstein (1995a) we estimate the effect of the net-of-tax-rate on taxpayers' income. We find an overall elasticity around zero, far below Feldstein's estimate on 1.04. The small behavioral response from lower marginal tax rates is contrary not only to Feldstein's study, but also to other studies on Norwegian data (Aaberge et al. 1995a), but in accordance with other studies in Scandinavian countries (Klevmarken et al. 1995, Pedersen and Smith 1996).[2]

How, then, can the increased post-reform inequality be explained? Utilising the panel data to study income mobility, we see that the post-reform «winners» are characterised by large increases in capital income. Decomposing the income changes, we find that more than 60 per cent of the increase in the inequality is due to increases in dividends, which are channeled almost exclusively to high income individuals. We discuss several explanations for how the tax reform may have influenced the decision to pay dividends.

[1] This was, however, in line with the international debate, where efficiency was the main issue.

[2] It must be stressed that the referred studies differ in methodological approach.

There might be a variety of reasons for reforming a tax system, among them the effect on income generating activities and the distribution of income among individuals. Our findings indicate that the individuals response to lower tax rates are small and might have been overstated by previous studies and the increased income inequality we observe has probably not been caused by incentive changes inherent in the tax reform. Thus, in terms of an underlying social welfare function, the reform has not added substantially to the size of the cake, but can neither be blamed for the more unequal post-reform distribution of the slices.

Because our data covers a rather short period of time it might be that our estimate understates the long term effect. According to Slemrod (1990,1995) the impact of a tax reform may be regarderd as a gradual process. First, changes in tax rates and tax bases will directly change income after tax, and thus the income distribution. Second, a fundamental tax reform like the Norwegian, will also change the preferences regarding how to report income, which might induce income shifting. Responses in real variables as labor, saving and investment are more sluggish (Slemrod 1990, 1995).

The paper is organised as follows. Section 2 gives a brief description of the changes in the tax system that have relevance for this study. Section 3 discusses measures of welfare, where we suggest avoiding sum measures of welfare. Section 4 presents income definitions employed. In Section 5 we give descriptions of the trends in key welfare indicators from 1991 to 1994. Section 6 focuses on responses to changes in the net-of tax-rate on overall income and the effects of changes in the taxation of dividends in order to explain the increased income inequality after the reform. Section 7 concludes the paper.

2. The personal tax code before and after the tax reform

The basic theme of the Norwegian tax reform was to reduce tax-induced distortions by lowering the statutory tax rates and to broaden the tax bases, thereby making it revenue and distributive neutral. By broadening the tax base in a direction of a more accurate measurement of income, it was hoped that the differentials in taxation of different activities would be lessened, often expressed as «levelling the playing field». The reform affected taxation of wage earners, self-employed and corporations. It was far-reaching because it entailed changes for most of the tax payers and the tax code was substantially changed for large groups of individuals.

The tax system has been more or less unchanged since 1992. There have been some minor changes, but these have solely minor impacts, since most of the tax payers are unaffected.

The personal tax system is, both before and after the tax reform, divided into two «tax classes». The only differences between these classes are higher standard base deductions in tax class 2 and higher surtax thresholds. Single individuals are all taxed in tax class 1. Married couples can choose whatever tax class that minimises the total tax for the couple. Single-income couples are therefore, in general, taxed in tax class 2, while two-income couples are usually taxed in tax class 1.[3]

Both the pre- and the post-reform (current) income tax systems consist of two tax bases: net and gross income. This kind of tax system is often named the dual income tax system (Nielsen and Sørensen 1997).

Net income (ordinary income) is the sum of labor and capital incomes net of deductions. The most important deductions are interest expenses and a standard percentage deduction in labor and pension income (which only applies for labor and pension income, not income from self-employment).[4] Gross income (personal income) is labor and pension income which is taxed with social security tax and surtax.[5] The surtax is an additional tax on high income and was first set into effect in 1991.

The tax reform implied large changes in the personal tax rates, while the definitions of gross and net income were more or less unchanged for wage earners. Self-employed and active owners, however, experienced large changes in both tax rates and tax bases.

The pre-reform tax rate structure can be characterized as follows:[6] First, individuals paid a flat 26.5 per cent tax on net income above the tax free amount (about 20 000 NOK in tax class 1). Second, a national income tax of 7 per cent was imposed for net income above 130 000 NOK and this rate increased to 14 per cent for net income higher than 164 000 NOK.[7] The maximal marginal rate on net income was therefore 40.5 per cent.

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[3] Single parents are taxed in tax class 2.

[4] Thus, the standard percentage deduction can only be used by employees. Individuals can, in addition to the standard percentage deduction, for instance deduct work travel expenses above 6000 NOK, union fees and child care expenses (with an upper limit).

[5] Labour income is a broad income measure that is defined as the sum of wages, the labour fraction of income from self-employment and fringe benefits as corporate cars, free phone, free stock options with a minimum value, etc. In general, every benefit that an employee receives from the employer is regarded as wage.

[6] Tax rates in the northern part of Norway (Finnmark, Svalbard and Nord-Troms) are lower than those mentioned in this paper.

[7] All thresholds mentioned in this paper refer to tax class 1.

Gross income was taxed with a social security tax and a surtax. The social security tax was flat (for gross income higher than approximately 25 000 NOK), 7.8 per cent for wage earners, 1.6 per cent for pensioners and 12.8 per cent for self-employed.[8] The surtax was progressive, the rate for gross income lower than approximately 207 000 was zero, while income over this threshold met 9.5 per cent surtax. Thus, the maximal marginal tax rates on gross income and net income were 57.8 per cent and 40.5 per cent, respectively (the maximal marginal tax rate on income from self-employment was higher due to the higher social security tax).

The 1992 tax reform entailed several changes in the personal tax structure. First, the progressive national tax was removed. Second, the flat tax on net income increased from 26.5 per cent to 28 per cent. These changes implied a reduction in the tax rate on net income from a maximum of 40.5 per cent to a flat rate at 28 per cent. Third, the social security tax for self-employed was reduced from 12.8 per cent to 10.7 per cent, while it increased from 1.6 to 3 per cent for pensioners. The rate structure for the surtax was also changed. The single step surtax was replaced by a two-step surtax with a maximal tax rate at 13.7 per cent.

Thus, the maximum marginal tax rate on labor income was reduced from 57.8 to 49.5 per cent after the tax reform (from 64.9 to 52.4 per cent for self-employed) and the marginal tax rate on capital income was reduced from 40.5 to 28 per cent. Figures 1 and 2 show the marginal tax rate as a function of wage income and income from self-employment, respectively. They display how the tax reform reduced marginal tax rates especially for high income individuals.

[8] This rate is 7.8 per cent of gross income from self-employment above approximately 430 000 NOK, both in the pre- and post-reform tax system.

Figure 1. Marginal tax rates on wage income. 1992-rules and wage adjusted 1991-rules. Class 1 (single persons). No deductions except standard deductions

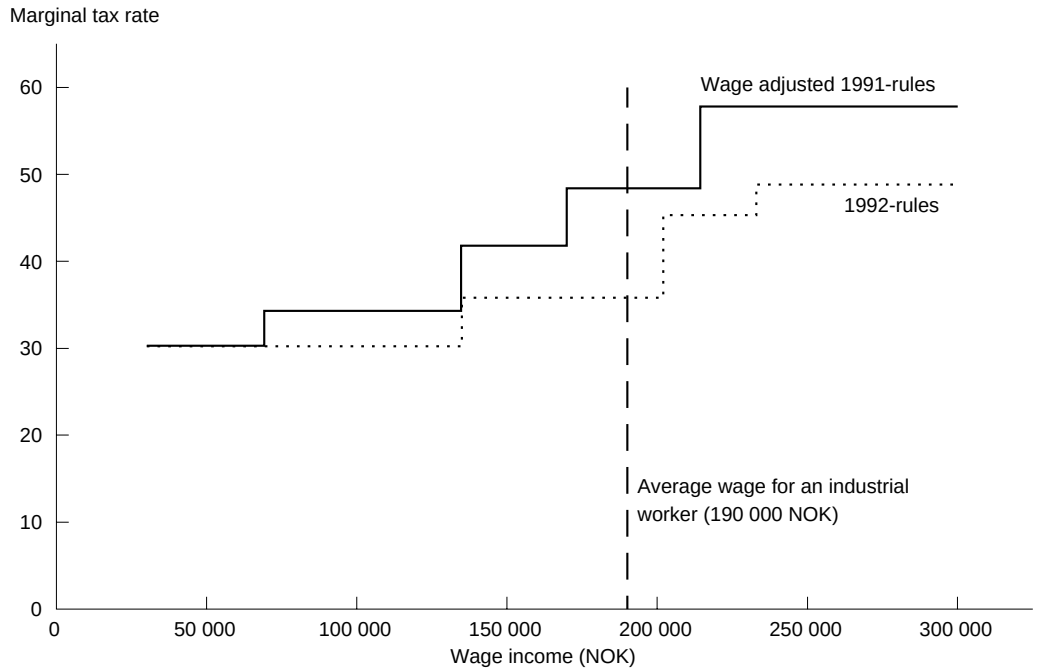
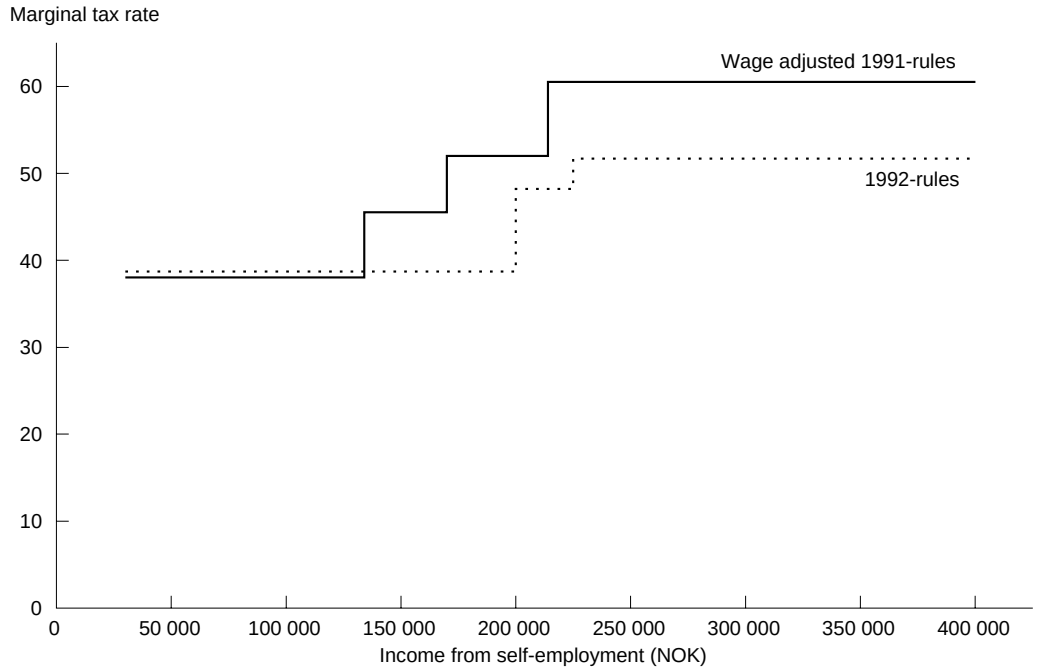


Figure 2. Marginal tax rates on income from self-employment. 1992-rules and wage adjusted 1991-rules. Class 1 (single persons). No deductions except standard deductions



Dividends have become increasingly more important as a source of income. Thus, the taxation of this income component will be described in short below.

In the pre-reform corporate tax system retained profits were taxed at a higher tax rate (50.8 per cent) than distributed profits, by allowing dividends to be deductible in the base for national tax. Shareholders, however, paid a national tax on their received dividends. The total tax rate on dividends was therefore dependent on the shareholders marginal tax rate.

The post-reform system is based on an imputation principle, which can be described as follows: First the firm pays a single rate corporation tax (28 per cent of profits). Distributed profits are regarded as already having borne personal tax at a certain «imputation rate», s. The imputation rate is equal to the corporate tax rate. Personal tax liability on dividends is then the shareholders marginal tax rate net of s times the dividends received. The personal tax rate on capital income is the same as the corporate tax rate (28 per cent). Thus, the receiver of dividends is not paying tax on dividends.

3. Welfare evaluations

Any description of the direction of key welfare indicators, applying income data, will in general be controversial. Before we in the next section present the trends in welfare indicators in the reform period, we discuss various approaches to welfare measurement. There are developed several welfare measures to aggregate both distributional and efficiency aspects into the same measure. We argue that the income distribution issue should be treated separately to the issue of the income size.

Within public economics the compensating and equivalent variations of Hicks are well-known measures of welfare. The compensating variation is the amount of income the consumer must receive to leave utility unaffected by the price change and the equivalent variation is the amount of income the consumer would forego to avoid the price change. Thus, the two measures of «money metric utility» only differ according to whether they use the pre-change level of utility or the post-change level of utility as the point of departure. If the price changes result from changes in taxation, the measures define the deadweight losses or excess burden of taxes (see e.g. Auerbach 1985). In order to determine the total effect on social welfare, the utility gains or the utility losses can be added up with a welfare weight attached to each individual. There are several studies of welfare measurement applying this methodological approach, among them Harberger (1971), Diamond and McFadden (1974), King

(1983).[9] Aaberge et al. (1995b) discuss the welfare effects of proportional taxation, employing this approach.

Our approach here is «non-welfarist» in the sense that we don't base our information on individual utilities. We observe incomes before and after a reform and analyse distributional and behavioral effects of the reform. However, the underlying social evaluation function is «welfarist» in that the approach is individualistic and based on personal well-being measures alone (Coulter et al. 1992):

$$(1) \quad W = W(Y_1, Y_2, \ldots, Y_n)$$

where

$$(2) \quad Y_i = f(X_i, p_i, a_i)$$

X_i is total money income of the household to which i belongs, p_i is a vector of prices of the goods and services consumed and a_i is a vector of characteristics (for instance the size of the household that i belong to). Making assumptions about the shape of W corresponds to choosing the approach for welfare measurement. The tax reform will generally affect all arguments in the personal well-being function, (2), and, thus, the effects of the tax reform can be evaluated along several dimensions. In the following we will focus on the trends in the income sizes and in the distribution of income, in order to characterise the economic conditions under the pre-reform and post-reform tax systems. Further, we examine whether the tax reform can explain the observed changes. Thereby, this study provides information about how the tax law changes has contributed to the size of the cake and the division of the cake, the measure of welfare often used in policy analysis.

But why not employ a measure of welfare that sums up both distributional and efficiency effects from income data, as the Atkinson measure (Atkinson 1970)[10] or the Generalized Lorenz approach (Shorrocks 1983)? In Atkinson's measure of inequality

$$(3) \quad I(e) = 1 - \frac{y_{EDE}}{\mu}$$

[9] See for instance Sen (1973) on the inadequacy of utilitarianism as measuring the social good.

[10] Foster and Sen (1997) argue that Atkinson's approach need not be seen as entirely utilitarian.

where e can be interpreted as the degree of relative inequality aversion, y_{EDE} defines the equally distributed level of income or the level of income per head that, if equally distributed, will give the same level of social welfare as the present distribution. Thus, this index of inequality measures how much total income can be reduced in order to keep the same social welfare level. Contrary to many other measures of income inequality (as for instance the Gini coefficient) the Atkinson measure is ethically founded on a social welfare function, which effects its interpretations. As the shape of the individual utility functions can be varied according to the degree of the relative inequality aversion, Sen (1978) shows that the Atkinson index of inequality can move in the opposite direction of the actual inequality of individual utilities when the utility functions become less and less concave. When the marginal utility goes down more slowly, the utility gap for a given income gap will increase, while the Atkinsons index shows a lower value due to slower diminishing marginal utility. The reason for this «perverse result» is that the Atkinson index measures «distributional badness» or «inefficiency from unequal distribution of incomes» instead of inequality per se (Sen 1992). With a less concave utility function, and more slowly diminishing marginal utility, there is less inefficiency from unequal distributions of income. The utility sum is closer to maximal value because the marginal utility is more slowly diminishing. Those with greater incomes are now producing utility relatively more efficiently (Morris and Preston 1986).

According to Foster and Sen (1997) there are two distinct reasons for regarding inequality to be distributionally bad:

1. The inefficiency of income inequality in generating aggregate utility
2. The inequity of income inequality in leading to unequal utilities

While utilitarianism is concerned with the former, we prefer to bring inequality in the latter interpretation into the welfare evaluation of the tax reform and to focus on the relative aspect of inequality.

The Generalized Lorenz curve approach is also often used in welfare evaluations of different tax systems. The Generalized Lorenz curve is the ordinary Lorenz curve scaled with mean income.

$$(4) \quad GL_A(p) = \mu_A L_A(p) \geq GL_B(p) = \mu_B L_B(p) \text{ for all } p \in [0,1] \leftrightarrow W_A \geq W_B$$

where μ_A and μ_B is the average incomes of distribution A and B, respectively. While the Lorenz curve is a plot of cumulative income shares, the Generalized Lorenz curve plots cumulative incomes per capita. A reform involving an increase in inequality can be preferred if the mean income is raised sufficiently. «Making some of the poor poorer might be tolerated if average living standards amongst all poor people were raised by enough» (Jenkins 1991).[11] However, it is argued that much of the strength of this measure to rank distributions derives from efficiency preference rather than equity preference (Bishop et al. 1991).

In the following we, thus, do not employ any sum measures of welfare. Effects on the income distribution and the income size are discussed separately.

4. Definitions of income

The definition of income is fundamental to the analyses in this study. The Haig-Simons definition of income (Simons 1938) is the usual theoretical basis for analyses of income distributions. It defines income as «the amount an individual can consume in a given period of time (one year) without any reduction in wealth». However, it is difficult to construct a practical income concept that satisfies this definition because tax return data only give information about taxable income, which in most cases will differ from the Haig-Simons income concept. For instance, tax returns do not have any information about the value of unpaid household work at home and unrealised capital income.

Further, especially when comparing income in reform-periods it is important to adjust for changes in income definitions, to avoid the results to be products of accounting rules. The most important changes in the tax base were reduced deprciation rates, removal of different tax saving fund allocations and removal of base deductions in interest income.

Changes in depreciation rates and removal of fund allocations affected income from self-employment. We have adjusted for this by applying the new rules on 1991- data. The adjustment will increase the reported incomes.

[11] This approach has similarities with the Gini-based welfare indicator, $\mu(1-G)$, derived in Sen (1976) and the welfare index $\mu(1-I)$ suggested by Blackorby and Donaldson (1978).

In 1991 only interest income in excess of 3 000 kroner (6 000 kroner for joint filers) was taxed. This deduction was removed in 1992. Thus, for 1991 we have adjusted gross income by adding the minimum of actual interest income or the maximal base deduction.

There were also changes in the taxation of capital gains from shares. Before the reform, gains from shares kept more than 3 years were exempted from taxation and these gains were not reported in the tax return. After the reform all gains from share sales are taxable.[12] We have not adjusted for this, which might induce a small bias.

The different income concepts that are used in this paper are given in the list below:

- Extended gross income (EGI) is defined as the sum of labor income, capital income (interest income, dividend income), income from self-employment, various transfers.
- Post-tax income is defined as EGI net of taxes
- Disposable income is defined as post-tax income net of deductible interest costs.

If we use income as an indicator of individual well-being the approach is clearly unacceptable if we have not adjusted for the differences in household composition (vector a_i in equation (2) above). There are different strategies to deal with the heterogeneity problem. One involves the use of a common metric when comparing individuals, i.e. an equivalence scale, another account for non-income heterogeneity at the aggregation stage.[13] The problem with the former method is that there is a whole range of different scales, and the results are influenced by the choice of scale.[14] The latter strategy involves decomposing the overall distributional judgement into contributions from various homogeneous subgroups, e.g. subgroups with identical demographical compositions. In this paper we follow a recommendation from Coulter et al. (1992); the empirical sensitivity check for a wide range of equivalence scale relativities, employing the methodology introduced in Buhmann et al. (1988). However, the results must be carefully interpreted when we go from money incomes to equivalized incomes.[15]

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[12] The base for the share gain tax is the sales price minus the cost price plus a term that correct for retained earnings. If a firm retains profit some the share value will in principle increase with the same amount. Increase in share values that stems from rententions are exempt from personal gains taxation trough a reduction of the tax base.

[13] Coulter et al. (1992) give references to analyses.

[14] See for instance Buhmann et al. (1988).

[15] Glewwe (1991) points to the fact that the principle of transfers is not necessarily satisfied when equivalence scales are employed.

5. Are we better off after the tax reform?

There has been a growing concern in Norway about the distribution of well-being after the tax reform, and the tax reform has often been mentioned as one key factor behind the increasing disparities. We address the issue in this section by focusing on welfare indicators in the period from 1991 to 1994, i.e. comparing pre-reform (1991) and post-reform (1992-1994) indicators on levels of economic well-being. With reference to the discussion in the previous section, we focus on separate measures of the size of the cake and the distribution of the slices. Obviously, these indicators are influenced by other factors than the tax reform, as for instance changes in macroeconomic conditions.

To assess the direct distributional effect we employ a tax-benefit model. Statistics Norway's tax-benefit model LOTTE assesses the direct effects on revenue and income distribution from tax law changes. The model is based on yearly surveys on income and wealth for individuals collected from income tax returns. Due to the need for an evaluation of the tax reform, these surveys were increased in size from 1991. The number of observations each year is in the range from 24 000 persons in 1991 to about 40 000 persons in 1994. Parts of these yearly surveys enter into a panel data set, which will be utilised in Section 6. All price adjustments in the following are done by applying the Consumer price index.

The pre-reform income inequality is measured by the Gini coefficient for 1991, as shown in Table 1. In order to assess whether the tax law changes, without any behavioral adjustments, have had any impact on the distribution of income we calculate the effect of employing 1992-rules on 1991-data. The total distributional (direct) effect of applying 1992-rules on 1991-data is very close to the inequality in the pre-reform system. In Table 1 we also present figures for the partial effects; effects from rate reductions and changes in the taxation of the self-employed.[16] We see that the rate reductions are contributing to an increase in income inequality.

[16] All the simulations are based on personal tax return data for 1991. The rate effect is simulated by applying 1992-tax rates on 1991 tax base definitions. The effect from the tax changes for self-employed is calculated by applying 1991 tax bases and 1991 tax rates, but the definition of gross income for self-employed is changed according to 1992-rules. However, important variables, as the imputed capital return, are estimated on the basis of limited information from 1991-data and these may differ from the actual outcome in 1992. Thus, the direct distributive effect of this particular provision may be uncertain. The total distributive effect of the tax reform is simulated using 1992 tax base definitions and 1992 tax rates. Hence, the results in Table 1 indicate that the rate reductions have increased inequality compared to the effect from the tax base broadening. This result is also confirmed by Thoresen (1995).

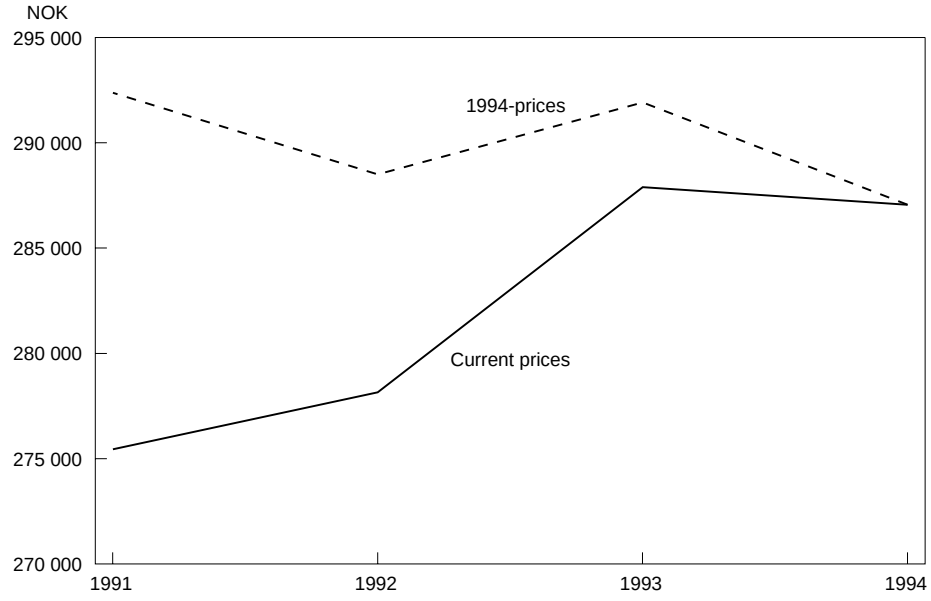
Table 1. Inequality measured by the Gini coefficient in equivalent post-tax income in 1991 compared to the effect of applying the post-reform tax system on 1991 data. Household income weighted with the square root of number of household members. The individuals are used as the unit of analysis

	1991	Rate-effect	Change in the tax- rules for self-employed	Total
Inequality measured by the Gini coefficient	0.233	0.243	0.232	0.235

The calculations by the static tax-benefit model do not indicate any strong direct effect on inequality from the tax reform. The inequality in 1991 and the simulated effect of the tax reform can be compared with the inequality in post-reform distributions of income, applying data for 1992-1994. However, first we show trends in various mean incomes in the period, starting with the trends in mean extended gross income from 1991 to 1994.

In Figure 3 we present the average extended gross income (EGI)[17] for the period 1991-1994 in current prices and 1994 prices. Figure 3 shows that the real value of the average EGI has slightly decreased from 1991 to 1994.

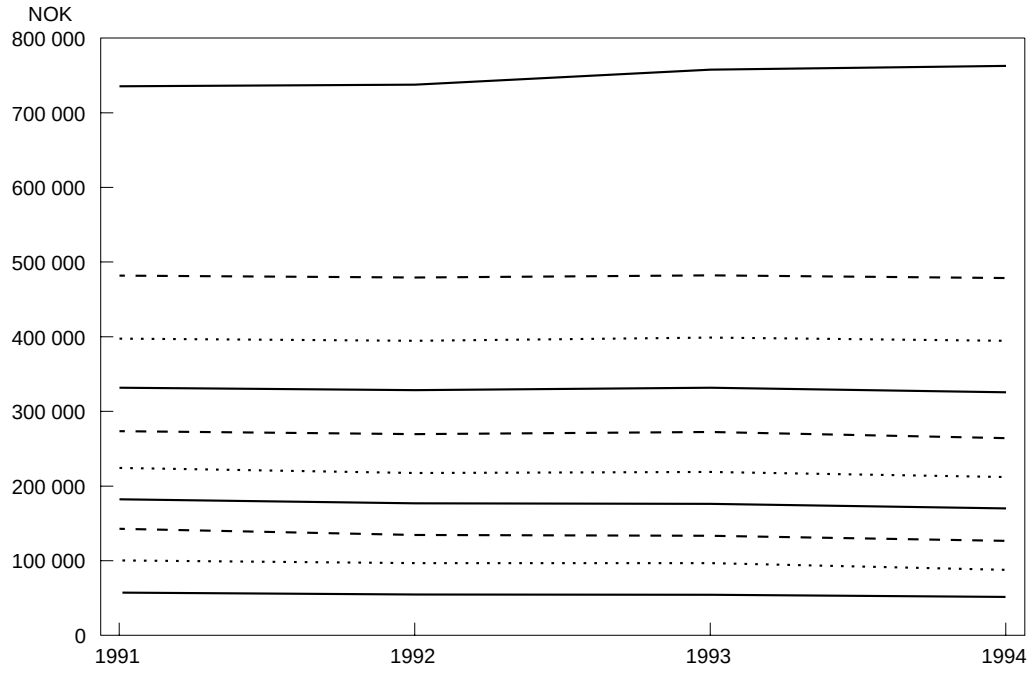
Figure 3. Average real and nominal extended gross income 1991-94. Household income and the household as the unit of analysis



[17] Cf. Section 4 for definition of EGI.

Real extended gross income in deciles from 1991 to 1994 are described in Figure 4. The figure shows a very stable pattern from 1991 to 1994. Most notably has the average extended gross income in decile 10 increased from about 735 000 NOK in 1991 to more than 760 000 NOK in 1994, see Table A1 in Appendix.

Figure 4. Average real extended gross income per decile group, 1991-94. Household income and the household as the unit of analysis



The pattern in Figure 4 can be further summarized in Lorenz curve comparisons. The Lorenz-curves are hard to distinguish from each other in a graph. In Table 2 we therefore sum up the information contents in a Lorenz curve comparison. The table shows that the pre-reform distribution of extended gross income is preferred to the distributions of extended gross income in each year after the reform.[18] In table 2 the incomes are weighted with an economies of scale indicator in the households, the square root of number of households members. The main results are not dependent on the choice of scale.

[18] We have not brought statistical uncertainty into consideration, which means that the results in the table are only indicating a direction.

Table 2. Lorenz curve comparisons of real equivalent extended gross income, 1991-94. Household income weighted with the square root of number of household members. The individuals are used as the unit of analysis

	B		
A	1992	1993	1994
1991	>	>	>
1992		>	>
1993			>

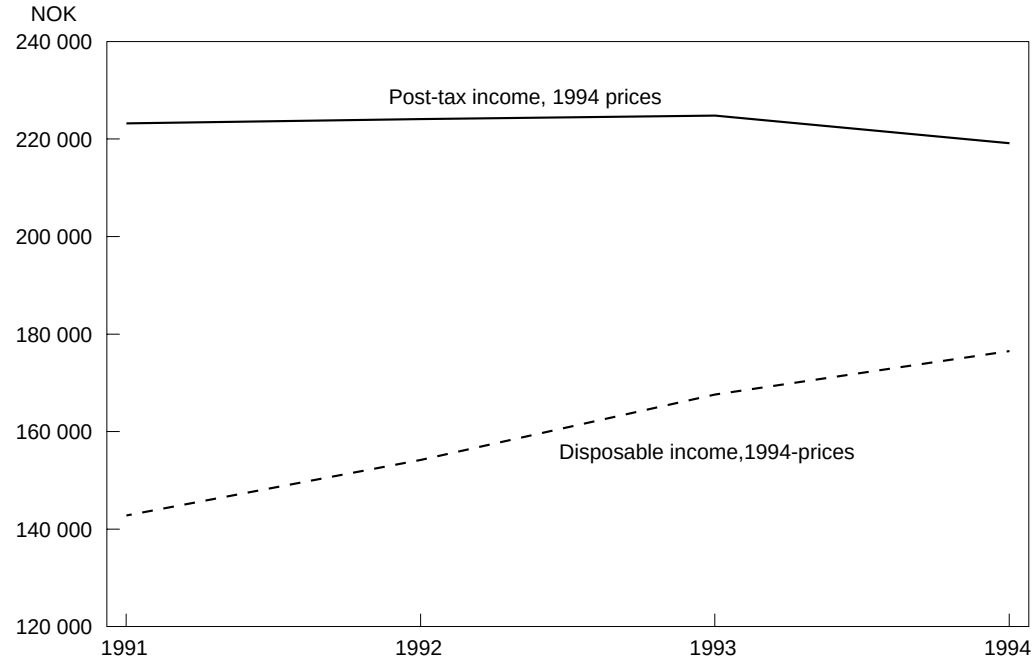
>: curve for year A lies above curve for year B (distribution A is preferred to distribution B)
<: curve for year A lies below curve for year B (distribution B is preferred to distribution A)

The concept of economic well-being is mainly associated with the level and distribution of post-tax income. Thus, in the following we will describe the distributions of income after taxes are deducted. There are various definitions of income after tax, among them what we have defined as post-tax income and disposable income (cf. section 4). The difference between post-tax income and disposable income is that in the latter concept interest expenses, for instance from purchases of houses, are deducted. The post-tax definition of income is most frequently used, due to the undervaluation of income from housing in our data.

After a decrease in the tax revenue the first year after the reform, the tax revenues for 1993 and 1994 are slightly above the 1991-level in real terms. Since also, as described by Figure 3, the average extended gross income is about 2 per cent lower in -94 than in -91, the average post-reform level of post-tax income is about unaltered in the period. This pattern is described in Figure 5. However, average disposable income has increased in the period, due to the substantial reduction in the interest rates in the period. The nominal interest rate has been reduced considerably from 1991 to 1994, from 14.5 per cent in 1991 to 8.4 per cent in 1994, which means that the interest expenses make a smaller part of the budget. But since the reduction in the real interest rate (after adjustment for taxation and inflation) is much smaller, from 5 in 1991 to 4.5 in 1994,[19] this also means a redistribution over time, moving some of the debt burden to the future. However, the reductions in nominal and real interest rates imply that many families have been able to increase the consumption of other goods and, thus, experienced a notably increase in the standard of living. This suggests that there are other important factors, not necessary related to the tax reform, which influence the levels of well-being in the period.

[19] The real interest rate was 7.8 in 1992 and 5.5 in 1993.

Figure 5. Real average disposable income and real average post-tax income, 1991-94. Household income and the household as the unit of analysis



In order to summarize the distributions of post-tax income, the ordinary Lorenz-curves of post-tax incomes are described in Table 3.[20] The distribution in 1991 is preferred to the post-reform distributions of 1992, 1993 and 1994. The picture in Table 3 is very similar to the pattern for EGI in Table 2.[21]

Table 3. Lorenz curve comparisons of real post-tax income, 1991-94. Household income weighted with the square root of number of household members. The individuals are used as the unit of analysis

	B		
A	1992	1993	1994
1991	>	>	>
1992		>	>
1993			>

>: curve for year A lies above curve for year B (distribution A is preferred to distribution B)
<: curve for year A lies below curve for year B (distribution B is preferred to distribution A)

[20] The results are not dependent on the choice of equivalence scale.

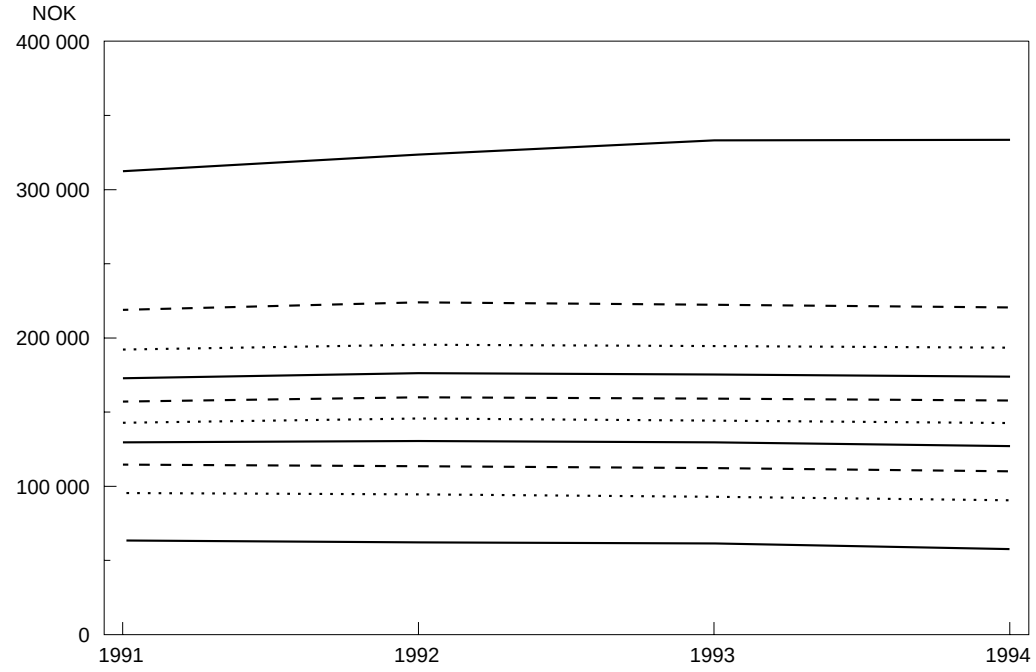
[21] The differences between the Lorenz-curves in each year are rather small, and not always significant.

The increase in inequality in the period is also reflected in Table 4, where the Gini coefficient for each year is displayed. The inequality has increased with about 8 per cent from 1991 to 1994.[22] An 8 per cent increase in the Gini coefficient corresponds to introduce an equal-sized lump-sum tax of 8 percent of the mean income in 1994 and the redistribute the collected tax revenue as proportional transfers where each unit receives 8 percent of its income (Aaberge 1997). Alternatively, it can be interpreted as an 8 per cent increase in the expected income difference between two individuals randomly drawn from the income distribution (Jenkins 1991).

Table 4. Inequality in equivalent post-tax income measured by the Gini coefficient, 1991-94. Household income weighted with the square root of number of household members. The individuals are used as the unit of analysis. The standard deviations are shown in parentheses

	1991	1992	1993	1994
Inequality measured by the Gini coefficient	0.233 (0.004)	0.242 (0.003)	0.247 (0.003)	0.253 (0.002)

Figure 6. Average real equivalent post-tax income per decile group, 1991-94. Household income weighted with the square root of number of household members. The individuals are used as the unit of analysis

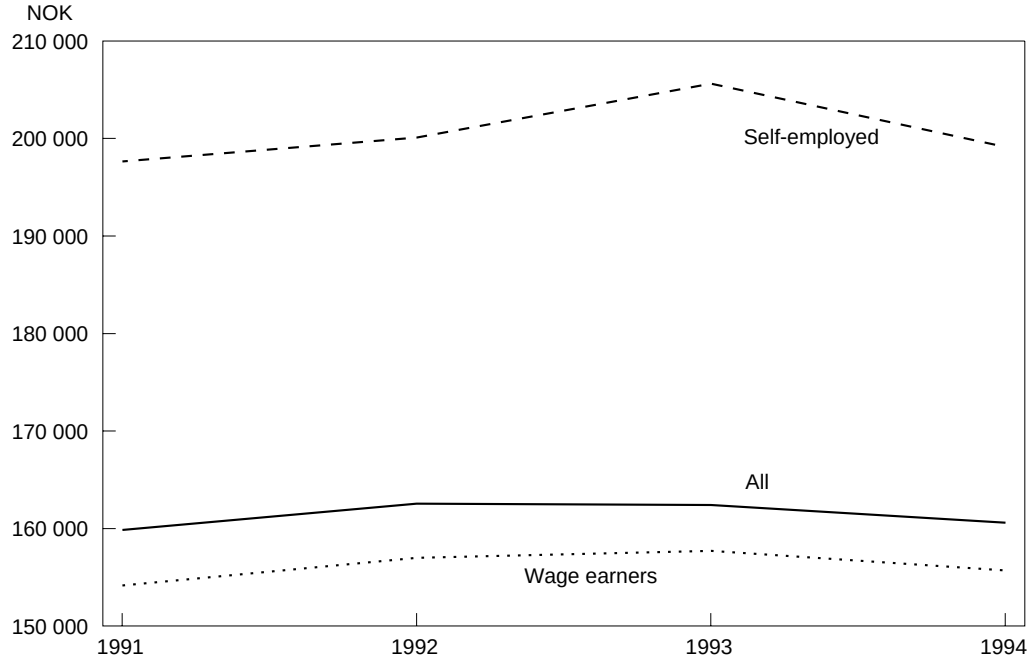


[22] Significant at the 5 per cent level.

The increase in inequality in the period is further described by Figure 6, which shows the average post-tax decile incomes in the period. The increase in inequality is influenced both by an increasing average income in the tenth decile and a decreasing average income in the first decile, as also documented by Table A2 in the Appendix.

Since the tax reform especially altered the taxation of the self-employed, we divide the material according to the individuals' occupations, either self-employed or wage-earners, and describe their incomes separately.[23] The individual is categorised as self-employed when the business income is the most dominating part of total income. Figure 7 describes the average equivalent after-tax income for the two socio-economic groups. Despite the differences in the levels of equivalent income, the trends are very similar for the two groups. By conferring Figure A1 and Figure A2 in the Appendix one will find that both among the self-employed and the wage-earners, the individuals in the tenth decile have become better off.

Figure 7. Average real equivalent post-tax income among the self-employed and income earners. Household income weighted with the square root of number of household members. The individuals are used as the unit of analysis



[23] To be classified as a «self-employed household» it is required that at least one of the household members is self-employed. Thus, a mixed household is classified as a «self-employed household».

The above description of tendencies in key variables reveals a post-reform increase in inequality, much more substantial than predicted by the tax-benefit model calculations. The average real value of income after tax is about unaltered in the period from 1991 to 1994, but the distribution of this income has become more unequal in 1994 compared to 1991.[24] A decrease in nominal interest rates and real interest rates in the period imply an improved level of economic well-being, especially for the individuals with the heaviest debt burden. The crucial question is, however, how the rise in inequality can be explained. Have the uneven reductions in marginal tax rates induced a relatively stronger income growth in the upper deciles and caused the increased inequality in the period or are there other reasons? If the uneven changes in marginal tax rates have given more disparity in post-tax incomes, the Norwegian tax reform might imply a traditional trade-off between equity and efficiency, where an efficiency improvement, in terms of reduced tax wedges, has been counterbalanced by a more unequal distribution of income. In the next section of the paper we assess the reactions to lower marginal tax rates at different income levels by employing a methodological approach suggested by Feldstein (1995a). We will also examine whether the changes in the taxation of dividends is influencing the increase in inequality.

6. Exploiting panel data to assess behavioral responses of tax changes

6.1. The «differences-of-differences» approach

In pre-reform documents on the Norwegian tax reform of 1992 (Ministry of Finance 1991) the efficiency arguments focused on investment and saving decisions more than the effects on labor supply. Even if the high marginal tax rates were conceived as a serious obstacle to an efficient allocation of resources, one might not expect any large changes in labor supply or taxable income. After all, when a reform is assumed to be both near distributionally and revenue neutral, are there reasons to expect any substantial effects on incomes? Auerbach and Slemrod (1997) argues, when discussing the effects of the US tax reform, that the constraints of revenue and distributional neutrality make large aggregate labor supply responses unlikely or even logically impossible. For instance, moving the tax burden to corporations decreases real wage rates and returns to capital and offsets the lower statutory marginal tax rates. The effect of a combination of base broadening and reduction in

[24] One can always question how comparable income from various years are when applying data from income tax returns, especially in reform periods. However, it is worth noting that the inequality has increased in every year after the reform as well.

marginal tax rates (inherent in most of the OECD tax reforms) is also ambiguous because the change in the effective marginal tax rate is a function of both changes.

When we in the following focus on income responses to lower marginal tax rates, it is important to note that we do not analyze hours of work, which is the traditional approach, see e.g. Blundell et al. (1988), Aaberge et al. (1995). The traditional approach involves applying a structural labor supply model to predict effects on the tax revenue and the income distribution. Here we employ a «differences-in-differences» approach, suggested by Feldstein (1995a), in order to describe how the individuals have adjusted their incomes after the reform. It is argued (Feldstein 1995a) that the effects of tax rates on revenue and income distribution are more accurately described by effects on taxable income rather than working hours.

The basic idea for the «differences-in-differences» approach in assessments of tax reform effects is that a tax reform constitutes a natural experiment. By comparing the change in taxable income in high marginal tax groups, with the same change in a medium or low marginal tax group, the response in taxable income can be estimated. If we, for instance, divide the individuals into two groups, with high (H) and low (L) pre-reform marginal tax rates, we define

$$(5) \quad \lambda = \frac{\Delta X_H - \Delta X_L}{\Delta D_H - \Delta D_L}$$

where ΔX_i (i=H,L) is the average percentage change in income for group i and ΔD_i is the percentage change in net-of-tax rates. The net-of-tax rate is the net-of-tax income of one more unit of pre-tax income. The «differences-of-differences» estimator measures the difference between the income change in a high marginal tax group with the income change in a low marginal tax group divided by the difference of changes in the net-of-tax rate. If those with large reductions in the marginal tax rate increase their income relatively more than those with small reductions in the marginal tax rate the estimator will be positive. The ratio λ can, under rather strict assumptions, be interpreted as the elasticity of taxable income to changes in marginal tax rates. The validity of this interpretation depends on how well the «the tax reform experiment» resembles a true experiment (Auerbach 1996).

Changes in taxable income will include other adjustments to the new tax system, in addition to labor supply effects,[25] such as changes in the form in which compensation is taken and changes in capital income, which also is influenced by the tax reform. We can, however, not describe the important entry/exit decisions with this approach. According to Feldstein (1995a) the «differences in differences» approach on taxable income gives a more comprehensive measure of the effects of a tax reform. The traditional studies of labor force participation and hours do for instance not include variations in efforts and effects on the choice of jobs, which can affect income, even if number of hours is unchanged. For the same reasons the corresponding measures of the deadweight loss of the income tax are underestimated, Feldstein (1995b) argues.

On the other hand λ in (5) may capture effects that not necessarily are due to tax changes. As illustrated by Heckman (1996), using the «differences-in-differences» approach in traditional labor supply analyses, relies on rather strong assumptions. Auerbach (1996) questions that low-income groups will react in the same manner as high-income groups to the same changes in marginal tax rates and there is reason to believe that macroeconomic phenomena will not hit the two groups equally. For instance will disproportionate changes in pre-tax wages influence the estimates of the elasticities. More fundamentally, λ does not yield any causal relationship (Auerbach and Slemrod 1997). Thus, it does not provide any comparison of the effects from a pre-reform tax system with the post-reform tax system, as the traditional approach.

Since the Tax Reform Act of 1986 is assumed to be revenue and distributionally neutral,[26] Feldstein (1995a) interprets λ in (5) as an estimate of the compensated elasticity of taxable income with respect to the net-of-tax share, and thus an indication of the magnitude of the deadweight losses due to high marginal tax rates. Feldstein (1995a) finds elasticities, dependent on the categorisation of low incomes and high incomes, from 1.04 to 1.48, which imply a substantial efficiency loss due to taxes. Compared to the results from the literature on taxes and labor supply (e.g. Pencavel 1986, MaCurdy et al. 1990), Feldstein's estimates imply a rather strong adverse effect from taxation.[27]

The use of the «differences-of-differences» estimator in this study is more limited. It captures the behavioral effects of the reductions in marginal tax rates (cf. section 2 above), and, thus, provides

[25] The «differences-in-differences» estimator or the Wald estimator has also been utilised in order to describe the effect from tax reforms on labor supply only, see e.g. Blundell et al. (1995), Eissa (1996).

[26] Auerbach and Slemrod (1997) questions this assumption.

[27] Even if the approaches are different, we would not expect very inconsistent results.

information about the relation between increased income inequality and the large tax rate reductions. Of course, the size of this estimator is of great interest in itself, since it gives an indication on individuals' tax sensitivity.

An important aspect when interpreting a «differences-of-differences» estimator applied on Norwegian data is the dual income tax system (see for instance Nielsen and Sørensen 1997). The dual tax system implies that the net-of-tax share is influenced by changes in both gross income and net income tax rates, in contrast to a single base system, as for instance in the US.

To derive the «differences-in-differences» estimator, panel data for the period 1991-94 is established. To remove potential bias in our estimates we follow Feldstein (1995a) and do a number of exclusions in constructing the panel. In order to exclude effects that stem from other decisions, not necessarily affected by the tax reform, the panel has been restricted. We exclude all persons below 16 years of age in 1994, persons that reach the point of retirement in this period and restrict the analysis to income earners and self-employed individuals.[28] We have also limited the analysis to persons with unchanged civil status and fixed number of children in the period. After these exclusions, we are left with more than 2 300 observations, which in the following will be used to assess the high income response to tax reform.[29] All wage figures for 1991 are adjusted by the wage growth in the period 1991-94, which is also in accordance with Feldstein's approach. Tax bases in 1991 are compared with the tax bases in 1994 that the individuals would report with unaltered behavior.

As described in section 2, the tax reform involved a decrease in formal tax rates, and most substantially on higher incomes. Effective marginal tax rates are also on average substantially reduced by the reform, as shown by Table 5.[30] But the table also reveals that the individuals with low marginal tax rates in 1991 on average experience higher marginal tax rates in 1994. This is an indication of an increase in taxable income in this group, since figures 1 and 2 show that none have experienced a substantial increase in formal tax rates. It is also worth noting, as seen in Table 5, that after-tax income in general is increasing with marginal tax rates, but there is no unequivocal relation. Nevertheless, our identification of high and low income earners is based on the marginal tax rates or the net-of-tax rate.

[28] The retirement age is 67 years in Norway. Feldstein (1995a) correctly points out that retirement in itself can be a function of changes in the marginal tax rate, which suggest that the observations should be included. However, if we include them we need a model that explains the relationship between retirement and taxes.

[29] Such rules for construction of the panel might lead to biases. For instance, we find that the self-employed are overrepresented in our material.

[30] The marginal tax rates in Table 5 are the marginal tax rates on labor income and income from self-employment.

The net-of-tax rate is the share of pre-tax income that the individual would retain after tax. For instance we see from table 5 that the individuals in the first decile have reduced their net-of-tax rate from 0.70 in 1991 to 0.64 in 1994.

In order to identify the «differences-in-differences» estimator, we compare the changes in the average net-of-tax rates in the deciles with the average changes in taxable income, when the taxpayers are ranked according to their marginal tax rate in 1991 (confer equation (5) above). Two income concepts are defined; gross income, which includes wage income, income from self-employment and capital income, and wage income only. The growth in capital income will be discussed separately below, in connection with the marginal tax rates on capital income. In Table 6 we present the average marginal tax rates and the associated percentage changes in the net-of-tax rates, gross income and wage income for both singles and married couples.[31] Remarkably, and contrary to the results in Feldstein (1995a),[32] table 6 indicates that the individuals at low marginal tax rates in 1991 on average have increased their gross income and wage income from 1991 to 1994, while the taxpayers at high marginal tax rates in 1991 on average have reduced their incomes in the same period.

Table 5. Average marginal tax rates in 1991 and 1994 and post-tax income in 1991. All individuals (2 333 obs.)

Decile ranking by marginal tax rates	Marginal tax rates in 1991	Marginal tax rates in 1994	Reduction in marginal tax rates 1991-94	Post-tax income 1991
1	30	36	-6	156 607
2	34	37	-3	127 468
3	37	38	-1	128 522
4	41	39	2	163 599
5	43	39	4	159 712
6	46	40	6	165 955
7	47	41	6	173 992
8	50	43	7	200 995
9	56	46	10	220 696
10	58	48	10	238 064
Average	44	41	3	173 561

[31] For married couples all calculations are done by pooling the couples' income and divide it equally between the spouses.

[32] Even if there are important reservations when comparing the results, we would expect to find figures close to Feldstein's results. However, TRA86 was introduced in a well-behaved macroeconomy (Auerbach and Slemrod 1997), while the period from 1991 to 1994 in Norway has implied increasing growth.

Table 6. Changes in net-of-tax rates, gross income and wage income between 1991 and 1994. All individuals (2 333 obs.)

		Percentage change of		
Decile ranking by marginal tax rates	Marginal tax rates in 1991	Net of tax rate	Gross income	Wage income
1	30	-8.2	12.9	15.3
2	34	-4.4	14.0	24.8
3	37	-1.8	6.3	3.2
4	41	3.5	1.1	1.7
5	43	5.8	-1.0	-8.5
6	46	10.4	-2.0	-10.2
7	47	11.6	0.6	3.4
8	50	14.0	-0.9	-6.2
9	56	23.5	-2.1	-7.9
10	58	24.9	-9.3	-15.1
Average	44	6.3	0.4	-2.2

The average age in higher deciles is higher than in lower deciles, but the difference is not large enough to explain the pattern in table 6 to result from life-cycle adjustments. Since the trends in income is explained by both growth in wages and changes in working hours, one would also consider differences in the wage growth to influence on the result in table 6. The growth in wages among various groups of income earners must, however, be characterized as even, when observing growth rates in the period 1991-94, as described by the Ministry of National Planning and Coordination (1997). Future work with this material will examine the differences between young and old, females and males, growth rates among various socioeconomic groups, wealth effects and other possible explanations to the observed pattern, in addition to the tax rates.

The figures in table 6 are based on calculations from a sample of all individuals, while Feldstein limits his analysis to married couples. Thus, we present separate figures for married individuals in Table 7. However, even if Table 7 shows that there is more income stability among the married in the period, there are no strong indications of increases in taxable income among the high income earners, as Feldstein finds.

Table 7. Changes in net-of-tax rates, gross income and wage income between 1991 and 1994. Married individuals (1 611)

Decile ranking by marginal tax rates	Marginal tax rates in 1991	Percentage change of		
		Net of tax rate	Gross income	Wage income
1	33	-1.7	1.4	-1.5
2	37	-0.6	5.8	10.0
3	40	4.0	-0.7	-2.2
4	43	5.6	4.0	10.0
5	45	8.8	-3.2	-6.7
6	46	11.2	-0.9	-15.1
7	46	10.7	-1.5	-2.4
8	50	12.0	-3.8	-7.4
9	51	17.9	0.4	-4.3
10	57	21.9	2.7	-0.6
Average	45	8.1	0.3	-2.3

To see this more explicitly and to derive the «differences-of-differences» estimator, we categorize the material, following Feldstein (1995a), into 3 groups, reflecting levels of marginal tax rates in 1991; the low/medium, the high and the highest level of marginal tax rates. The results are shown in Table 8 and Table 9 for the whole sample and the married taxpayers, respectively. Table 8 shows that the «elasticities» of gross income and wage income with respect to the net-of-tax share, are negative when all individuals are included.

Table 8. Estimated elasticities of gross income and wage income with respect to net-of-tax shares. All individuals (2 333 obs.). The marginal tax rates are shown in parenthesis

		Net of tax rate	Gross income	Wage income
Percentage changes 1991-94	Low (under 40)	-4.7	10.8	14.7
	Medium (40-49)	9.0	-0.5	-3.7
	High (over 49)	22.2	-5.7	-11.1
Differences of Differences	Medium minus Low	13.7	-11.3	-18.4
	High minus Medium	13.2	-5.2	-14.8
	High minus Low	26.9	-16.5	-25.8
Implied Elasticity Estimates	Medium minus Low		-0.8	-1.3
	High minus Medium		-0.4	-1.1
	High minus Low		-0.6	-1.0

Table 9. Estimated elasticities of gross income and wage income with respect to net-of-tax shares. Married individuals (1 611 obs.). The marginal tax rates are shown in parenthesis

		Net of tax rate	Gross income	Wage income
Percentage changes 1991-94	Low (under 40)	-0.5	2.2	1.4
	Medium (40-49)	10.1	-0.4	-3.2
	High (over 49)	20.1	0.3	-3.0
Differences of Differences	Medium minus Low	10.6	-2.6	-4.6
	High minus Medium	10.0	0.7	0.2
	High minus Low	20.6	-1.9	-4.4
Implied Elasticity Estimates	Medium minus Low		-0.3	-0.5
	High minus Medium		0.1	0.0
	High minus Low		-0.1	-0.2

The implied «elasticities» for married individuals in Table 9 are close to zero. Feldstein (1995a) finds positive compensated elasticities of net-of-tax rates with respect to taxable income on 1.04 and higher. Our implied «elasticities» fluctuate between negative and positive values, but they are far below the elasticities in Feldstein (1995a).

So far, our definition of gross income has also included capital income, but capital income is taxed as a part of net income (gross income minus deductions), as discussed above. There are also separate tax rules for dividends (see section 2). Thus, in Table 10 we present «elasticities» when capital income and dividends are deducted from gross income. We see that the exclusion of capital income and dividends does not alter the result, since wage income and income from self-employment are the larger components of gross income.

Table 10. Estimated elasticities of gross income minus capital income and dividends with respect to net-of-tax shares. Married individuals (1 611 obs.). The marginal tax rates are shown in parenthesis

		Net of tax rate	Gross income exclusive capital income and dividends
Percentage changes 1991-94	Low (under 40)	-0.5	3.0
	Medium (40-49)	10.1	-0.6
	High (over 49)	20.1	0.0
Differences of Differences	Medium minus Low	10.6	-3.6
	High minus Medium	10.0	0.6
	High minus Low	20.6	-3.0
Implied Elasticity Estimates	Medium minus Low		-0.3
	High minus Medium		0.1
	High minus Low		-0.2

Feldstein (1995a) derives his elasticities from taxable income, that is total income after deductions. Taxable base corresponds to net income (or ordinary income) in the Norwegian dual tax system. Since capital income only enters into the net income tax base, the marginal tax rates on net income coincide with the marginal tax rates on capital income. Thus, in Table 11 we present the pre-reform marginal tax rates on capital income and changes in the net of tax rate, taxable net income and capital income. We have adjusted taxable net income in 1991 to the 1994 definitions, in order to avoid deriving results that are influenced by the changes in standard deductions in the period. However, we do not consider taxable net income as a good indicator of behavioral adjustments to the reduced tax rates. It is mainly reflecting the changes in interest rate deductions in the period, which in turn depends on the distribution of the debt in the population.

The change in capital income is, of course, also influenced by the reductions in the interest rate in the period. But it is worth noting that the substantial capital income growth among individuals in the upper deciles. This result might be in accordance with other studies, that find more response in financial transactions than for instance in labor supply adjustments, cf. Slemrod (1990, 1995).

Table 11. Changes in net-of-tax rates on capital income, taxable net income and capital income between 1991 and 1994. Married individuals (1 611 obs.)

Decile ranking by marginal tax rates on capital income	Marginal tax rates on capital income in 1991	Percentage changes		
		Net of tax rate on capital income	Taxable net income	Capital income (exclusive dividends)
1	25	-1.8	30.5	-32.5
2	27	-1.8	19.3	-35.1
3	30	2.9	14.6	-11.1
4	31	3.9	18.1	-22.1
5	34	8.3	26.1	87.5
6	34	8.3	10.1	-18.5
7	34	8.3	5.8	-22.0
8	34	9.6	15.6	-9.2
9	37	14.8	17.2	14.2
10	42	23.8	16.9	5.8
Average	33	7.1	16.7	-0.2

As already shown in table 1 in Section 5, the Norwegian tax reform was not distributionally neutral, which means that the high-income individuals might have responded to the growth in income after tax. Have the high-income individuals reduced their income in response to their relative gain in terms of after-tax income in the period? In table 12 we show the magnitude of this uneven growth in income after tax, by comparing income earners at different net-of-tax rates in 1991 (using the same categorisation as above). The comparison of income after tax in 1991 and 1994 is done by calculating the post-tax income in 1994 that would be reported by the tax-payers with unaltered behavior in the period. Hence, 1994 tax-rules is applied in 1991-data by a tax-benefit model calculation.

Table 12. The average increase in post-tax income when applying the 1994 tax system on 1991 data. Married individuals (1 611 obs.)

Marginal tax rates in 1991	Average marginal tax rates in 1991	Average marginal tax rates in 1994	Average post-tax income in 1991	Average increase in post-tax income when imposing the 1994 tax system on 1991 data	Average increase in per cent in post-tax income when imposing the 1994 tax system on 1991 data
Under 40	36	36	148 974	5 578	3.7
40-49	46	41	173 284	6 403	3.7
Over 49	56	47	216 365	10 506	4.9

Even if the high-income earners have experienced a relatively larger increase in post-tax income and might have spend it on leisure, table 5 shows that the importance of this effect must be modest. The income effect alone can not explain the lack of response among high-income individuals to the tax reform and the small «differences-of-differences» estimator.

6.2. Taxation of dividends

As shown in table 11 the response in capital income was more in accordance with expectations. In the following we will discuss the influence from capital income and especially the effects from the changes in the taxation of dividends on the increased inequality.

It is a general result that the income inequality can be overstated when focusing on incomes in one single year, since low income in one year can be compensated by higher income in another year. Instead of focusing on income mobility in general, we show a quite remarkable result when we focus on the income composition of the richest individuals, in terms of post-tax income in 1991 and 1994, compared to the others. As displayed by Table 13, the newcomers in the tenth decile in 1994[33] are characterized by extraordinary high capital incomes in 1994. Especially their average dividends from shares have increased in the period. The average gross dividend in -94 among the newcomers is close to 100 000 NOK, which is remarkably more than the other three groups we have identified in Table 13. Of course, one should be cautious about making strong statements about the income mobility with such a limited data set. However, Table 13 expresses very strongly some distinctive features about the «winners» in the 1994 income distribution.

[33] A newcomer in tenth decile in 1994 was not in tenth decile in 1991.

Table 13. Comparison of capital income in the tenth decile and the other deciles in 1991 and 1994. Number of individuals in each group are shown in parentheses

Various groups	Gross dividend 1991	Gross dividend 1994	Capital income 1991	Capital income 1994
Tenth decile only in -94 (72)	84	95 442	10 398	152 645
Tenth decile both in -91 and -94 (162)	4 459	11 389	32 380	45 362
Tenth decile only in -91 (72)	4 262	4 353	29 170	20 955
All others (2 027)	230	368	7 286	5 696

The adjustments in gross income, revealed in Table 8 and 9 above, do not give support to a strong negative relation between marginal tax rates and gross income. Contrary, the increase in gross income among married taxpayers is very evenly distributed, in spite of the large reductions in marginal tax rates for high income earners. However, the distribution of growth in capital income seems to be more in accordance with the results reported in Feldstein (1995a) and especially dividends have increased in the period, from about 1.5 thousand million NOK in -91 to more than 8 thousand million NOK in -94. Table 14 shows that the inequality is substantially reduced when dividends from shares are deducted from income.[34] In fact, the increase in dividends in the period from 1991 to 1994 is explaining more than half of the observed increase in inequality.

Table 14. Inequality in equivalent post-tax income measured by the Gini coefficient, 1991-94. Income defined with and without dividends

	1991	1994	Increase in inequality 1991-94
Inequality measured by the Gini coefficient when dividends are deducted from income	0.232	0.240	3.5
Inequality measured by the Gini coefficient	0.233	0.253	8.6

What then, can be the underlying causes for this huge dividend increase? We will consider several possible explanations. First, the tax reform had an impact on the cost of paying dividends. Second, the base for dividend payments was changed both due to the tax and the 1992 accounting reform. Third,

[34] Since dividends were taxed as capital income in 1991, deducting dividends also means a tax reduction in 1991.

the reduction in the capital income tax rate (from a maximum of 40.5 to a flat rate of 28 percent) may impact firms' preferred source of finance and the channeling of profits back to the owners. Fourth, expectations about future increases in the capital income tax rate (which is equal to the dividend tax rate) may have accelerated dividend payments. These possible explanations are discussed in more detail below.

Following King (1977), it is possible to construct a parameter, denoted θ, that measure the degree of double taxation under different tax systems.

The θ-parameter is a tax discrimination variable which is defined as the opportunity cost of retained earnings in terms of net dividends foregone. Thus, θ equals the amount of dividends a shareholder receives after all taxes if the firm decides to pay out one more unit of retained earnings. When θ is unity there is no double taxation which means that the tax system does not distort neither the retain or dividend decision. When θ is below unity dividends are taxed more heavily than retained earnings, while a θ greater than unity indicates that dividends are taxed less than retained earnings.

Table 15 shows the development of θ from 1986 to 1992.[35] The parameter is calculated using the maximal marginal tax rate on capital income each year.

Table 15. θ in the Norwegian tax system from 1986 to 1992

Year	θ
1986	0.845
1987	0.928
1988	1.038
1989	1.072
1990	1.108
1991	1.143
1992→[1]	1

[1] In Finnmark and the northern part of Troms capital income has a tax rate lower than 28 percent at the personal level but still 28 percent at the corporate level. The tax discrimination variable θ is therefore higher than unity in this region, that increase the incentives to take profits as dividends.

The numbers in the table indicate that the development of the corporate tax system from 1986 to 1991 made it more and more profitable to take income as dividends due to the decrease of the personal

[35] We have included several years prior to the reform as well, in order to show the variation in θ.

dividend tax in the period. The cost of taking profits as dividends was actually lower in the period from 1988 to 1991 than in the years after 1991. Taken at face value, dividends should be higher in the period before the tax reform than after the tax reform due to the relatively lower cost of paying dividends before the reform. However, before the reform some of the dividend tax was paid by the receiver, while after the tax reform the whole tax is paid by the corporation. This shift might have been interpreted as a tax reduction.

The base for paying dividends changed due to several reasons. Most important were changes in the accounting rules. Before 1992, deductions for tax purposes had to be deducted also in the financial accounts. Dividends, that are paid out of profits after tax, could be effectively limited by this so-called "uniform reporting". This requirement was abolished after 1992 and firms were allowed to keep separate books (separate reporting) for tax and financial purposes (see for instance Sørensen (1994) or Cummins et al. (1994) for a discussion of these conventions). If we compare potential dividends before and after the accounting reform, all other things equal, we find that the base for dividend payments is higher under separate reporting compared to uniform reporting. Almost equally important was the removal of different fund allocations. The most important fund allocation was the so-called "consolidation fund". Each year a corporation could allocate 23 percent of positive pre-tax profits into this fund. There were no requirement to reverse these fund allocations, which meant that corporations could defer taxes infinitely. Thus, a firm that used the maximal allocation rate could reduce the statutory tax rate from 50.8 percent to 39.1 percent for each unit of allocation (0.508(1-0.23)).[36] This allocation reduced the base for paying dividends quite much, because uniform reporting requires that all tax deductions also had to be deducted in the financial statement and thereby the amount that could be paid as dividends. Thus, there is reason to believe that the combination of the abolition of different fund allocations and the change from uniform to separate reporting have increased the potential for paying dividends quite substantially.

The reduction of the tax rate on interest income might have induced an increase in dividends. In itself, such a change will increase the required rate of return on real investments financed by retained earnings, see Sinn (1990). The intuition behind this result is quite simple. When the tax rate on interest income decreases, everything else equal, the return after tax on bank savings increases relative to real investments. This will reduce the attractiveness of real investments compared to financial investments and firms will therefore choose to pay more of their profits in dividends. Another way to see this, is

[36] A self-employed could allocate the same percentage of pre-tax profit into this fund but with a required reversal after three years. Thus, it worked only as a deferral of the tax payment for three years.

that a larger reduction in the interest tax rate than in the corporate tax rate, has the same effect as an increase in the interest rate, which is the opportunity cost of real investment. The formal corporate tax rate was, however, reduced from 50.8 percent to 28 percent. A quite substantial decrease, but on the other hand, calculations by Aarbu and Lian (1996) shows that the effective corporate tax rate probably was more or less unchanged. Thus, a reduction in the effective tax rate on interest income combined with a more or less unchanged effective corporate tax rate might have induced a channeling of retained earnings from corporations to individuals.[37]

Another possible cause can be changes in firms preferred source of finance. It can be shown that the optimal financial policy for a firm before the tax reform was first to retain profits by using full allocation to the consolidation fund. If the need for financing exeeded the consolidation fund allocation the firm should issue new shares which was less costly than to borrow. After the tax reform a firm is indifferent between these financing sources. Because the cost of using retained earnings increased relatively more after the tax reform compared to new share issues and borrowing, more dividends will probably be paid out.

From time to time business executives often express their fear for politicians that want to increase the corporate tax rate and also introduce a double tax on dividends. Such expectations can induce shareholders to take more dividends today than in the future. To our knowledge, however, there is no study that has aimed to measure the effect of these expectations.

To sum up, there might be several causes that can explain the increase in dividends. The combined effect of the change from uniform to separate reporting and the abolition of the consolidation fund is probably the most important cause. However, the relatively larger reduction in the effective tax rate on interest income compared to the reduction in the effective corporate tax rate may be another important cause.

Moreover, the large changes in dividend distributions questions how well income and income inequality is measured. Does the observed increase in inequality only reflect a channeling of profits from firms to individuals? If the owners retained more of the profit before the reform,[38] the comparison of pre-reform and post-reform income inequality is questionable, due to the limited

[37] Why does not the firm itself undertake financial investments? One reason might be that the owners first take profits as dividends and then channel the money back to another (new started) firm that concentrates solely on financial investments.

[38] Uniform reporting , for instance, usually means that owners have to retain a greater share of profits.

information from the income tax returns. Before the reform more income was probably kept within the firm and not reported on the income tax return, while a greater share of the profits are channeled to the owner through dividends after the reform.

7. Summary

In this paper we have evaluated some effects influencing welfare in connection with the Norwegian tax reform, employing data for one pre-reform year (1991) and three post-reform years (1992-94). We observe an increase in inequality after the tax reform, while real average income is about unchanged. Applying the «differences-of-differences» estimator we examine whether the response from high-income individuals can explain the increased inequality. It must be emphasized that there are several other constraints involved when constructing a tax system, influencing both the income distribution and the efficiency in the economy. For instance, capital movement considerations are important in a small open economy as the Norwegian.

Contrary to Feldstein's result from the US, the response to lower marginal tax rates is very small, and our results indicate that the implied elasticities are not larger than 0. The general impression is that the reductions in marginal tax rates, so far, have not given any substantial increase in taxable income. Cultural differences and differences in the wage formation are possibly explanations for the differing results for the two countries, a result which should be further examined.

We find that most of the increase in inequality after the reform is due to a substantial increase in dividends in the period. Several changes in the taxation of dividends are discussed, which might have influenced the «observed» inequality. We still believe that the economic recovery in Norway after the reform is the most important factor behind the increased inequality after the reform. Thus, we can so far (fairly shortly after the reform) neither say that the tax reform has added substantially to the size of the cake nor lead to a more unequal division of slices.

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Appendix

Table A1. Average real extended gross income per decile group, 1991-94. Household income and the household as the unit of analysis

Deciles	1991	1992	1993	1994
1	55 979	53 391	53 134	50 371
2	99 357	95 250	95 645	86 939
3	142 523	134 211	133 434	126 444
4	181 955	176 498	175 761	169 938
5	224 201	217 254	218 909	211 936
6	273 390	269 186	272 211	263 844
7	331 731	328 387	331 519	325 476
8	397 335	394 274	398 595	394 552
9	481 765	479 007	482 185	478 268
10	735 529	737 490	757 782	762 790
Average	292 376	288 495	291 922	287 056

Table A2. Average real equivalent post-tax income per decile group, 1991-94. Household income weighted with the square root of number of household members and the individual as the unit of analysis

Deciles	1991	1992	1993	1994
1	63 200	61 962	61 043	57 491
2	95 197	94 422	92 622	90 227
3	114 454	113 467	112 133	109 959
4	129 484	130 560	129 603	126 987
5	142 846	145 679	144 253	142 514
6	157 095	160 012	159 033	157 724
7	172 823	176 291	175 300	173 802
8	192 082	195 386	194 507	193 315
9	218 887	223 941	222 404	220 523
10	312 354	323 643	333 106	333 499
Average	159 842	162 537	162 401	160 604

Figure A1. Average real equivalent post-tax income per decile group, 1991-94. Household income weighted with the square root of number of household members and the individual as the unit of analysis. Households with one or more self-employed individuals

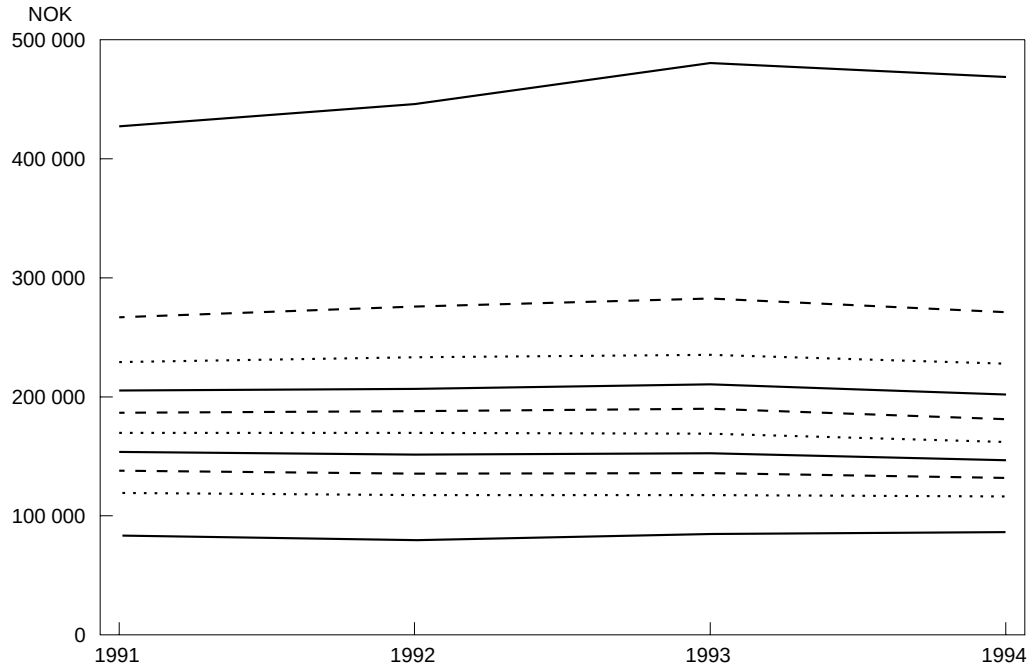

Figure A2. Average equivalent (θ=0.5) post-tax income per decile group, 1991-94. Income adjusted to 1994 prices. Household income weighted with the square root of number of household members and the individual as the unit of analysis. Households with wage earners