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Tax progressivity and recent evolution of the Finnish income inequality*

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TIIVISTELMÄ

1990-luvun alun laman jälkeen Suomen talous kääntyi nopeaan kasvuun ja samalla myös tuloerot alkoivat kasvaa. Vain muutamassa vuodessa Gini-kertoimen arvo palautui 30 vuotta aiemmin vallinneelle tasolle, kääntäen kehityssuunnan, jolloin tuloerot jatkuvasti tasoittuivat. Tässä työssä tarkastellaan julkisen vallan toimien ja erityisesti verouudistusten luomien kannustimien vaikutusta tulonjaon muutokseen. Esittelemme menetelmän, jolla Gini- ja keskittymiskertoimet voidaan hajottaa väestöryhmittäin ja tutkimme sen avulla tulonjaon muutosta soveltaen hajotelmaa sekä veroja edeltäviin että verojen jälkeisiin tuloihin vuosina 1990–2004. Verojen jälkeisten tulojen Gini-kertoimen hajotelmat eivät kerro juuri mitään verotuksen aikaansaamasta tulojen uudelleenjaosta. Sitä vastoin verotuksen progressiivisuusmittarit, kuten Reynoldsin ja Smolenskyn (1977) esittämä, osoittavat verotuksen progressiivisuuden merkitsevästi vähentyneen. Tulokymmenyksiin sovellettu väestöhajotelma havainnollistaa, miten eri tulokymmenysten verokohtelu on muuttunut 1990-luvun puolivälin jälkeen. Suurituloisten ryhmien tulo-osuuksien ja näiden pohjalta laskettujen vero-osuuksien muutokset ovat vaikuttaneet eniten verotuksen progressiivisuuden alenemiseen ja tätä kautta viimeaikaiseen tuloerojen kasvuun. Muutoksiin yhdistyy samanaikainen tuotannontekijätulojen rakenteen muutos. 1990-luvun puolivälin jälkeen pääomatulot ovat kasvaneet voimakkaasti ja ne kertyvät yhä selvemmin kaikkien suurituloisimmille. Vuoden 1993 verouudistus, jossa siirryttiin pääomatulojen eriytettyyn verotukseen, houkutteli muuntamaan muuten ankarasti verotettuja korkeita ansiotuloja pääomatuloiksi ja oli osaltaan tämän muutoksen taustalla. Yllättävä havainto oli, ettei eriytetyn verokohtelun käyttöönotto lisännyt verotuksen horisontaalista eriarvoisuutta, seikka, joka tukee esitettyä tulojen muuntohypoteesia.

ABSTRACT

After the Economic Crisis in early 1990s the Finnish economy has recovered rapidly, and simultaneously a major period of equalization from the mid 1970s to the mid 1990s has been reversed, taking the levels of the Gini coefficient in a few years back to levels of inequality found 30 years ago. The paper examines how changes in Government policy, and in particular, in the incentives introduced by tax reforms have influenced income inequality. The paper introduces a decomposition of the Gini and concentration coefficients by population groups which are calculated for before and after-tax incomes to consider evolution of income inequality and tax progressivity in Finland over the period 1990–2004. Decompositions of the Gini coefficient of after-tax income by income sources give little information on the effects of taxation. In contrast, popular measures of tax progressivity (Reynolds and Smolensky 1977) show a significant decrease. Our decomposition of the progressivity measure by income deciles focuses on changes in tax treatment of the income deciles in the ten year period after the mid 1990s. The changes in the decile shares of before-tax and after-tax income among those in the highest before-tax income deciles are the main factors that lie behind the recent change in tax progressivity, and play an important role in explaining the recent surge in inequality. These changes have been accompanied with a change in the composition of factor income. There has been an unprecedented increase in capital income which has mainly accrued to the population groups at the high end of the income distribution after the mid 1990s. The change is most clearly seen among those in the top income percentage. The 1993 Finnish tax reform introducing the Nordic dual income tax model, and creating strong incentives to shift labour income to capital income for those in the highest marginal tax brackets, is among the key policy decisions responsible for this trend. Interestingly enough, but consistent with the income shifting hypothesis, we find no increase in horizontal inequality in response to the introduction of the dual income tax.

JEL Codes: D31, D63, H24

Key words: Income inequality, Tax progressivity, Gini coefficient

Contents

1 Introduction

Since early 1980s there has been widening income inequality in the United States. In the United Kingdom the increase has been even larger. In some other countries, such as Germany and Japan, the increase up to the early 1990s has been more modest, and Canada, France and Italy show no overall rise over the same period (Atkinson 2000). In addition, there has been surge in top incomes in some countries over the last 10–20 years. At the other end of the income distribution it has been documented that relative poverty rates have increased during the same time period as the top incomes have soared. In other words, the income distribution has been polarized.

Economists have formulated several hypotheses about the causes of these changes. Among them are the shift from manufacturing to service production, technological change, expanding international trade and finance. Of these, the most frequently cited explanation is that technological advances, particularly in the advent of computerised technologies, have shifted labour demand in favour of relatively high skilled and more educated workers. By means of a simple application of supply and demand, this theory posits that skill biased technological change has driven up the wages (employment) of the higher skilled and driven down those of the lower skilled (see Atkinson 2000, for exposition and criticism of the explanation coined as 'Transatlantic Consensus').

Atkinson has been joined by growing group of economists who argue that a passive adaptation to technological shocks is not the sole explanation. For example, Piketty and Saez (2003) challenge the skill-biased technological change thesis on the grounds that the timing of the shifts in income differences does not support it in the US. Similarly they contend that widening income differences cannot be a simple response to technical change or to changes in the supply of educated workers, because the increase is highly concentrated among the very highest earners (Atkinson 2002, 2003). The theory is not able to explain the rise of working rich. Piketty and Saez (2003) instead argue that changing social norms and power are important factors in explaining the recent increase in income inequality and top income shares. These development have affected most Anglo-Saxon countries, including USA, UK, Canada (Atkinson 2002; Piketty and Saez 2003) while in Europe Netherlands, France and Switzerland display hardly any change in top income shares (Atkinson and

Piketty 2007).

Several OECD countries have recently faced severe budgetary pressures, particularly on governments' social retirement and health care finance systems. Public policy has considerable influence on the distribution of income in society. Budgetary pressures may lead changing nature of taxation and income transfer policy. These may include a lowering of the marginal tax rates in top income tax brackets and reductions in benefit levels and coverage in response to the budgetary pressures.

For the above reasons, we should not expect the same developments in all countries, particularly given the role of national policies; put differently, the evolution of income inequality is not simply the product of common economic forces; it also represents the impact of institutions and policies over which we have choice.

In the present paper we will look how progressivity of Finnish income tax has evolved and what implications it has on the income inequality in the 1990s and 2000s. We use popular measures of tax progressivity, introduced by Reynolds and Smolensky (1977) and Kakwani (1977), which are based on Gini and concentration coefficients in answering the questions, is the current income distribution more unequal than in the past and how the progressivity of taxes has changed. Easy interpretation of the results and useful properties play an important role in choosing these measures.

Decompositions of inequality measures offer useful methods of analysis by breaking down the temporal evolution of income inequality into more easily analysable components, see Jenkins (1995). The method can be used to assess the distributional role of factor income and the various items in the Government budget, see Atkinson (1997). Decompositions can be formed with respect to population subgroups or income sources, such as components of factor income, taxes and income transfers.

If population groups are considered, Shorrocks (1980) has convincingly argued that a natural summable decomposition can be obtained for only those inequality measures that belong to the family of generalised entropy measures. In the decomposition, the index is broken down into within- and between-group components. The latter is calculated using the group means and the former by using the within-group values of the measure. The square of the variation coefficient is a member in this family.

The Gini coefficient is the most extensively used summary measure of inequality.

Lerman and Yitzhaki (1985) have presented a decomposition of the Gini coefficient as a weighted sum of the concentration coefficients of the income sources. Their and subsequent analysis has proved its usefulness in explaining inequality trends. In the present paper we develop and apply their decomposition to throw light on measures of tax progressivity. However, the Gini coefficient is not in general decomposable by population subgroups if one uses the group Ginis to calculate the within-group contributions. The Gini coefficient does not meet the conditions set by Shorrocks (1980) in the case of overlapping partitions of the income distribution. In this case a third component, a crossover effect, enters the calculations in addition to the within- and between-group contributions.

It has been argued that since the ranking of the individuals plays a central role in the computation of the Gini coefficient, aiming at to decompose the Gini in terms of subgroup Ginis runs counter to the intuition behind the Gini coefficient (Suoniemi 2000). A method of decomposing the Gini by population subgroups is proposed which is simple and intuitively appealing. It obeys the natural linearity of the Gini in terms of suitably defined concentration coefficients.

To be more explicit, the decomposition by income sources is utilized here by defining a set of indicator functions for a given partition of the population. Multiplying the income variable by these indicators enables one to represent the income as a sum of synthetic income sources. The corresponding decomposition by these sources gives our method. The "elasticity" interpretation by Lerman and Yitzhaki (1985) is the main motivation for extending the decomposition by income sources to cover synthetic income sources which involve population subgroups.

The approach can be extended by treating each income source separately to give a general table of Gini decomposition. In this table inequality is broken into elements that account simultaneously for both income sources and population subgroups. The rows in the table sum up to the total contribution of the population subgroup under consideration. Similarly, the column sums give the contributions of each income source to overall inequality. This decomposition of inequality is compact as it has no separate components for the within- and between-group contributions (Suoniemi 2000).

The decomposition of the Gini coefficient and related tax progressivity measures are used empirically to examine the evolution of Finnish income inequality, in 1990–2004. Comparing the differences in the individual elements across time periods

seem to give interesting insights into the evolution of inequality in the period of deep economic crisis and subsequent rapid economic recovery in the 1990s.

In summary, it is argued that the decompositions by income sources and recipients offer a useful tool for assessing the temporal evolution of income equality in light of the distributional role of the items in the Government budget and progressivity of taxes.

The paper is organized as follows. Section 2 introduces the Gini coefficient and reviews its main properties as inequality measure. In Section 3 our proposal for decomposition of the Gini by population subgroups is examined. Section 4 illustrates the method by empirical examples with Finnish household data.

2 Some properties of the Gini coefficient and measures of tax progressivity

The Gini coefficient is the most extensively used summary measure of inequality. Commonly, the Gini coefficient is defined as twice the area bounded by the Lorenz curve and the unit diagonal. But the following alternative forms are most appropriate to the purposes of this paper.

$$G(y) = 1 - \frac{2}{\mu} E\, y\, (1 - F) = \frac{1}{2\mu} E\, |\, y_1 - y_2\, |, \tag{1}$$

where E refers to the expectation (mean) operator, F is the cumulative distribution function of the income distribution considered, μ denotes the mean income, and in the last equality y_i, i = 1,2, refer to two independent copies of a random variable with distribution F.

The last mean-difference representation of the Gini coefficient is a most useful one. It gives the Gini coefficient as the mean of relative income differences in the population, if one introduces a conditional expectation[1]

$$G(y) = \frac{1}{\mu} E\, (y_1 - y_2\, |\, y_1 \geq y_2). \tag{2}$$

[1]It is interesting to note that another widely used inequality measure, the square of variation coefficient can be written in a similar form (Suoniemi 2000). Here the Gini and variation coefficient are compared using empirical examples with Finnish data. It is found out that the decompositions of the measures give same results qualitatively but the elements in the decomposition of the Gini coefficient are estimated more accurately if the comparison is based on the variation coefficients of the estimators.

Assessments of inequality correspond to a specification of the Social Evaluation Function $W(y)$, $y = (y_1, y_2, \ldots, y_n)$, with the indices corresponding to the individuals in the society (Atkinson 1970). Social evaluation functions present judgments about what is good for the society and what is good for its individual members. Atkinson (1970) has emphasized that social welfare functions implicit in conventional measures, e.g. the Gini coefficient, may have some properties which are unlikely to be acceptable by welfaristic criteria.

Start mechanically from the Gini index of inequality. By inverting Atkinson's (1970) reasoning one obtains the corresponding Gini social evaluation function:

$$W(y) = \mu\,(1 - G(y)) = \frac{1}{n}\sum_i U_i, \quad \text{where } U_i = w_i y_i \tag{3}$$

with an implicit weight $w_i = 1 - (1/n)\sum \mathbf{1}\,(y_j > y_i)$.

The above function is not additively separable in individual incomes, y_i. In contrast, we have a weight term reflecting the income deficits, a direct measure of deprivation. The marginal utility of individual income is decreasing to the rank of incomes, ranging from one for the least privileged individual to zero for the most affluent.

The Gini coefficient is decomposable by income sources (Lerman and Yitzhaki 1985). Let $y = \sum x_k$ then

$$\begin{aligned} G(y) &= \frac{1}{\mu}\,E\,(\sum_k x_k(y_1) - \sum_k x_k(y_2)\,|\,y_1 \geq y_2) \\ &= \sum_k \frac{\mu_k}{\mu}\,E\,(\frac{x_k(y_1)}{\mu_k} - \frac{x_k(y_2)}{\mu_k}\,|\,y_1 \geq y_2) \\ &= \sum_k \frac{\mu_k}{\mu}\,C(x_k, y), \end{aligned} \tag{4}$$

where $C(x_k, y)$ is the concentration coefficient of the variable x_k w.r.t. the income variable, y.

The above equation can be used to interpret how inequality is affected by a *proportional* change in the income source x_k that is equal across all individuals. Here a supplementary condition is needed: The change is marginal in the sense that the original rank of observations w.r.t. the values of y is left unchanged. In particular, no ties in the values of y are allowed. Thereby, the initial ranking can be maintained.

$$\frac{dG(y)}{G(y)} \Big/ \frac{d\mu_k}{\mu_k} = \frac{\mu_k}{\mu}(\frac{C(x_k, y)}{G(y)} - 1). \tag{5}$$

The elasticity formula shows that a marginal proportional change in the income source x_k has a tendency to increase inequality if the corresponding concentration coefficient is larger than the Gini coefficient for total income. Looking at the above implicit definition of the concentration coefficient (4), one notices that in this case the corresponding relative differences are generally larger in x_k than in terms of y. The elasticity interpretation is our main motivation for extending the decomposition by income sources to cover suitably defined synthetic income sources which involve population subgroups.

If there exists a well defined tax function, t, we can define disposable (after-tax) income y, in terms of gross (before-tax) income, $y = x - t(x)$. The effect of taxation on the Gini coefficient may be described by using either the concentration coefficient of taxes, $C(t, x)$, or after-tax income $C(y, x)$ w.r.t. before-tax income. In the case of a progressive taxation, after-tax income is distributed more equally than before-taxes, and the set of inequalities $C(t, x) > G(x) > C(y, x)$ should hold.

The difference in before- and after-tax Gini coeffients of income, $G(x) - G(y)$, can be a written as

$$G(x) - G(y) = (G(x) - C(y, x)) - (G(y) - C(y, x)). \tag{6}$$

The first component,

$$RS = G(x) - C(y, x), \tag{7}$$

is an established measure of tax progressivity (Reynolds and Smolensky 1977). The second term is the corresponding measure for horisontal inequality. It is equal to zero if there is no re-ranking in the income distribution after-taxation. If re-ranking is present the measure of tax progressivity over-estimates the actual degree of income redistribution due to the taxation.

Kakwani (1977) has proposed an alternative measure of tax progression

$$KW = C(t, x) - G(x). \tag{8}$$

A simple proportional, flat rate tax would give zero values to both the above measures (7) and (8). The first, RS, measures the redistribution effect attributable to taxation, and the second, KW, how large share of the (flat rate) tax burden is shifted from those with low income to those at the high end of income distribution.

If $y = x - t(x)$, one can apply (4) to write

$$G(x) = (1 - T)\, C(y, x) + T\, C(t, x) \tag{9}$$

and

$$G(y) = \frac{1+T}{1-T}\, C(x,y) - \frac{T}{1-T}\, C(t,y), \tag{10}$$

where T is the aggregate tax rate. Giving

$$RS = G(x) - C(y,x) = \frac{T}{1-T}\,(C(t,x) - G(x)) = \frac{T}{1-T}\, KW. \tag{11}$$

The two measures of tax progressivity differ by a multiplicative factor which is a monotonous function of the aggregate tax rate.

3 Decomposition of the Gini by subgroups of income recipients

Shorrocks (1980, 1982) has established that the family of generalized entropy measures is unique in having elegant and transparent properties if decompositions by population sub-groups are considered. Using this class of measures one can unambiguously separate total inequality into its between-group and within-groups components. The decomposition has monotonicity properties: total inequality increases if the inequality is increased in any sub-group. The decompositions offer useful tools by breaking down the temporal evolution of inequality into more easily analysable and interpretable components.

The decomposition of the Gini coefficient by income sources is used here to present a simple factoring by groups of income recipients which in our opinion is potentially informative on the temporal changes in inequality.

Consider a partition of the population $\Omega = \sum_i A_i$ and the indicator variables $\mathbf{1}_i$, i = 0,1,...,n, where $\mathbf{1}_i(a) = 1$, if $a \in A_i$, and zero otherwise. Writing $y = \sum \mathbf{1}_i\, y$, using synthetic income sources which account for the population group that is receiving the income, one obtains

$$G(y) = \sum_i w(y_i) C(\mathbf{1}_i\, y, y) = \sum_i \frac{p_i \mu_i}{\mu} C(\mathbf{1}_i\, y, y), \tag{12}$$

where $E\,\mathbf{1}_i\, y = p_i \mu_{i.}$, and p_i and $\mu_{i.}$ stand for the population share and mean of the subgroup i, respectively.

The above decomposition of the Gini coefficient is natural in the sense that it is based on the natural linearity of the expectation (or integral) operator, cf.

$E \sum_k x_k = \sum_k E\, x_k$. This representation is a direct sum and has no separate components for within-group and between-group contributions. The elasticity interpretation by Lerman and Yitzhaki (1985) is the main motivation for extending the decomposition by income sources to cover synthetic income sources which involve population subgroups.

The above formula reaffirms that in general the Gini coefficient is not decomposable in terms of within-group Ginis. This is in contrast with measures that are based on distance measures. For example, the Euclidean norm satisfies the Pythagorean Theorem which guarantees a canonical decomposition of the measure, square of variation coefficient, I_2.

This may be considered as a handicap for the Gini. However, our 'decomposition of the Gini' explicitly accounts for the ranking of the subpopulation within the total population. For example, there are generally "gaps" in the values of the distribution of a subpopulation while observations in other groups are encountered. A direct decomposition of the Gini in terms of the subgroup Ginis runs counter to the intuition behind the Lorenz curve. It may be useful to account for these gaps in the distribution.[2]

However, if the within-group distributions are non-overlapping and have their supports with a single component one obtains a decomposition of the Gini coefficient in terms of the within-group Gini coefficients. This result is well known.

The decompositions of the Gini coefficient by population groups and income sources can be combined to give a combined, simultaneous decomposition. Consider, as above, the indicator variables $\mathbf{1}_i$, corresponding to a partition of the population, i = 0,1,. . . ,n, $\Omega = \sum_i A_i$ and income sources $y = \sum_k x_k$. Writing $y = \sum_i \sum_k \mathbf{1}_i\, x_{k,}$, one obtains

$$G(y) = \sum_i \sum_k \frac{p_i \mu_k}{\mu} C(\mathbf{1}_i\, x_k, y). \tag{13}$$

where $E\, \mathbf{1}_i\, x_k = p_i \mu_k$, and p_i and μ_k for the population share and mean of the income source x_k in the subgroup i, respectively.

These components can be represented as a combined table of decomposition, with a general element $(p_i \mu_k / \mu) C(\mathbf{1}_i\, x_k, y)$. In the table the elements in a column sum up to the decomposition by income sources and the row sums correspond to

[2]This may become more apparent if one considers (2) which gives the Gini coefficient as the mean of relative income differences in the population, a measure of "income deprivation".

the above decomposition of the Gini by population groups.

In the present paper we apply the above decomposition of the Gini coefficient by population groups to groups defined by the deciles of before-tax income. This gives the Reynolds and Smolensky measure of tax progressivity as a weighted sum

$$RS = G(x) - C(y, x) = \sum_i w(x_i)(C(\mathbf{1}_i\, x, x) - \frac{w(y_i)}{w(x_i)} C(\mathbf{1}_i\, y, x)), \tag{14}$$

where $w(x_i)$ and $w(y_i)$, are the ith (before-tax) income deciles share in before-tax and after-tax income, respectively. In the formula we utilise an analogous decomposition of the concentration coefficient,

$$C(y, x) = \sum_i w(y_i) C(\mathbf{1}_i\, y, x). \tag{15}$$

4 Evolution of Finnish income inequality and tax progressivity in 1990–2004

We study the evolution in Finnish tax progressivity using two complementary methods. Both involve decompositions of the Gini and concentration coefficients. The first one examines changes in Gini-correlations between taxes and after-tax (disposable) income and the second one examines the corresponding change in Gini-correlations between taxes and before-tax (gross) income.

Our data consist of the population samples in the Income Distribution Statistics (IDS) collected by the Statistics Finland in 1990–2004. The yearly samples include data on 9 000–12 000 resident households (25 000–35 000 persons) in Finland. Most of the information on household income in the data has been collected from various administrative registers, tax records and government registers holding data on social transfers. Augmenting information on tax-exempt income sources and socio-economic status of the household members are collected through interviews.

Economic conditions and inequality are examined using disposable household income. In calculating inequality each household member is assumed have access to an income level obtained by dividing total household income by an equivalence scale denoting the number of equivalent adults in the household. Here we use the OECD-equivalence scale.

The income sources that define disposable income are: capital income, earned income which includes both employee income and income from self-employment,

current transfers received and current transfers paid.[3] The sum of capital and earned income corresponds to factor income. Adding current transfers received gives gross income.[4] Disposable income is obtained by deducting current transfers paid by the household members.[5]

After a booming economy in the 1980s Finland experienced an exceptionally deep and long economic crisis during the first half of the 1990s (Kalela et al. 2001). Within four years, output was reduced by more than 10 per cent and the unemployment rate quadrupled to nearly 17 percent. Inequality as measured by factor income increased dramatically but there was no corresponding effect on (relative) income differentials in gross income and disposable income. Before the 1990s there was a remarkably stable period in Finnish income inequality. The Gini coefficient of disposable income had remained practically constant between 1976 and 1994 (Riihelä et al. 2001).

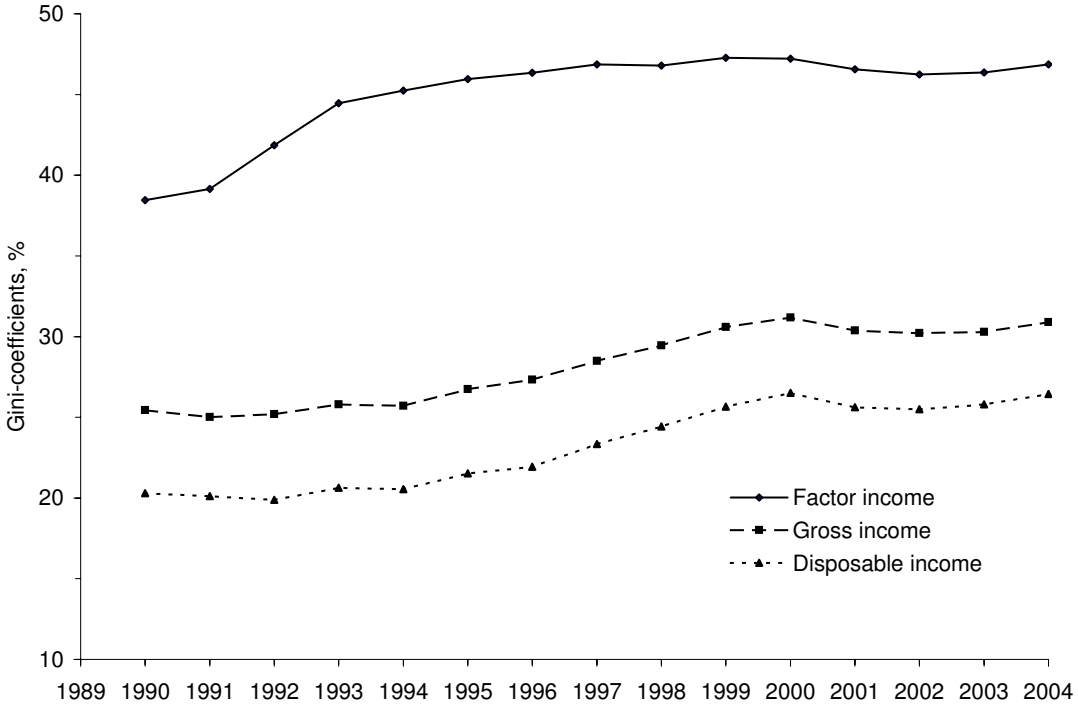
In 1995 the economy started to recover quite rapidly with growth rates averaging 4 per cent in 1995–2000. But employment picked up slowly and unemployment rate leveled to 10 per cent (historically, a quite high level) after the world economy slowed down in the early 2000s. Simultaneously the income inequality as measured by both gross income and disposable income started to rise quite rapidly whereas the trend in increasing inequality in factor income was stopped after 1997 (Figure 1). Clearly public policy has some role in this. In light of the widely differing economic conditions the time period 1990–2004 can been divided into time periods, the crisis period 1990–1994, the period of economic recovery 1994–1999, with a sub-period of rapid growth in 1996–1999, and the last period 1999–2004 while economic growth slowed down. Comparison of decompositions of the Gini coefficient in 1990, 1994, 1999 and 2004 will be used to uncover some of the factors behind the recent and rapid increase in income inequality.

[3]Capital income includes interest received less interest paid, rental income, dividends, pensions and compensations based on private insurance, net imputed rents from owner-occupied dwellings and realised capital gains. Income from self-employment accrues from agriculture, forestry and firms. Employee income consists of cash wages and salaries, value of managerial stock options and compensations in kind, deducting work expenses related to these earnings.

[4]Current transfers received include benefits from unemployment and sick insurance and occupational and national old age, disability and unemployment pensions, child benefits, unemployment and welfare assistance.

[5]Current transfers paid include taxes paid on income and wealth and employee's social insurance contributions.

Figure 1: Income inequality (Gini) in Finland 1990–2004



The decompositions by income sources show a clear picture. Comparing relative contributions of the income sources shows that earned income seems to have a substantial influence in increasing income inequality (Table 1). On the other hand, direct taxes seem to have the most marked influence in the opposite direction. These effects are due to their high share in disposable income (Table 2).

Table 1: Decomposition of the Gini coefficient (%) by income sources in Finland

Year	Capital income	Earned income	Transfers	Direct taxes	Disposable income
1990	2.20	33.25	-2.05	-13.10	20.29
1994	4.67	30.71	-1.29	-13.56	20.54
1999	10.22	32.52	-1.42	-15.65	25.66
2004	11.36	31.40	-2.19	-14.14	26.44

Finland experienced an exceptionally deep and long economic crisis during the first half of the 1990s. Interestingly enough, the Depression left the relative inequal-

Table 2: Mean disposable income (1000 €) by income sources in Finland

Year	Capital income	Earned income	Transfers	Direct taxes	Disposable income
1990	1.13	17.79	4.67	-5.92	17.66
1994	1.98	13.67	6.83	-5.90	16.57
1999	3.34	16.54	6.33	-7.02	19.19
2004	4.26	18.42	6.62	-7.15	22.14

ity seemingly unaffected. The change in Gini was insignificant, about one quarter of a percentage point between 1990–1994. Unemployment rose more rapidly in the high wage, male dominated sector, manufacturing. Since factor income was reduced, the relative position of those who received stable income, such as pensioners, improved, and automatic stabilisers operating through unemployment insurance improved the relative income position of those receiving social transfers (Riihelä et al. 2001). However, the level of the public dept rose very rapidly, and this has been countered by raising the tax rates on wage income. This clearly shows up in the data (Table 1).

In the period of economic recovery, 1994–1999, the value of overall Gini increased remarkably by five percentage points. Although earned income has some contribution to this, capital income has been responsible for most of the increase in the Gini coefficient. It would seem that change in the wage differentials has not been a major factor for the substantial increase in inequality.[6]

[6]In the decade after 1979 the income inequality increased dramatically in the United Kingdom after a relatively stable period of three decades, Johnson (1996). Over the last two decades wage inequality and educational wage differentials have expanded markedly in the USA. These effects show up particularly pronounced in the top income shares Atkinson (2003). There are several explanations for this development. A popular one involves a positive productivity shock that reward high skills relatively more than in the past. These skills are acquired by high education levels and increased use of new information technology is frequently seen as a supplementary factor in the skill-biased productivity change. In addition, some people see globalization of world trade as an additional factor that adversely affects low-skill workers in the developed economies through competition from emerging economies. If the composition of the labour force and labour supply are held constant, the changes in the demand for labour are transmitted by either higher wages or higher employment rates for high-skill workers. The latter effect shows up especially if low skill workers are protected by minimum wages. In both cases high-skill workers increase their share in wage income. This explanation has been extensively discussed and challenged by Atkinson (2000)

Table 3: Reynolds-Smolensky and Kakwani measures of tax progressivity in 1990–2004

Year	Gross income Gini (%)	Net income Concentration (%)	RS measure (%)	KW measure (%)
1990	25.44	19.93	5.51	1.85
1994	25.72	20.07	5.65	2.01
1999	30.60	25.34	5.26	1.93
2004	30.90	26.23	4.67	1.51

It is difficult to see any clear effects of taxation in the decomposition of the Gini coefficient of disposable income (Table 1). Partly this is due to the fact that changes in taxes paid are closely related to simultaneous changes in the level and composition of income. Furthermore, comparisons of correlations of paid taxes with disposable income, as these decompositions implicitly do, are not informative. Conventional methods which aim at assessing the progressivity of taxation and the change in it, relate taxes with gross income whereas the above decompositions relate taxes with after-tax (disposable) income.

Table 3 shows that the progressivity of taxation has been considerably decreased after 1994. Here we show two summary indices, the first one introduced by Reynolds and Smolensky (1977) measures how much disposable income has been redistributed through taxation. The second one by Kakwani (1977) tells how the total tax burden is distributed. In relative terms, the second one shows a more substantial decrease. Since the two measures are functionally dependent (10) through aggregate tax rate, the reduction in aggregate tax rate lies behind this observation.

In the period of economic recovery, real growth in disposable income has been very rapid at the high end of income distribution (Jäntti et al. 2009). The growth in mean income has been more moderate and the real incomes of those in the first, lowest income decile show little growth (Figure 2). Simultaneously the relative poverty rates have gone up (Riihelä et al. 2004, 2008). Decomposition of the progressivity of taxation measure by Reynolds and Smolensky by population groups is used to

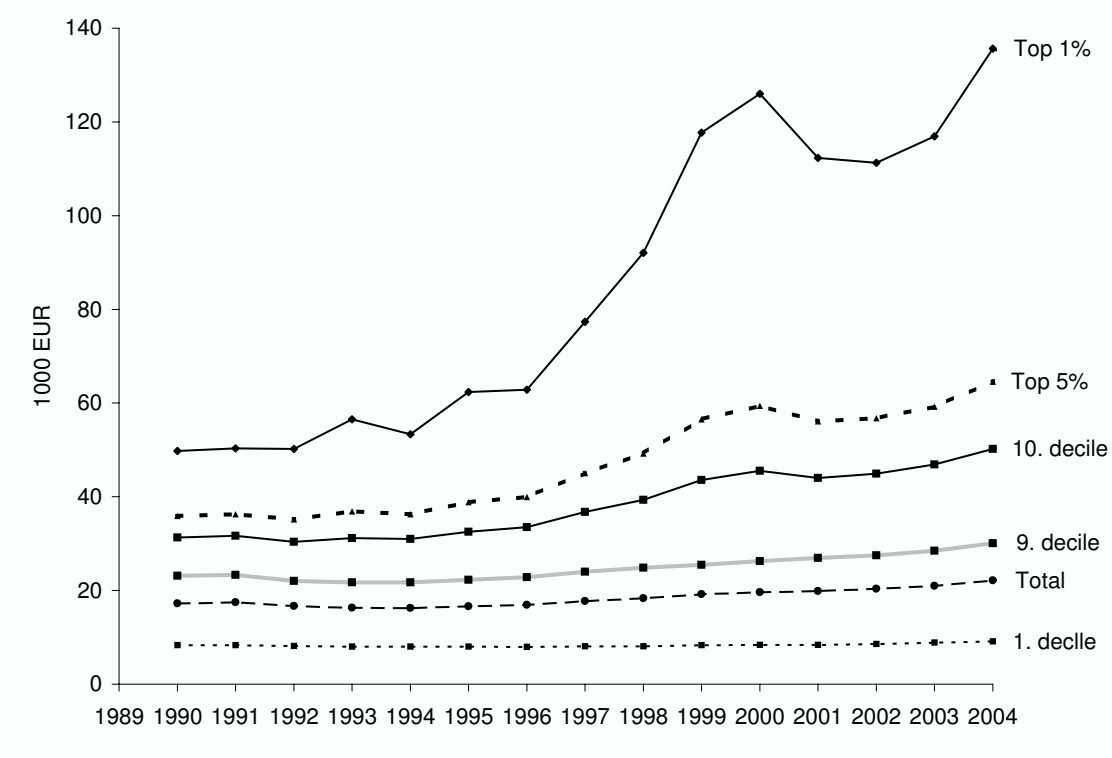
and Piketty and Saez (2003).

examine the change in 1994–2004.

$$RS = G(x) - C(y,x) = \sum_i w(x_i)(C(\mathbf{1}_i\, x, x) - \frac{w(y_i)}{w(x_i)} C(\mathbf{1}_i\, y, x)),$$

where $w(x_i)$ and $w(y_i)$, are the ith (before-tax) income deciles share in before-tax and after-tax income, respectively.

Figure 2: Mean real disposable income in some income deciles in 1990–2004



To examine whether the change in progressivity can be localised to a particular region in the income distribution, the population groups are defined on the basis of before-tax (gross) income, taking the first nine income decile groups, 1,2,...,9, and dividing the top, 10. decile into two non-overlapping groups using the 99th percentage point of the distribution. Therefore, the highest income group consists of those in the top one per cent of the income distribution. Tables 4 and 5 show the factors in the decomposition (14) in 1994 and 2004, respectively.

Table 4: Decomposition of the Reynolds-Smolensky progressivity by gross income deciles in 1994

Income group by Gross income	Share in Gross income (%)	Concentration in Gross income (%)	Share coefficient	Concentration after-tax in income (%)	Contribution (%)
Top 1 per cent	3.72	99.14	0.84	99.14	0.61
90-99 per cent	17.68	89.76	0.88	89.62	1.92
9. decile	14.17	70.36	0.93	70.28	0.66
8. decile	11.94	50.23	0.96	50.19	0.22
7. decile	10.56	30.17	1.00	30.14	0.01
6. decile	9.47	10.18	1.02	10.12	-0.02
5. decile	8.51	-9.81	1.05	-9.83	0.05
4. decile	7.58	-29.81	1.08	-29.86	0.19
3. decile	6.66	-49.77	1.13	-49.82	0.42
2. decile	5.64	-69.70	1.18	-69.77	0.72
First decile	4.07	-88.86	1.24	-88.94	0.88
All	100.0	25.72	1.00	20.07	5.65

Table 5: Decomposition of the Reynolds-Smolensky progressivity by gross income deciles in 2004

Income group by Gross income	Share in Gross income (%)	Concentration in Gross income (%)	Share coefficient	Concentration after-tax in income (%)	Contribution (%)
Top 1 per cent	7.03	99.40	0.87	99.42	0.94
90-99 per cent	18.12	89.91	0.91	89.76	1.51
9. decile	14.13	70.36	0.96	70.30	0.39
8. decile	11.83	50.23	0.98	50.21	0.12
7. decile	10.36	30.21	1.00	30.17	0.00
6. decile	9.14	10.20	1.03	10.19	-0.02
5. decile	8.05	-9.78	1.05	-9.84	0.04
4. decile	7.02	-29.76	1.07	-29.80	0.15
3. decile	6.00	-49.71	1.11	-49.76	0.34
2. decile	4.90	-69.58	1.16	-69.70	0.55
First decile	3.44	-88.89	1.21	-88.93	0.66
All	100.0	30.90	1.00	26.23	4.67

Our decomposition consists of a (before-tax) income share weighted average of the terms, $C(\mathbf{1}_i\, x, x) - (w(y_i)/w(x_i))\, C(\mathbf{1}_i\, y, x)$, for each income group. We suggest that, the concentration coefficients in before-tax income, $C(\mathbf{1}_i\, x, x)$ and after-tax income, $C(\mathbf{1}_i\, y, x)$, can be interpreted to reflect "progressivity effects" within the decile group, i. In Tables 4 and 5, $C(\mathbf{1}_i\, x, x) - C(\mathbf{1}_i\, y, x) \approx 0$. In addition, there seems to be little change in this difference over time. The coefficients $(w(y_i)/w(x_i))$ are more important to the analysis. They give the ratios of mean after-tax income to before-tax income, in the different income deciles, where after-tax and before-tax income are measured as shares in total after-tax and before-tax income, respectively. Tables 4 and 5 show some increase in these coefficients at the high end of income distribution. This means that after-tax income shares of those with high before-tax income has increased over the comparison period more than their before-tax income shares. In addition, we find that their share in before-tax income has increased markedly in the time-period 1994–2004. For example, the top one per cent's income share has nearly doubled. These give the weights in the sum (14) which amplify the decrease in progression which is mostly due to the after-tax and before-tax income ratios at the high end of the income distribution.

This reflects the fact that measures of tax progressivity are sensitive both to change in actual tax schedules and change in the distribution of before-tax income. A fine example concerning the interplay of these two effects is the fact that the product of these effects, $w(x_i)(C(\mathbf{1}_i\, x, x) - (w(y_i)/w(x_i))\, C(1_i\, y, x))$, have actually increased from 1994 to 2004 for those in the top one per cent before-tax income group signalling more tax progressivity. This is in clear contrast to the case of the 8. and 9. decile groups and the 90–99 per cent group. At the very top we find an *increase* in the progressivity of taxes.

However, since their share in before-tax income has nearly doubled, one would expect that a clearly progressive tax schedule would result in more substantial rise in the ratio of their relative shares in mean after-tax income to before-tax income than the actual rise of three percentage points from 0.84 to 0.87. In our data the "income growth for those in the top one per cent" has been much more rapid than for the rest and has deformed the income distribution to the extent that the effect due to actual tax schedules is masked by the distributional effect, "exception that probes the rule".[7]

[7]The quotation marks are used here to remind that we use gross section not panel data. In

Table 6: Direct taxation and horizontal inequality in 1990, 1994, 1999 and 2004

Year	Gini coefficient in after-tax income (%)	Concentration of after-tax income (%)	Horizontal inequality (%)
1990	20.29	19.93	0.36
1994	20.54	20.07	0.47
1999	25.66	25.34	0.32
2004	26.44	26.23	0.21

There has been a prominent change in the factor income in favour of capital, and the Finnish firms have been exceptionally profitable during the last decade (Sauramo 2004 and Maliranta 2007). Presently, developments in capital income are the main source for the increase in relative income inequality if the sources of factor income are under consideration (Table 1). In addition, the main factor that has driven up the top income shares in Finland since the mid 1990s is in an unprecedented increase in the share of capital income. Top incomes are composed more and more of dividend income (Jäntti et al. 2009). The 1993 tax reform introducing dual income tax is seen as one of the key factors responsible for this trend. The dual income tax treats capital and wage income differently. In those income groups facing high marginal tax rates in wage income, capital income is taxed using much lower rate.

One would expect that an introduction of dual income tax would result in substantial re-ranking after taxation. This should show up in the measure of horizontal inequality. However, in contrast to expectations the data show relatively small effects in horizontal inequality of taxation (Table 6). In addition, there has been no increase in these effects after 1994. A strong correlation of between before-tax income level and share of capital income offers an explanation. This would in turn be true if income shifting from wage income to dividend income becomes more popu-

addition we find that the concentration of after-tax incomes of the top one per cent group have increased, signalling even more rapid change at the very top. Since the top income group has no natural upper income bound these effects have very large standard errors and the results have considerable year to year variation. Naturally there has been many small changes in actual tax rates between 1994 and 2004. The tax rate of capital income was increased from 28 to 29 per cent in 2000 and this may also have some influence at the very top end of income distribution (see Figure 4, below).

lar with higher income. The 1993 Finnish tax reform, introducing the Nordic dual income tax model, created strong incentives to shift wage income to capital income for those in the highest marginal tax brackets (Lindhe et al. 2004; Pirttilä and Selin 2006).

Figure 3: Composition of gross income and taxes in average values by gross income deciles in 1994 and 2004

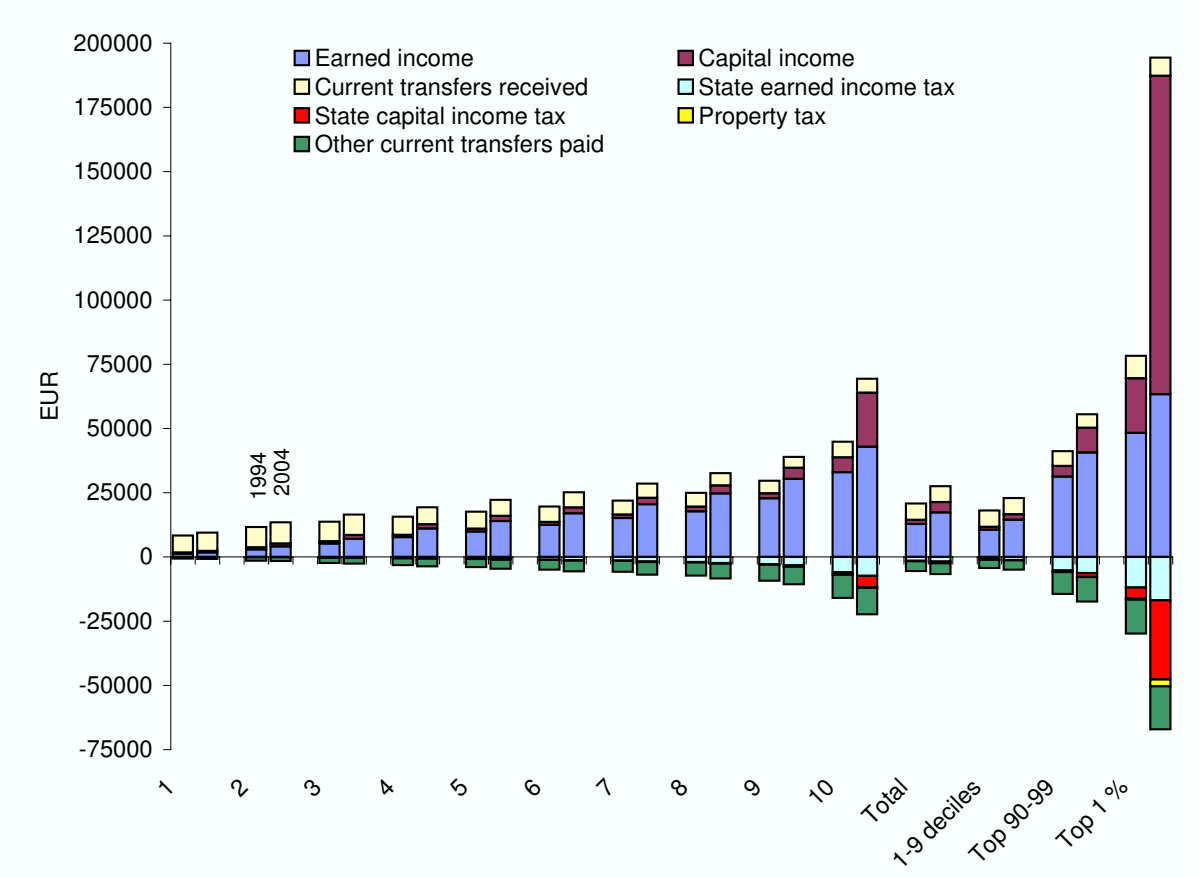
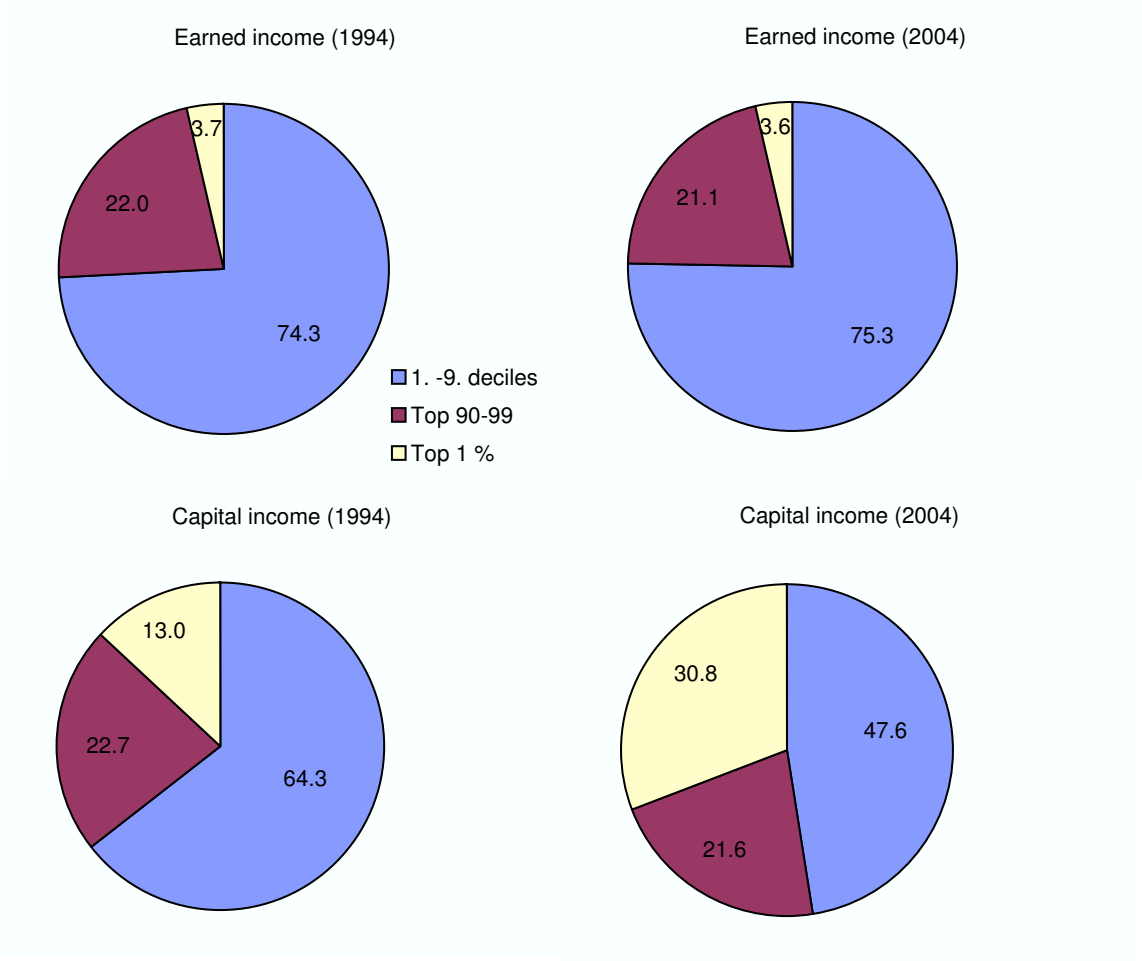


Figure 3 compares composition of gross income and taxes in average values by the different income deciles in 1994 and 2004. The share of capital income increases markedly moving up the income distribution in 2004. In the top one per cent the share is particularly high, and in fact they pay most of their tax from capital income. In 1994 the corresponding gradient is less pronounced. In addition, almost all real income growth for those in the top one per cent in the distribution in 1994–2004 has accrued from capital income. This shows up in the distribution of total capital

Figure 4: Gross income deciles' shares in earned and capital income in 1994 and 2004



income between the income decile groups (Figure 4).

5 Conclusions

The paper has offered some observations and explanations for the recent evolution of Finnish income inequality, focusing on the role of different sources of income and in the progressivity of taxation. Total inequality rose significantly during the latter part of the 1990s. The period of major income equalization from the early 1970s to the mid 1990s has been reversed, taking the values of the Gini coefficient to levels of inequality found 30 years ago.

Widening differentials in earnings seem to play a minor role in these developments even though the economy has experienced mass unemployment and dramatic restructuring of the economy in the 1990s. As a general pattern, inequality rose with growing capital income shares. In particular, among the well-to-do the share of capital income grew most significantly during the late 1990s. The results show that capital income although it appears to represent only 15 per cent of the total equivalent household income makes by far the most significant contribution to overall inequality. The decline in income progressivity since the mid 1990s and the unprecedented increase in the share of capital income are important factors explaining both the increase income inequality and top income shares in Finland.

The 1993 Finnish tax reform, introducing the Nordic dual income tax model, is one of key factors responsible for this trend. Differential taxation of wage and capital income created strong incentives to shift labour income to capital income for those in the highest marginal tax brackets (Lindhe et al. 2004; Pirttilä and Selin 2006). In their study of the recent increase in US income inequality, particularly in the rise of mega-incomes for the very top earners, Piketty and Saez (2003) conclude that "the coupon-clipping rentiers have been overtaken by the working rich". In Finland the opposite seems true. Piketty and Saez (2003) give a central role to taxation, executive compensation and shocks to capital returns.

Finland is a prime example of interaction of political and labour market power (see e.g. Pekkarinen et al. 1992). The history of collective bargaining marks the development of Finnish social security system. After the Economic Crisis of the 1990s, collective bargaining and political exchange in formulating economic policy shifted their focus from expanding social security provisions to income taxes reductions and erosion in tax progressivity. The social norms and power have changed in the Finnish society.

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