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Revealed preferences for redistribution and government's elasticity expectations*

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Tiivistelmä

Tutkimuksessa tarkastellaan Suomen vero- ja sosiaaliturvajärjestelmän taustalla vallitsevia tulonjakopreferenssejä. Tämä toteutetaan laskemalla käänteisen optimiveromallin avulla millä tulonjakopreferensseillä käytössä oleva vero- ja sosiaaliturvajärjestelmä olisi optimaalinen. Näin estimoidut hyvinvointipainot voidaan nähdä tuloeromittarina, joka ottaa huomioon sekä verotuksen tehokkuus- että tulonjakotavoitteet. Tulokset osoittavat, että Suomen verojärjestelmä voi olla optimaalinen vain, jos valtio asettaa hyvin pienen painon pienituloisten työntekijöiden hyvinvoinnille. Vuosien 1995 ja 2006 välillä tulonjakopreferenssit ovat muuttuneet siten, että työttömien suhteelliset hyvinvointipainot ovat laskeneet ja työntekijöiden hyvinvointipainot ovat kasvaneet niin, että suurin muutos on tapahtunut pienituloisimmilla työntekijöillä. Muutokset voivat johtua esimerkiksi aidoista muutoksista suomalaisten tulonjakopreferensseissä, tai muutoksista valtion arvioissa työn tarjonnan joustosta.

Abstract

This paper examines revealed preferences for redistribution behind the Finnish tax-benefit system in years 1995-2006 using the optimal income taxation framework. These implied preferences for redistribution are estimated by solving the redistributive preferences that would make the actual tax-benefit system optimal. Revealed preferences for redistribution can be seen as a inequality measure that takes into account both aspects of the equity-efficiency tradeoff. When comparing the redistributive preferences over time a behavioral decomposition method is used to separate the mechanical effects due to changes in pre-tax income from the direct effects of policy changes. Also another dual approach to optimal income taxation is used in order to estimate the labour supply elasticity expectations of the government. The results show that the Finnish tax-benefit system can be optimal only if the government places a relatively low weight on the welfare of the working poor. Over a timeperiod when there were several changes made to the tax-benefit system that decreased participation tax rates there seems to have been a shift of social welfare weight from the unemployed to the working poor. This shift is mostly due to direct policy changes. There are several potential explanations for the change in revealed welfare weights. One of them is an actual change in the social preferences for redistribution.

Keywords: Redistribution, inequality, optimal income taxation, social preferences

JEL Classification: H11, H21, D63, C63

1 Introduction

The redistributive preferences of a society can be studied by conducting experiments or surveys that measure attitudes towards inequality (e.g. Pirttilä & Uusitalo 2010). Redistributive preferences affect the level of redistribution via tax and transfer programs. The shape of the tax-benefit system is also affected by labour supply elasticities and the optimal tax system is a balance between equity and efficiency.

Optimal income tax models are usually used to estimate optimal marginal tax rates for given labour supply elasticities that maximize some social welfare function. By inverting optimal income tax models it is possible to derive the revealed social preferences that make the observed tax-benefit system optimal. This dual approach to optimal taxation has been previously studied in the case of commodity taxation (e.g. Ahmad & Stern 1984). Inversion of optimal non-linear income tax models was first suggested by Bourguignon & Spadaro (2012) in an application with French data. Bourguignon & Spadaro (2012) inverted both the Mirrlees model with only intensive labour supply responses and the Saez (2002)'s model with both extensive and intensive labour supply responses. Most of the studies focus on households that have only one adult. This is because it is unclear which labour supply elasticities should be used with two-earner households. Bourguignon & Spadaro (2012) focused on single individuals without children using French data.

Bargain & Keane (2010) focused on single individuals without children using Irish data from years 1987–2005. Bargain & Keane (2010) tested whether the revealed welfare weights are comparable over time and how the changes in the welfare weight reflect changes in political forces. Bargain & Keane (2010) found that the redistributive preferences of the government did not change much over time although there were large fiscal reforms and changes in political power. The finding is consistent with the view that the welfare weights reflect the redistributive preferences of the whole nation and not just the political parties in power. The results were different for the UK, where the changes in government had a large impact on the welfare weights. Bargain et al. (2013a) compared the revealed inequality aversion in tax-benefit systems of 17 EU-countries (incl. Finland) and the US using the revealed redistributive preferences approach. They found that compared to Eastern/Southern Europe the implicit redistributive preferences in Nordic/Continental Europe are closer to the maximin criterion, where the government only cares about the welfare of the least well-off households. Bargain et al. (2013a) conclude that the high implied inequality aversion in the Nordic countries can be partly caused by differences in the elasticity expectations of governments and the actual labour supply elasticities estimated from the data.

Blundell et al. (2009) compared the social welfare weights of lone mothers in the UK and Germany. Blundell et al. (2009) found out that in both countries the current tax-benefit system is optimal only if the government places much

higher weight on the income of the non-workers than those working in low-income jobs. Haan & Wrohlich (2010) extended the analysis of Blundell et al. (2009) by explicitly accounting for the in-kind subsidies of childcare in the German tax-benefit system. Haan & Navarro (2008) extended the model to the collective framework when they compared joint taxation and individual taxation of married couples in Germany.

In the 1990s politicians worried about the so called incentive traps in the Finnish tax-benefit system. Several reforms were made to the Finnish tax-benefit system in order to increase the financial gains from work and reduce the number of incentive traps. As a part of the incentive trap reform an in-work tax allowance was introduced to the municipal taxation in 1993. After that the earned income tax allowance in municipal taxation has been increased several times and it is now one of the largest tax allowances in the Finnish tax system. Finland was one of the first countries in Europe to implement an in-work tax credit that have since become increasingly popular. Because of the incentive trap reforms participation tax rates and effective marginal tax rates have decreased in Finland. Since the tax-benefit system has changed it is possible that the redistributive preferences of the government have changed as well.

This paper studies changes in the revealed redistributive preferences in Finland between 1995 and 2006 by using the inverted Saez (2002) -optimal income tax model. The main interest is to compare the revealed welfare weights of the unemployed and the working poor. Bargain et al. (2013a) estimated that the relative welfare weights of low-income workers are extremely small in Nordic countries. However in recent years taxation of the working poor has been lowered in order to account for the high participation elasticities. The changes in the tax-benefit system might be caused by changes in the elasticity expectations of the government or the redistributive preferences.

Another contribution of this paper is to use a decomposition approach to separate the effect of changes in the redistributive preferences from other effects. Policy reforms can be explained by changes in the redistributive preferences and by changes in the pre-tax incomes and demographics. It is possible to separate these two effects using a decomposition method. The interesting question is how much of the policy reforms are due to direct changes in the redistributive preferences. Usual microsimulation based decomposition are static in the sense that the "pure policy effect" does not include any behavioral changes. The static decomposition method is therefore not suitable for this study when the elasticity expectations of the government are non-zero. Instead a behavioral decomposition method is used where the government expectations about behavioral changes due to policy changes are estimated using the elasticity of taxable income.

The dual approach to optimal income taxation can also be used to estimate the elasticity estimates that would make the current tax-benefit system optimal. The revealed redistributive preferences are found to be non-Paretian for some years and this may an indication that the elasticity expectations of the

government differ from the elasticity estimates taken from economic research. Therefore the dual approach is used to estimate the elasticity expectations that would be consistent with the assumption of a Pareto-maximizing social planner with given redistributive preferences.

The results show that for given elasticity expectations the Finnish tax-benefit system can be optimal only if the government places a relatively low weight on the welfare of the working poor. If the government does not take participation decisions into account, the relative welfare weight of low-income workers is higher, but still less than the welfare weight of workers with higher wages. However the relative welfare weight of low-income workers has increased between 1995 and 2006.

The changes in the tax-benefit system might be also a result from changes in the elasticity expectations of the government. The elasticity expectations would have to be large and concentrated on middle- and high-income earners in order for the Finnish tax-benefit system to be optimal for a given social welfare function with a modest taste for redistribution.

The paper is organized as follows: Section 2 presents the optimal income tax model. Section 3 describes issues regarding the empirical implementation. Section 4 concentrates on the issues regarding the Finnish tax-benefit system. Section 5 presents the results and finally section 6 concludes.

2 Theoretical background: optimal income taxation (Saez (2002)'s model)

The Saez (2002) model differs from the Mirrlees (1971) optimal tax model in that it takes into account the participation decision of individuals. In the Saez-model individuals choose whether to work or not and how many hours to work. Individuals choose a consumption-labour -pair that maximizes their utility. Social planner maximizes social welfare, which is a function of individual utilities. The social planner can observe only gross incomes and therefore it has to resort to distorting taxation.

2.1 Solving the optimal tax rates

In Saez (2002)'s model there are *I+1* groups in the labour market: *I* groups who do work ranked by increasing gross income levels (Y_i) and one group which consists of those who do not work ($Y_0 = 0$). Individuals choose whether to work or not (the extensive margin) and which group to choose (the intensive margin). In the Saez-model the optimal taxation has the following form:

$$\frac{T_i - T_{i-1}}{C_i - C_{i-1}} = \frac{1}{\xi_i h_i} \sum_{j=i}^{I} h_j \left[1 - g_j - \eta_j \frac{T_j - T_0}{C_j - C_0} \right], \tag{1}$$

where T_i is the net tax paid by group i, C_i is the disposable income of group i, h_i is the share of group i in the whole population and g_i are the welfare weights that summarize the social preferences of the government. g_i is the marginal social welfare of a 1€ transfer to an individual in group i expressed in terms of public funds. The mobility elasticity ξ_i is defined as

$$\xi_i = \frac{C_i - C_{i-1}}{h_i} \frac{dh_i}{d(C_i - C_{i-1})}. \tag{2}$$

The intensive elasticity captures the percentage increase in group i following a 1% increase in $C_i - C_{i-1}$, assuming that individuals can adjust labour supply only to the nearest choice. It should be noted that the mobility elasticity differs from the classical labour supply elasticity, ϵ_i which measures the effects of wages on hours of work in a continuous case.

The extensive elasticity η_i is defined as

$$\eta_i = \frac{C_i - C_0}{h_i} \frac{dh_i}{d(C_i - C_0)}. \tag{3}$$

The participation elasticity measures the percentage of individuals in group i who stop working when the difference between the disposable income out of work and at earnings point i is decreased by 1%. It should be noted that for group 1 the participation elasticity is equal to the mobility elasticity by definition. It is possible to study pure intensive or pure extensive models by setting either the participation elasticity or the mobility elasticity to zero for all groups.

When there are no income effects the welfare weights can be normalized by the following constraint:

$$\sum_i h_i g_i = 1. \tag{4}$$

The government budget constraint restricts that the sum of net taxes has to equal the consumption of the government,

$$\sum_i h_i T_i = H. \tag{5}$$

2.2 Solving the revealed welfare weights

The optimal tax schedule can be calculated from (1) under assumptions on the elasticities and social preferences. Equation (1) can be inverted to calculate the welfare weights for which the current tax-benefit schedule is optimal. The inversion is straightforward. From (1) we obtain that for $i = 1, \ldots, I-1$

$$g_i = 1 - \eta_i \frac{T_i - T_0}{C_i - C_0} - \xi_i \frac{T_i - T_{i-1}}{C_i - C_{i-1}} + \frac{1}{h_i} \sum_{j=i+1}^{I} h_j \left[1 - g_j - \eta_i \frac{T_j - T_0}{C_j - C_0} \right]. \tag{6}$$

For group I the welfare weight is

$$g_I = 1 - \eta_I \frac{T_I - T_0}{C_I - C_0} - \xi_I \frac{T_I - T_{I-1}}{C_I - C_{I-1}}. \tag{7}$$

Using the normalization condition (4) together with (6) and (7) yields the welfare weight for the non-working group:

$$g_0 = \frac{1}{h_0}\left(1 - \sum_{i=1}^{I} h_i g_i\right). \tag{8}$$

2.3 Solving the revealed elasticity expectations

Equation (1) can also be used to solve the elasticities that would make the current tax-benefit system optimal for given welfare weights. The elasticity expectations are calculated separately for a pure extensive model, pure intensive model and a model with both intensive and extensive labour supply responses. For a pure extensive model the revealed participation elasticity expectations for groups $i = 1, \ldots, I$ are

$$\eta_i = \frac{C_i - C_0}{T_i - T_0}(1 - g_i). \tag{9}$$

For the pure intensive model the revealed mobility elasticity expectations for groups $i = 1, \ldots, I$ are

$$\xi_i = \frac{C_i - C_{i-1}}{T_i - T_{i-1}} \frac{1}{h_i} \sum_{j=i}^{I} h_j (1 - g_j). \tag{10}$$

For a model with both extensive and intensive labour supply responses, the participation elasticity expectations with given mobility elasticities for groups $i = 2, \ldots, I-1$ are

$$\eta_i = \frac{C_i - C_0}{T_i - T_0}[1 - g_i - \xi_i \frac{T_i - T_{i-1}}{C_i - C_{i-1}} + \frac{1}{h_i} \sum_{j=i+1}^{I} h_j (1 - g_j - \eta_j \frac{T_j - T_0}{C_j - C_0})]. \tag{11}$$

For group I the revealed participation elasticity is

$$\eta_I = \frac{C_I - C_0}{T_I - T_0}[1 - g_I - \xi_I \frac{T_I - T_{I-1}}{C_I - C_{I-1}}]. \tag{12}$$

Finally for group 1 the mobility elasticity and participation elasticity are equal by definition and therefore the revealed participation/mobility elasticity for group 1 is

$$\eta_1 = \frac{C_1 - C_0}{2(T_1 - T_0)}[1 - g_1 + \frac{1}{h_1} \sum_{j=2}^{I} h_j (1 - g_j - \eta_j \frac{T_j - T_0}{C_j - C_0})]. \tag{13}$$

3 Empirical implementation

3.1 Calculating the welfare weights

The marginal welfare weights can be computed from equations (6), (7) and (8) using the observation of T_i, C_i, h_i, ξ_i and η_i for each $i = 0, \ldots, I$. The information about net taxes T_i and disposable income C_i is usually found in the data or they can be calculated using a microsimulation model and information about the gross labour income $Y_i = C_i + T_i$. Bourguignon & Spadaro (2012) discussed the assumptions that have to hold in order for the inversion to be meaningful. One of them is that the revealed social welfare function has to be non-decreasing everywhere. Negative welfare weights for some groups would violate this assumption about a Paretian welfare maximizing social planner.

Observed labour supply behavior to tax-benefit reforms is a function of true elasticities. Observed tax-benefit policies are instead a function of the elasticity expectations of policy makers. The expectations of policy makers can differ from true elasticities especially if the elasticities change over time. The elasticity expectations should be used when estimating the revealed redistributive preferences of policy makers. Since these values are not known, they have to be estimated. The elasticities can be estimated from the data assuming that the elasticity expectations are the same as true elasticities (e.g. Blundell et al. 2009; Bargain & Keane 2010; Bargain et al. 2013a). Another way of estimating the elasticity expectations is to the upper and lower bounds for the elasticities based on previous research results (e.g. Bourguignon & Spadaro 2012; Spadaro et al. 2012). The assumption in this case is that research on labour supply behavior influences the elasticity expectations of policy makers. There are also other possible ways of estimating the elasticity expectations of the government. Information about the expected labour supply responses can be possibly found in the government proposals for amendments to tax legislation. If the government uses a behavioral microsimulation model when estimating the impacts of tax-benefit reforms, the elasticity estimates used in these simulations would be the best estimates for the government's elasticity expectations.

Almost all of the studies focus only on one demographic group at a time. This requires the assumption that the redistribution between different demographic groups and within a group is separable. The focus in the studies is on the vertical redistribution within a single homogenous group. The redistribution between groups is assumed to be constant and therefore the sum of net taxes in the government budget constraint can be negative for some demographic groups (e.g. single parents).

3.2 Decomposition approach

The income distribution is affected by policy reforms and changes in the demographics and pre-tax wages. Using a decomposition approach it is possible to separate the direct effect of policy changes from other factors. When comparing the changes is the welfare weights over time it is interesting to see how much of the changes can be explained with direct effects of policy reforms. The decomposition approach is usually used with different inequality measures. The structure of revealed welfare weights can be seen as an inequality measure that takes into account the efficiency aspect in the shape of tax-benefit systems.

The decomposition method is based on the microsimulation assisted decomposition approach used in Bargain & Callan (2010) and Bargain et al. (2013b). Consider a matrix y that includes information about individuals' pre-tax income from different sources and socio-demographic characteristics that affect tax-benefit calculations. Tax-benefit function d represents the rules and structures of the tax-benefit system (e.g. marginal tax rates). The tax-benefit calculations also depend on a set of monetary parameters (e.g. threshold level of tax brackets) p. Gross income is transformed into disposable income with the function $d_i(p^{\mathrm{j}}, y^l)$ using population from year l, tax-benefit structure from year i and tax-benefit parameters from year j. The income levels and/or parameters p can be nominally adjusted using factor α. For example $d_t(\alpha^{t+1}p^{\mathrm{t}}, y^{t+1})$calculates disposable incomes using population from year *t+1*, tax rules from year t, and parameters from year t that are nominally corrected using factor α^{t+1}. (Bargain et al. 2013b)

The total change in the distribution of disposable income (or in this case the distribution of welfare weights) is characterized as

$$\triangle = G[d_{t+1}(p^{\mathrm{t}+1}, y^{t+1})] - G[d_t(p^{\mathrm{t}}, y^t)]. \tag{14}$$

The total change can be decomposed between the contribution of policy reforms and the "other" effect caused changes in pre-tax wages and demographics.

$$\begin{aligned} \triangle \quad = \quad & \{G[d_{t+1}(p^{\mathrm{t}+1}, y^{t+1})] - G[d_t(\alpha^{t+1}p^{\mathrm{t}}, y^{t+1})]\} && \text{(policy effect)} \\ & + \{G[d_t(\alpha^{t+1}p^{\mathrm{t}}, y^{t+1})] - G[d_t(p^{\mathrm{t}}, y^t)]\} && \text{(other effect)} \end{aligned} \tag{15}$$

It should be noted that the nominally adjusted parameters $\alpha^{t+1}p^{\mathrm{t}}$ are not identical to the actual parameters $p^{\mathrm{t}+1}$ decided by the policy makers. Therefore the policy effect includes both the effect of changes in the tax-benefit structure (d_t to d_{t+1}) and the effect of adjusting the policy parameters (p_t to p_{t+1}) when the adjustment differs from a plain nominal adjustment with factor α^{t+1} (e.g. price inflation or earnings growth). The counterfactual simulations needed for the decomposition are calculated using a microsimulation model.

The described decomposition method is static in the sense that all behavioral responses to tax-benefit changes are included in the other effects and the policy effects are static changes to inequality measures due to policy changes. The static decomposition method is not directly suitable for decomposing changes in the revealed redistributive preferences when the government expects policy changes to have impacts on labour supply. Instead the policy effect should include the expectations of the government about the behavioral effects of policy changes. Bargain (2012) used labour supply simulations to decompose changes in income distributions to policy effects, other effects and behavioral effects. The other effect in (15) can be divided into behavioral effects and other effects. Denote y_t^{t+1} population of year *t+1* making labour supply decisions using the tax-benefit policies of year *t*. Now the total change in the distribution of disposable income can be decomposed between the static policy effects, behavioral effects and other effects.

$$\begin{aligned}
\triangle \quad = \quad & \{G[d_{t+1}(p^{t+1}, y^{t+1})] - G[d_t(\alpha^{t+1}p^{\mathrm{t}}, y^{t+1})]\} && \text{(policy effect)} \\
& + \{G[d_t(\alpha^{t+1}p^{\mathrm{t}}, y^{t+1})] - G[d_t(\alpha^{t+1}p^{\mathrm{t}}, y_t^{t+1})]\} && \text{(behavioral effect)} \\
& + \{G[d_t(\alpha^{t+1}p^{\mathrm{t}}, y_t^{t+1})] - G[d_t(p^{\mathrm{t}}, y^t)]\} && \text{(other effect)} \qquad (16)
\end{aligned}$$

One possible way of estimating behavioral effects of tax reforms is to use the elasticity of taxable income. In addition to pure labour supply responses, the elasticity of taxable income (ETI) can also capture other margins of adjustment (f.e. tax planning). The elasticity of taxable income is defined as

$$ETI = \frac{1-\tau}{z} \cdot \frac{\partial z}{\partial z(1-\tau)},$$

where z is the reported income of the individual and τ is the marginal tax rate. Elasticity of taxable income is defined as the percentage change in reported income when the net-of-tax-rate increases by 1 percent. (Saez et al. 2012.)

When decomposing the changes in revealed redistributive preferences the policy effect with expected labour supply responses is the sum of the first two elements in (16). Using the elasticity of taxable income and true changes in marginal tax rates the policy effect with expected behavioral responses can be defined as

$$G[d_{t+1}(p^{t+1}, y^{t+1})] - G[d_t(\alpha^{t+1}p^t, (1 + ETI\frac{\tau_t - \tau_{t+1}}{1-\tau_{t+1}})y^{t+1})].$$

3.3 Calculating the revealed elasticity expectations

The revealed elasticity expectations can be calculated from equations (9) - (13) using information about net-taxes, disposable incomes and redistributive preferences of the government. The welfare weights are calibrated in the same way as in Saez (2002). The curve of the marginal welfare weights is $g(c) = 1/(p \cdot c^v)$, where v is a parameter defining the redistributive tastes of the government and p denotes marginal value of public funds, calibrated to satisfy equation (4). Redistributive tastes increase with v and redistributive preferences of a maximin criterion can be obtained by setting $v = +\infty$. The calculations are done using different redistributive tastes.

The elasticities are calculated separately using a pure intensive model, pure extensive model and a model with both extensive and intensive responses. When there are both intensive and extensive labour supply responses the participation elasticity expectations are calculated taking the mobility elasticity estimates as given for groups $i = 2, \ldots, I$.

4 Estimating the revealed preferences for redistribution in Finland

4.1 Data and estimation methods

The empirical estimation is based on a panel data from 1995 to 2006. The data consists of 30 000 individuals per year. The register based data has information on the gross income, net taxes and disposable income of the households. The data also has information on the labour supply of the individuals.

The welfare weights can be computed using the register data or by using a microsimulation model to estimate the taxes and social transfers for each income group.

Income groups

The study focuses on childless individuals aged between 20 and 64 years. Students and pensioners are excluded from the sample. Also households where capital income represents more than 10% of total gross income are excluded from the sample. The selected sample size is between 600 and 2000 depending on the year.

The sample is divided into 6 groups. The partitioning of the population can be done in different ways. The simplest way is to use income quintiles (e.g. Bargain et al. 2013a; Blundell et al. 2009). When using income quintiles, group 0 consists of households with no or very little labour income. The 5 other groups consist of income quintiles among workers. Another possibility is to partition the population into groups by using the median income in each year. Spadaro et al. (2012) defined income groups in different countries using information about the median income and minimum wage (60% of median income). Group 1 starts at half the minimum wage and group 2 at 1.3 times the minimum wage. Group 3 starts at the median income and group 4 at 1.5 times the median income. Finally group 5 starts at twice the median income.

In this research the population is partitioned using income quintiles and information about the median wage. Group 0 consists of those with wage income less than 30 % of the median wage income. The rest of the groups are simply income quintiles among the rest of the population.

Unemployment benefits

Should the unemployment benefits be treated as redistributive social assistance or as delayed salary? Most of the previous studies have treated unemployment benefits as replacement income and therefore persons who receive unemployment benefits have been treated as workers.

In Finland the unemployment benefits are partly linked to workers past earnings. Persons who are not eligible for earnings related unemployment benefit

receive a basic unemployment allowance or labour market subsidy that is not linked to past earnings. The requirement for earnings related unemployment allowance are met if the person has been a member of a unemployment fund prior to the unemployment and meets the employment requirement. The employment requirement is met if the person has been employed for at least 34 weeks in the 28 months preceding the date of registering as an unemployed job seeker. The earnings related unemployment allowance consists of a basic component and an earnings-related component. The basic component is the same as in the basic unemployment allowance. The earnings related component depends on the wage before the unemployment.

The basic component is the same for all unemployed persons with the same number of children and is not linked to past earnings. Therefore the basic component could be seen as a redistributive assistance for the unemployed. The earnings related part on the other hand could be seen as delayed salary. Unfortunately the dataset has only information about the earnings related unemployment benefit as whole and it is not possible to divide the unemployment benefit between the basic component and the earnings related component.

In the basic setting both the basic unemployment allowance and the earnings related unemployment allowance are treated as a redistributive benefit.

Elasticity estimates

The estimates for the elasticity of labour supply are taken from previous research (Bargain & Orsini 2006). In the basic setting the extensive (η_i) elasticity is assumed to be 0.25. The mobility elasticities estimates (ξ_i) for groups 2-5 ranging from 0.02 to 0.05 are taken from Bargain et al. (2013a) while the mobility elasticity of group 1 is equal to the extensive elasticity by definition. Sensitivity analysis is conducted by testing other values for the elasticity estimates.

4.2 Changes in the Finnish tax-benefit system between 1995 and 2006

In the optimal income taxation framework the changes in the tax-benefit system are responses to changes in the social welfare weights, the labour supply elasticities or the distribution of pre-tax income.

Several policy changes were made to the Finnish tax-benefit system between 1995 and 2006 that increased the financial gains from work. If the labour supply elasticities have not changed, then there should be a change in the relative welfare weights of groups 0 (unemployed) and 1 (working poor).

In-work tax allowances were introduced to the Finnish tax-benefit system in the 1990s "incentive trap reforms". The largest in-work tax allowance is the earned income allowance in municipal taxation. The allowance was increased several times between 1995 and 2006. The maximum deduction from taxable income was 2000 FIM (ca. 350€) in 1995. In 2006 the maximum deduction from taxable income was 3850€. In addition to the increases in the earned income tax allowance in municipal taxation a new in-work credit was implemented to state taxation in 2006. In 2006 the earned income allowance in state taxation deducts a maximum of 157 € from paid taxes.

While the low-income tax allowances were increased, the nominal adjustment for social transfers to the unemployed was slow between 1995 and 2006. The increase in low-income allowances and the slow adjustment of social transfers increase the financial gains from low-income work. Therefore they affect the gap in welfare weights of groups 0 and 1.

5 Results

5.1 Descriptive statistics

The descriptive statistics for years 1995, 2001 and 2006 are found in Table 1. Group 0 consists of those with wage income less than 30 % of the median wage income. The rest of the groups are simply income quintiles among the rest of the population. Table 1 has information about the average wage income, disposable income and size of each income group. The incomes are in Euro per year. The gross wage income has increased in all income groups between 1995 and 2006.

Table 1: Descriptive statistics

Income groups	1995	2001	2006
Wage income (Y_i)			
0	1134	1214	1716
1	10920	13739	15293
2	17063	20436	22847
3	20040	24299	26992
4	24265	29166	32568
5	34586	42226	48300
Disposable income (C_i)			
0	7570	7963	9119
1	10063	12148	13952
2	12187	15329	17828
3	13765	17439	20282
4	16011	20355	23594
5	20737	27102	32111
Group size (h_i)			
0	22,75 %	18,57 %	16,68 %
1	15,57 %	16,35 %	16,68 %
2	15,37 %	16,25 %	16,68 %
3	15,57 %	16,35 %	16,64 %
4	15,37 %	16,25 %	16,68 %
5	15,37 %	16,25 %	16,64 %

All incomes in € / year

Discrete effective marginal tax rates $(T_i - T_{i-1})/(Y_i - Y_{i-1})$ were also calculated. The discrete effective marginal tax rate is not precisely a marginal tax rate since the income change to the neighboring group is larger than in the normal marginal case (e.g. 1 % increase in income). For group 1 the discrete effective marginal tax rate is actually a participation tax rate since the neighboring group is the non-working group. The results for years 1995 and 2006 can be found in Figure 1. The figure is U-shaped in both years. Participation tax rates are quite high in both years. The effective marginal tax rates have decreased in all income groups between 1995 and 2006. The largest change was in group 2.

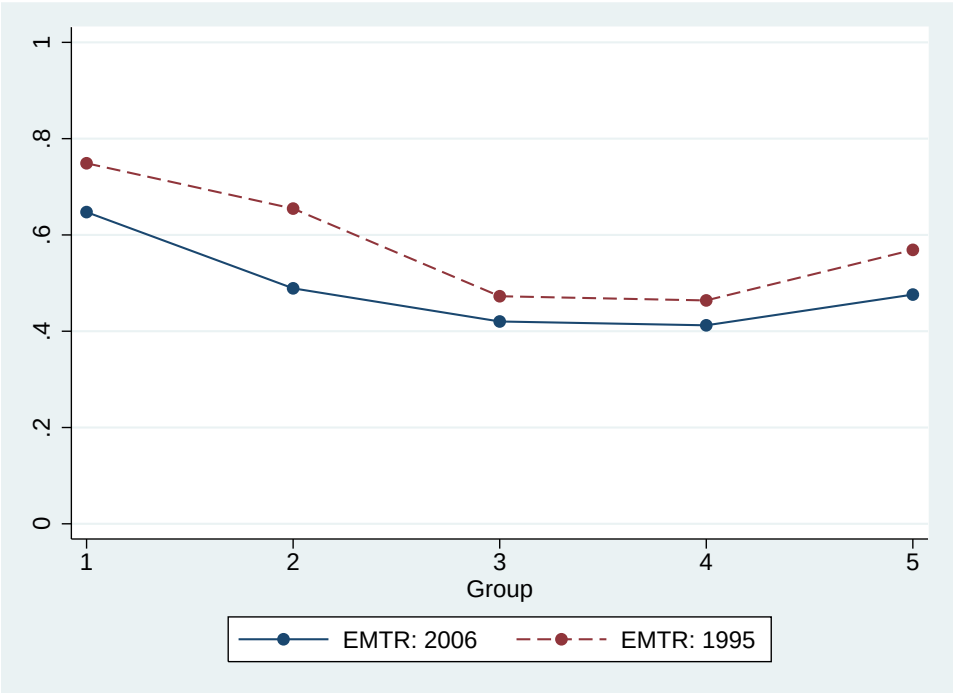

Figure 1: Discrete effective marginal tax rate (EMTR), years 1995 and 2006

5.2 Revealed redistributive preferences

The welfare weights for childless individuals were calculated separately for each year using (6), (7) and (8). The welfare weights for each income group in 2006 are found in Figure 2. All welfare weights are positive, so they are consistent with the assumption of a Paretian social planner. The largest welfare weight is placed on the poorest group. However the welfare weights are not monotonically decreasing. The welfare weight of group 1 is much smaller than the welfare weights of groups with higher wage income. This means that the social welfare would increase by redistributing from the low-income earners to high-income earners. The small welfare weight of group 1 is due to high participation tax rates. If the participation elasticity is significant, then the high participation tax rate can be optimal only if the welfare weight of the working poor is very small. The welfare weight of group 1 could be increased by adding more in-work type benefits to the working poor.

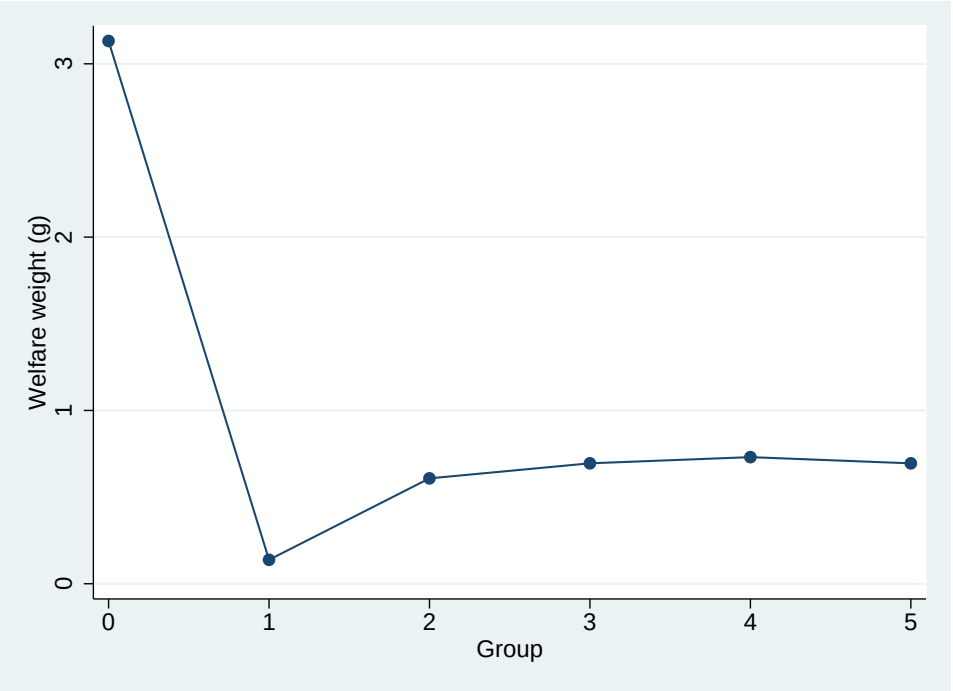

Figure 2: Welfare weights, year 2006

The elasticity estimates have a large impact on the welfare weights. The revealed welfare weights in 2006 with different estimates for the extensive elasticity are found in Figure 3. With a pure intensive model ($\eta_i = 0$), the shape of the welfare weights is close to utilitarian preferences. However the welfare weight of group 1 is still smaller than the welfare weight of other income groups. If the participation elasticities are very high ($\eta_i = 0.5$) the welfare weight of group 1 is negative. So with very high participation elasticities the welfare weights are not consistent with the assumption of a Paretian social planner.

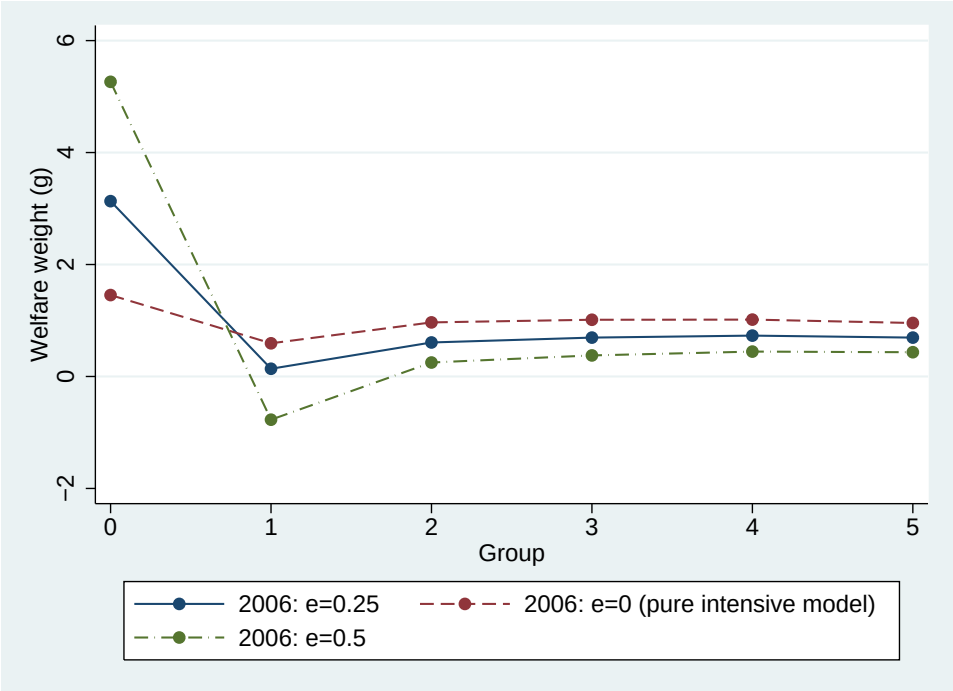

Figure 3: Welfare weights with different estimates for extensive elasticity

Additional robustness checks regarding the role of earnings related unemployment benefit and the definition of income groups were also done. The results are in the Appendix.

5.3 Changes in the redistributive preferences between 1995 and 2006

In order to estimate how the redistributive preferences have changed over time, the welfare weights were calculated also for years 1995 and 2001. To aid the comparison between years, the welfare weights are expressed relative to the welfare weight of group 0. The relative welfare weights are found in Figure 4. First thing to notice from the figure is that the welfare weight of group 1 is negative in 1995. This is not consistent with the assumption of a Paretian social planner. Negative welfare weights mean that redistribution to the working poor would actually decrease social welfare.

The relative welfare weights of groups 1–5 have all increased between 1995 and 2006. The largest change is found in groups 1 and 2. The overall structure of the relative welfare weights has changed so that the dip in the welfare weight of group 1 is smaller in 2006 than in 1995. The change in the relative welfare weights is much larger between 1995 and 2001 than between 2001 and 2006.

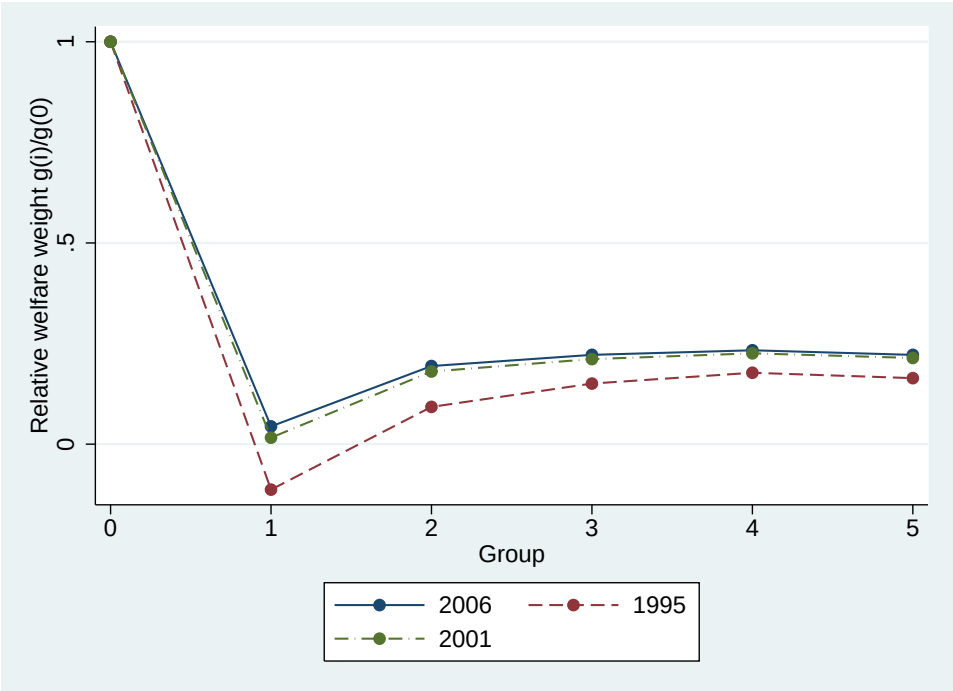

Figure 4: Relative welfare weights: years 1995, 2001 and 2006

It should be noted that the elasticity estimates have a large impact on the estimated welfare weights. The relative welfare weights in Figure 4 were calculated with the assumption that the elasticity estimates have not changed

between 1995 and 2006. If the government expectations for the labour supply elasticities have changed, then the results would be quite different. The comparison of welfare weights over time would be more precise if the elasticity estimates used in the calculations reflected the real changes in the government expectations. The welfare weights were also calculated using a pure intensive model, which assumes that the government expected the participation decision to be inelastic. The results for the pure intensive model are found in Figure 5.

The larger dip in the welfare weight of the working poor is due to the fact that for group 1 the neighboring group is group 0 and therefore the mobility elasticity is higher for group 1. With a pure intensive model the welfare weights of all groups are positive and the absolute welfare weight of group 0 is smaller than in the model with both extensive and intensive labour supply responses. With the pure intensive model, the change in the welfare weights is similar to the original model. The relative welfare weight of the unemployed has decreased and relative welfare weights of all other groups have increased so that the largest increase was with the group with lowest labour income.

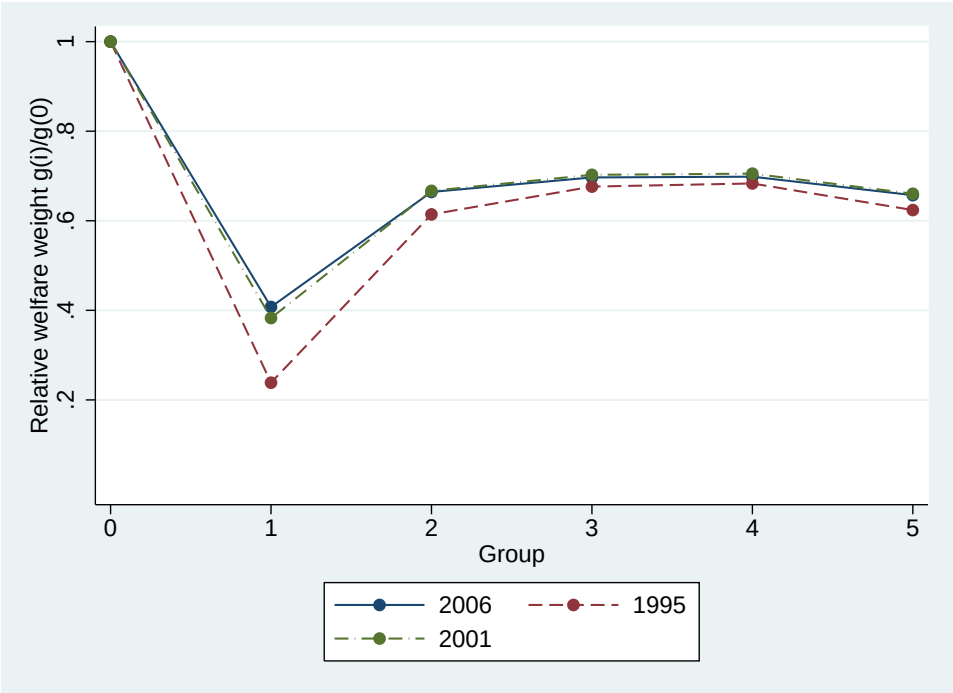

Figure 5: Relative welfare weights (pure intensive model): 1995, 2001, 2006

The change in revealed redistributive preferences of the government might be different from the change in true social redistributive preferences. The reason for this might be political economy aspects or the difference between redistribu-

tive preferences of politicians and the whole population. In order to compare the changes in revealed redistributive preferences to changes in traditional measures of redistributive preferences the latter was estimated using survey data from the World Values Survey and European Values Study between 1996 and 2005. In the WVS and EVS respondents are asked to rank a scale from 1 to 10 whether "incomes should be made more equal" or whether "we need larger income differences as incentives for individual effort". This question has been used to measure preferences for redistribution. It should be noted that the scale is such that a higher number indicates less inequality aversion. The weighted averages of the answers from years 1996 and 2005 from the WVS and 2000 from the EVS are found in Figure 6. The scale is turned in the figure so that a higher number indicates higher redistributive preferences.

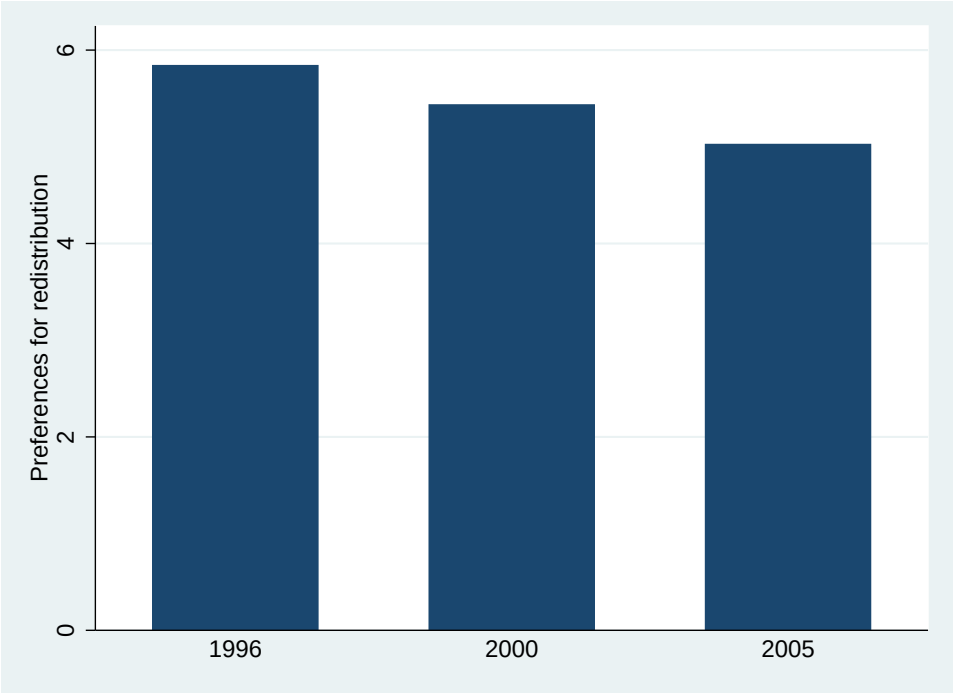

Figure 6: Redistributive preferences: World Values Survey, European Values Study

The redistributive preferences measured in surveys have decreased over the time period and in 2005 the mean inequality aversion was less than in 1996. At the same time revealed redistributive preferences have decreased so the sign of the change is the same in both cases. This indicates that the changes in tax-benefit policies might have been due to changes in the social redistributive preferences.

5.4 Decomposition results

The data set does not have a microsimulation model linked to it. Therefore the estimations about the direct effect of policy reforms are done using different data. The data is from the Finnish Income Distribution Survey that is used in JUTTA microsimulation model. The data consists of 30 000 individuals per year. JUTTA is a static microsimulation model developed as a cooperative effort between the Labour Institute for Economics Research, Åbo Akademi University and the Research Department of Finnish Social Insurance Institution. It encompasses Finnish social security and personal tax legislation for all the years needed in the decomposition. The welfare weights calculated with the microsimulation model and legislation from year 2006 are extremely close to the ones calculated with the register based data set (Appendix). Therefore the JUTTA model and its data are used when conducting the decomposition estimation.

The decomposition results were estimated using end period data (2006). Usually the decomposition is calculated as an average of the results from using end period data and base-period data. In this case the microsimulation model does not have data from the base-period (1995). Both Bargain & Callan (2010) and Bargain et al. (2013b) found that the results from using only base- or end period data were very close to the average results and they concluded that when necessary estimations can be done with only base- or end period data. The direct effects of policy reforms were estimated by using data from 2006 and tax-benefit structure from 1995. The tax-benefit parameters were nominally adjusted using changes in the consumer price index. The expected behavioral effects were estimated by calculating marginal tax rates in both years and using elasticity of taxable income to estimate the behavioral responses. The estimate for the elasticity of taxable income used in the calculations was 0.20.

The results from the simulations are found in Figure 7. Since the population is the same in all simulations, the comparison is done using absolute welfare weights. Between 1995 and 2006 the welfare weights of unemployed have decreased and the welfare weights of all other groups have increased. The largest increase was in groups 1 and 2. These changes are directly due to policy reforms without changes in the population or income structure. These changes include the government expectations about behavioral responses to tax-benefit reforms. The overall structure of the welfare weights changed such that the relative welfare weight of the working poor increased and the dip in their welfare weight was smaller in 2006.

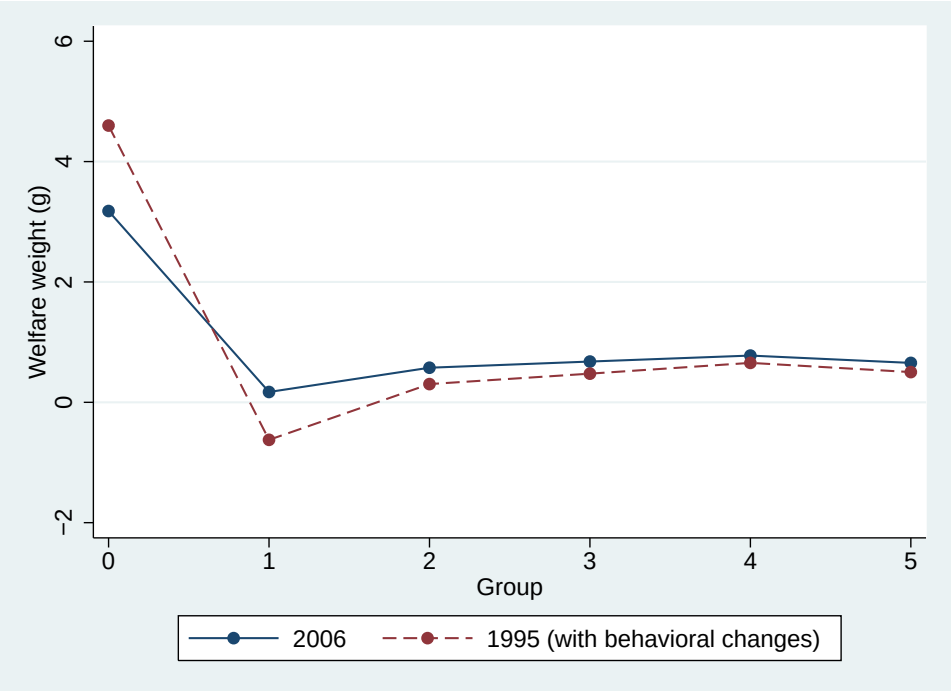

Figure 7: Change in welfare weights due to policy reforms

The change due to policy reforms is very close to the total change described in part 5.3. This indicates that the changes in redistributive preferences coincide with the direct changes in the tax-benefit structure. This means that the estimated changes in redistributive preferences can be for the most part explained by changes in the tax-benefit system instead of the "other" effect which measures the difference between government expectations about changes to the population and income structure and the actual changes that happened between 1995 and 2006.

5.5 Revealed elasticity expectations of the government

The revealed welfare weight for the working poor was negative in 1995, which violates the assumption of a Pareto maximizing social planner. One reason for this might be that the elasticity expectations of the government were different than the elasticity estimates used in the calculations. The optimal income tax models can also be used to study the revealed elasticity expectations of the government that would make the current tax-benefit system optimal for some set of redistributive preferences.

The revealed elasticity expectations were calculated for different redistributive preferences measured by the parameter v. The baseline $v = 1$ corresponds

to fairly strong redistributive tastes. For robustness the calculations were also done with extremely strong redistributive tastes $v = 4$, which is close to the maximin criterion. The third case $v = 0.25$ represents fairly low redistributive tastes. The results for year 1995 are found in Table 2.

Table 2: Revealed elasticity expectations, year 1995

Pure intensive model (ξ_i)			
	Redistributive preferences		
Group	Low (v=0.25)	Medium (v=1)	High (v=4)
1	0.061	0.262	1.033
2	0.122	0.493	1.617
3	0.252	0.976	2.789
4	0.223	0.825	2.053
5	0.102	0.356	0.761
Pure extensive margin (η_i)			
	Redistributive preferences		
Group	Low (v=0.25)	Medium (v=1)	High (v=4)
1	-0.016	-0.051	0.005
2	0.000	0.021	0.220
3	0.016	0.078	0.349
4	0.039	0.159	0.485
5	0.081	0.283	0.605
Intensive&Extensive margin (intensive margin fixed) (η_i)			
	Redistributive preferences		
Group	Low (v=0.25)	Medium (v=1)	High (v=4)
1	0.008	-0.010	0.018
2	-0.030	-0.010	0.189
3	0.024	0.086	0.357
4	0.055	0.175	0.501
5	0.041	0.243	0.565

The first results in Table 2 are for a model with only intensive labour supply responses. These results correspond to the case where the government is using a Mirrlees optimal income tax model with only intensive responses. With medium or high redistributive tastes the revealed elasticity expectation are extremely high for all groups. If the government has a low redistributive taste ($v = 0.25$), the intensive elasticities are still higher than the estimates used when calculating

the revealed welfare weights. In order for the current tax-benefit system to be optimal the elasticity expectations has to be higher for middle-income workers. In the case with low redistributive tastes, the labour supply of the working poor (group 1) is expected to be much less elastic than the labour supply of workers with higher labour incomes.

With the pure extensive model the revealed extensive elasticities are increasing with income. For low or medium redistributive taste the revealed participation elasticity for low-income workers is actually negative. Negative elasticities violate the assumption of a Pareto maximizing social planner. With very high redistributive tastes ($v = 4$) all participation elasticities are positive. However in this case the participation elasticity of group 1 is still very low compared to other groups and the participation elasticity of high-income earners is extremely high.

With both extensive and intensive labour supply responses the revealed participation elasticities were calculated with given mobility elasticities. As can be seen from equation (11) the inclusion of intensive labour supply responses decreases revealed participation elasticities compared to a pure extensive model. The effect is a bit different for group 1 as in this case both intensive and extensive elasticities are calculated because they are identical by definition. With both extensive and intensive labour supply responses, the revealed participation tax rate is negative for group 2 if the government has low or medium redistributive taste. With a high redistributive taste all participation tax rates are positive and they are increasing with income. The reason for the low participation elasticity of group 1 is that the high participation tax rates in the actual tax-benefit system can only be optimal if the labour supply of low-income workers is very inelastic.

The results for year 2006 can be found in Table 3. Since the income groups and groups sizes are different between years some caution should be taken when comparing the results to elasticity estimates from 1995. The revealed elasticity estimates seem to be larger in 2006 than in 1995. This is a result from a decrease in effective tax rates. If the redistributive preferences have not changed, the change in effective tax rates is optimal only if labour supply has become more elastic.

Table 3: Revealed elasticity expectations, year 2006

Pure intensive model (ξ_i)			
	Redistributive preferences		
Group	Low (v=0.25)	Medium (v=1)	High (v=4)
1	0.099	0.454	1.946
2	0.254	1.069	3.534
3	0.339	1.346	3.784
4	0.298	1.116	2.689
5	0.157	0.547	1.103
Pure extensive margin (η_i)			
	Redistributive preferences		
Group	Low (v=0.25)	Medium (v=1)	High (v=4)
1	-0.034	-0.106	0.094
2	0.001	0.046	0.481
3	0.026	0.140	0.639
4	0.061	0.258	0.787
5	0.132	0.461	0.929
Intensive&Extensive margin (intensive margin fixed) (η_i)			
	Redistributive preferences		
Group	Low (v=0.25)	Medium (v=1)	High (v=4)
1	-0.004	-0.040	0.060
2	-0.022	0.022	0.457
3	0.037	0.151	0.650
4	0.075	0.272	0.801
5	0.090	0.419	0.887

It is also possible to solve the change in elasticity expectations that would keep the shape of the welfare weights constant between 1995 and 2006. This is done by taking the estimated welfare weights from 2006, reweighting them to fit the group sizes of 1995 and solving the elasticity expectations that would make the 1995 tax-benefit system optimal with the 2006 welfare weights. The main interest is the change in extensive elasticity estimates, which are calculated keeping the intensive elasticity estimates constant. The results are found in Table 4.

Table 4: Extensive elasticity estimates with welfare weights from 2006

Group	Extensive elasticity 1995	Extensive elasticity 2006	Relative welfare weight 1995 & 2006
0	.	.	1
1	0.166	0.250	0.044
2	0.161	0.250	0.194
3	0.201	0.250	0.222
4	0.226	0.250	0.233
5	0.215	0.250	0.222

If the redistributive preferences of the government have not changed, then the government elasticity expectations have increased. From Table 4 one can see that the largest changes are in the low-income groups. For example the extensive elasticity expectation of group 1 would have to have increased from 0.166 to 0.25 in order to keep the redistributive preferences constant.

6 Conclusions

The objective of this paper was to analyze the government preferences for redistribution in Finland by using an inverted optimal income tax model. By calculating welfare weights that make the current tax-benefit system optimal it is possible to analyze the redistributive preferences implied by the actual tax system. The revealed welfare weights in Finland are not monotonically decreasing. The welfare weight of the working poor is much smaller than the rest of the welfare weights. The small welfare weight is caused by high participation tax rates combined with significant participation elasticities. The labour supply elasticity estimates have a large effect on the revealed welfare weights. In a pure intensive model with no participation effects the welfare weights are close to utilitarian preferences.

Several in-work related policy changes were made to the Finnish tax-benefit system in the recent decade that might be caused by changes in the social preferences behind the tax-benefit system. Therefore the relative welfare weights were calculated separately for years 1995, 2001 and 2006 in order to see if the revealed welfare weights have changed over time. The welfare weights of all groups except the unemployed increased such that the largest increase was in the groups with the least amount of labour income. Therefore the dip in the welfare weight of the working poor was smaller in 2006 than it was in 1995. The change in welfare weights was similar also with a pure intensive model.

The total change in welfare weights was close to the direct change due to policy reforms that was estimated using a decomposition approach. This indicates that the changes in revealed redistributive preferences can be for the most part explained by changes in the tax-benefit system.

There are several reasons why the revealed redistributive preferences might have changed between 1995 and 2006. One possible reason is that the true social preferences for redistribution have changed. The survey results indicate that this might be a plausible explanation. The change in the revealed redistributive preferences of the government could also be due to political changes in the government. However most of the change happened over a time period when the government did not change. After the government changed in 2003 there seems to have been almost no changes in the revealed redistributive preferences.

If the redistributive preferences have not changed, then the elasticity expectations of the government have changed so that the decrease in effective tax rates is based on efficiency grounds. The results show that if the redistributive preferences have not changed, the extensive elasticity expectations have increased so that the largest changes are in the low-income groups.

For a given set of redistributive preferences, the elasticity expectations of the government would have to be large and concentrated on middle- and high-income earners in order for the current tax-benefit system to be optimal.

It should be noted that the analysis covers only direct taxation of labour income. It is likely that the shape of the tax-benefit system is also affected by other margins, for example the taxation of capital income. If people can shift

their income between labour and capital income, then the effective marginal tax rates on labour income might be lower than they would be without income shifting.

It can be questioned if the assumption of a welfare maximizing social planner is valid for real tax-benefit systems. Political economy literature addresses the issue that true tax-benefit systems are constructed by political parties who must win elections (see e.g. Castanheira et al. 2012). However the welfare maximizing social planner can be used as a proxy for more complex political economy models (Coughlin 1992). Still, it would be interesting to extend the inversion method to political economy models.

There are several potential avenues for future research. One possible extension would be to study the changes in elasticity estimates. The correct values would be the government expectations for the elasticities. Unfortunately specific labour supply elasticity estimates have not been used in Finland when estimating the impacts of tax reforms and the calculations have been done using static microsimulation models only. However in the future when tax reform estimations are done using behavioral microsimulations the government expectations for elasticities can be found in the calculations.

The decomposition analysis could be extended in order to estimate more thoroughly the composition of the changes in welfare weights using a discrete labour supply model to estimate the expected behavioral effects as in Bargain (2012).

Finally research on the revealed social welfare weights could be extended by allowing the welfare weights to be endogenous. Saez & Stantcheva (2013) propose a generalized optimal taxation theory using a tax reform approach where endogenous social marginal welfare weights directly reflect society's views on justice. Saez & Stantcheva (2013) show how the model can be used to study optimal family taxation or account for political economy restrictions. Endogenous social marginal welfare weights also allow the model to account for horizontal equity concerns.

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Appendix

Robustness analysis

Role of earnings related unemployment benefits

For robustness the revealed welfare weights were computed with treating earnings related unemployment benefit as delayed wage. The results are in Figure 8. The relative welfare weight of the unemployed was smaller when earnings related unemployment benefit was assumed to be delayed wage. Otherwise the results were close to the baseline.

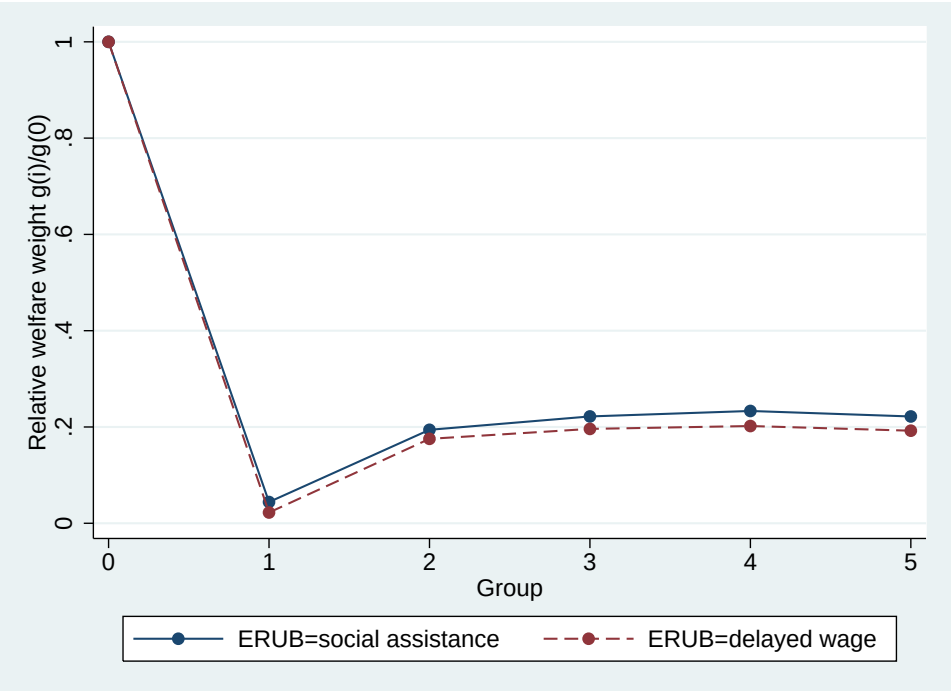

Figure 8: Role of earnings related unemployment benefit (year 2006)

Alternative cutoff points for income groups

In the baseline calculations income groups were constructed using income quintiles in different years. Therefore the cutoff points were different each year partly due to changes in the income distribution. In the robustness check the cutoff points of 1995 income quintiles are used. The cutoff points were uprated using average wage growth between 1995 and 2006. The results are in Figure 9. The welfare weights seem to be robust to the choice of cutoff points.

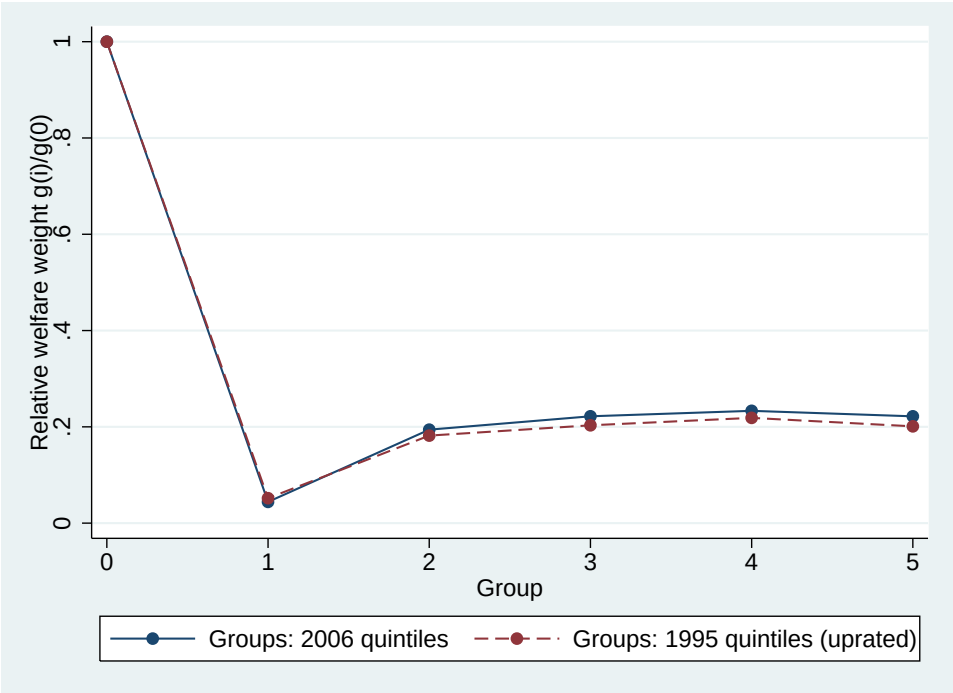

Figure 9: Different cutoff points for income groups (year 2006)

Decomposition data analysis

In Figure 10 are the revealed welfare weights calculated with two different data sets. The first one is the register based data and the second one is the microsimulation data. The results are extremely close to each other.

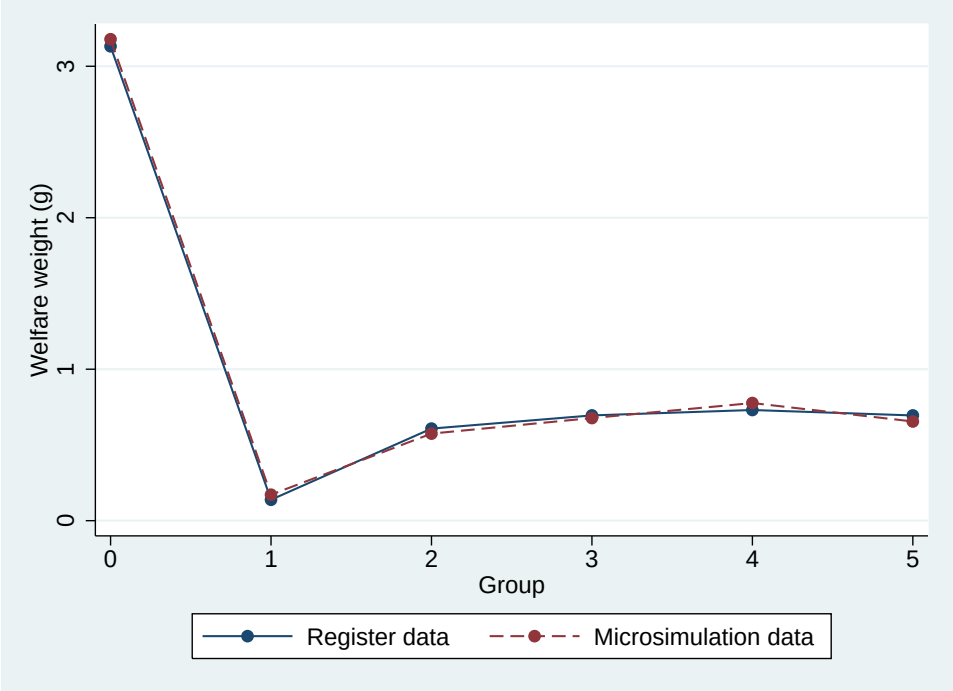

Figure 10: Welfare weights calculated with different data sets, year 2006