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**WORKING PAPER 6/2002**

**ESTIMATING POST-TAX SOCIAL INSURANCE BENEFITS:  
Validity Problems in Comparative Analyses of Net Income Components  
from Household Income Data**

**by**

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# Estimating Post-tax Social Insurance Benefits:

Validity Problems in Comparative Analyses of Net Income Components

from Household Income Data<sup>1</sup>

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<sup>1</sup> Authors share equal responsibility for this article. We thank Olof Bäckman, Johan Fritzell, Ola Sjöberg, Tomas Korpi, Walter Korpi and Joakim Palme for valuable comments. This work has received financial support from the Bank of Sweden Tercentenary Foundation and the Swedish National Social Insurance Board.

## Abstract

Comparative household micro income databases do not report the level of social transfers after taxation. Consequently, disaggregated redistributive analyses of the welfare state are based on gross income components. In most countries, however, social insurance benefits are subject to taxation. In such instances, the level and equalising effect of social insurance to income inequality are overestimated, both in absolute terms and in relation to non-taxable benefits. One way to avoid this problem is to estimate the level of net social insurance by the use of a so-called proportional tax estimation technique. This technique, however, causes a misspecification of the level of net social insurance in cases where taxation is established at the individual level. In this paper we therefore apply the proportional tax estimation technique for validity analyses on household income data. The question is to what extent this estimation of taxes misspecifies the level of net social insurance. It is found that the proportional tax estimation is viable when separating social and fiscal policies in comparative analyses on household micro income data. The underestimation of the level of net social insurance which is due to the application of the proportional tax estimation technique is negligible compared with the overestimation occurring from not taking taxes into account.

Keywords: Welfare state, Social policy, social insurance, income taxation, inequality, redistribution, comparative.

Previous research highlights the importance of measuring social insurance net of taxes, in order to make the value of social entitlements (Korpi, 1989; Palme, 1990; Esping-Andersen, 1990; Mitchell, 1991) and social policy effort comparable across countries (Adema, 2001). Nevertheless, it is common in comparative redistributive analyses of specific social transfer schemes to disregard taxation of social insurance (e.g. Deleeck, 1992; Jäntti, 1997; Aaberge *et al.*, 2000; Hataaja, 1999; Pedersen, 2000). Consequently, the redistributive effects of social insurance are overestimated. In some cases this misspecification have important implications for both inter- and intra-country comparisons of the impact of social insurance on income inequalities (Ferrarini and Nelson, 2002).

Taxation of social insurance entitlements has become a more frequent feature in the advanced welfare states during the last decades. With the exception of the Netherlands and Switzerland, only pension benefits were subject to taxation before the 1960s. In the following two decades most of the OECD-countries introduced taxes on an increasing number of social insurance entitlements. However, some countries still have elements of non-taxable benefits in their social insurance systems. With the exception of pension income, no special allowances or tax credits exist for social insurance benefits. Thus, social insurance benefits are generally taxed in the same way as work income.

Comparative household micro income databases, such as the Luxembourg Income Study (LIS), do unfortunately not report the post-tax level of different income components. Taxes paid on different parts of the household's income package must therefore be estimated. One method is to ascribe taxable social insurance benefits a share of total income taxes paid corresponding to their relative size in the gross household income package (Rainwater, 1993). This proportional tax estimation technique does, however, misspecify the value of net social insurance when taxes are paid on individual incomes. The purpose

of this paper is to evaluate whether a proportional estimation of taxes poses any serious problems of validity in analyses of household income data. The question is to what extent this estimation misspecifies the level of net social insurance packages.

We will here conduct two validity tests. The first validity analysis is based on micro income data from the Swedish Level of Living Survey (LLS). With this data it is possible to compare estimates of the level of net social insurance when the proportional tax estimation technique is applied on household and individual income packages, respectively. The second validity analysis is based on a fictitious income distribution, which makes it possible to assess the generalisability of the results from the Swedish case to countries with other income tax systems. The countries included in this analysis are Belgium, Canada, Denmark, Finland, the Netherlands, Norway, Sweden, the United Kingdom and the United States.

### **The Proportional Tax Estimation Technique**

The proportional tax estimation technique of net social insurance is shown below. Assume that an income distribution comprises only married couples and let each spouse, (i) and (j), receive an amount of taxable social insurance benefits (S). Let (T) denote the amount of income tax paid on total taxable income (M). If income data are available at the individual level, estimated net social insurance benefits of the household (h) are calculated in three steps, as shown in Eq. (1) to (1.3), below. The first two steps involve a separate calculation of net social insurance for each spouse. The third step is simply constituted of a summation of net social insurance of the two spouses.

$$\text{Estimated Net } S = S_i - (S_i / M_i) * T_i \quad (1)$$

$$\text{Estimated Net } S_j = S_j - (S_j / M_j) * T_j \quad (1.2)$$

Estimated Net  $S_h$  from individual income packages

$$= \text{Estimated Net } S_i + \text{Estimated Net } S_j \quad (1.3)$$

If income data are only available at the household level, it is not possible to apply the three steps shown in the above formulas. Instead, the proportional tax estimation technique ascribes social insurance a proportional share of the total income taxes paid corresponding to its relative size in the gross taxable income package of the household, as shown in Eq. (2), below. The right side of the equation shows the proportional weighting procedure of the total taxes paid by the household. The difference between the estimated level of net social insurance when the proportional tax estimation technique is applied on household and individual income packages, respectively, is the error of net social insurance due to the use of household income data, as shown in Eq. (3).

$$\text{Estimated Net } S_h \text{ from household income packages} = S_h - (S_h / M_h) * T_h \quad (2)$$

Estimation Error  $S_h = \text{Estimated Net } S_h \text{ from household income packages} -$

$$\text{Estimated Net } S_h \text{ from individual income packages} \quad (3)$$

### **Evidence from Swedish Household and Individual Level Income Data**

In cases where the proportional tax estimation technique is applied on household income whereas tax liability is established at the individual level, it is expected that the estimation error of net social insurance on average is negative, since the spouse with the largest share of social insurance in the individual income package is likely to have a lower taxable income

than the other spouse. Due to the progressivity of income taxes, the proportional tax estimation technique will in such cases overestimate the tax claw-back of transfer income and thereby underestimate the level of net social insurance. Market income is overestimated by the corresponding amount.

[Figure 1 about here]

*Figure 1* shows the relative estimation error of net social insurance benefits in ten income groups delineated on basis of equivalised gross taxable income in Sweden.<sup>1</sup> Only couples are chosen as base line for comparison, since an estimation of taxes paid on different income components is necessary only for these households. The results are in line with the expectation that a proportional estimation of taxes overestimates taxation of social insurance when household income packages are used. However, the relative estimation errors are small. On average net social insurance is underestimated by 1 per cent, which should be evaluated in relation to an overestimation by approximately 30 per cent if taxes are not deducted.

### **Assessing Generalisability of the Results**

The analysis in the above section shows that the estimation error of net social insurance is almost negligible compared with the misspecification occurring from not taking taxation into account in the Swedish case. However, the size of the estimation error depends on the redistributive mechanisms of the income tax system. The proportional tax estimation may therefore pose validity problems in countries with separate taxation of spouses and where the income tax system is more progressive and tax rates are higher than in Sweden.<sup>2</sup>

As is evident from *Figure 2*, however, none of the tax systems in the other countries satisfy both these conditions.<sup>3</sup> It is clearly shown that countries tend to rely either on high tax rates or on high tax progressivity. Belgium and Sweden are the only countries that score above average on both these aspects, but far from having the highest values.

[Figure 2 about here]

To evaluate whether the proportional tax estimation technique pose validity problems in countries with different tax systems, we will here simulate the effects of direct income taxes and social security contributions in Belgium, Denmark and Sweden as expressed in tax legislation of 1995 on a modified version of the fictitious income distribution applied in *Figure 1*, above.<sup>4</sup> Belgium and Denmark are chosen for comparison with the Swedish case since Belgium has the greatest tax progressivity and Denmark the highest average tax level of the nine countries under investigation.

[Figure 3 about here]

*Figure 3* shows the results of this exercise. Negative simulated relative estimation errors indicate an underestimation of the level of net social insurance. The positive estimation error for Sweden in the first income group is due to the basic tax allowance, which is regressive in lower income brackets. Most importantly, however, simulations of the Danish and Belgian income tax systems do not reveal any larger deviations from the Swedish pattern.<sup>5</sup>

## **Discussion**

The purpose of this article was to apply the proportional tax estimation technique for validity analysis on household micro income data. The question was to what extent this estimation misspecifies the level of net social insurance. Although the proportional tax estimation overestimates the amount of taxes paid on social insurance and, consequently, underestimates the value of net social insurance, the results suggest that this estimation does not introduce serious problems of validity in analyses of household income data. The underestimation of the net level of social insurance when estimating taxes from household income data is much less of a problem than the overestimation resulting from not taking taxes into account. This seems to be the case regardless of the degree of tax progressivity and average tax level of income tax systems in modern welfare states.

The possibility to decompose tax/transfer systems into program specific components improves the ability to formulate and test hypotheses about which institutional differences in countries social policy systems that produce divergent distributive outcomes. The demand for such analyses has increased with the world wide economic recession in the late 1980s and early 1990s. In the last two decades of the 2000<sup>th</sup> century most Western countries have implemented cuts in social security provisions and experienced an increase in income inequalities. However, cross-country differences remain substantial. This may indicate that some welfare states still achieve a greater redistribution of economic resources than others.

In order to learn more about why some welfare states are more successful in combating income inequalities, more specified analyses of the distributive process are needed. Since we in this paper have approved one method for calculating net income components from household income data, one of the obstacles for conducting such analysis is removed.

## Notes

- <sup>1</sup> We here use the “old” OECD equivalence scale, which gives the first adult a weight of 1, subsequent adults a weight of .7 and each child a weight of .5.
- <sup>2</sup> Another factor that may cause biased estimates is cross-national differences in the intra-household distribution of different income sources. Since labour force participation and market income are more equally distributed in some countries than in others, cross-national differences in the intra-household distribution of different income sources could cause validity problems of estimated net social insurance. However, a factor working in the other direction is that that the lower paid female spouse in countries with comparatively unequal distributions of market income more often is confined to untaxed means-tested benefits, while working males are more likely to receive taxable social transfers (Sainsbury, 1996).
- <sup>3</sup> An income tax system is defined as progressive (regressive) if the richer (poorer) individuals pay more (less) tax in proportion to their incomes; and it is defined as proportional if the tax liability is equally distributed among the individuals in relation to their incomes. Progressivity is measured as the excess of the concentration index of taxes over the Gini index of the pre-tax income (Kakwani, 1976). The average tax rate is simply defined as the average tax liability of included households. For each country we have simulated direct income taxes and social security contributions as expressed in tax legislation in 1995 on a fictitious income distribution. The fictitious income distribution comprises a single and a one-earner family with two children earning 0.5, 0.6, 0.7, up to 3.0 times of an average production worker’s wage. The value of an average production worker’s wage is derived from the Social Citizenship Indicators Program (SCIP) at the Swedish Institute for Social Research at Stockholm University. For documentation of the SCIP database see Korpi (1989).

<sup>4</sup> The fictitious income distribution in this exercise comprises only two-earner households with none, one, two and three children where one of the spouses receives work income and the other spouse receives taxable social insurance for the whole tax year. Work income is defined as 0.5, 0.6, 0.7, up to 3.0 times of an average production worker's wage and social insurance as 60 per cent of these amounts.

<sup>5</sup> The simulated estimation errors are larger than in reality due to the assumptions used in the fictitious income distribution (compare Figure 2).

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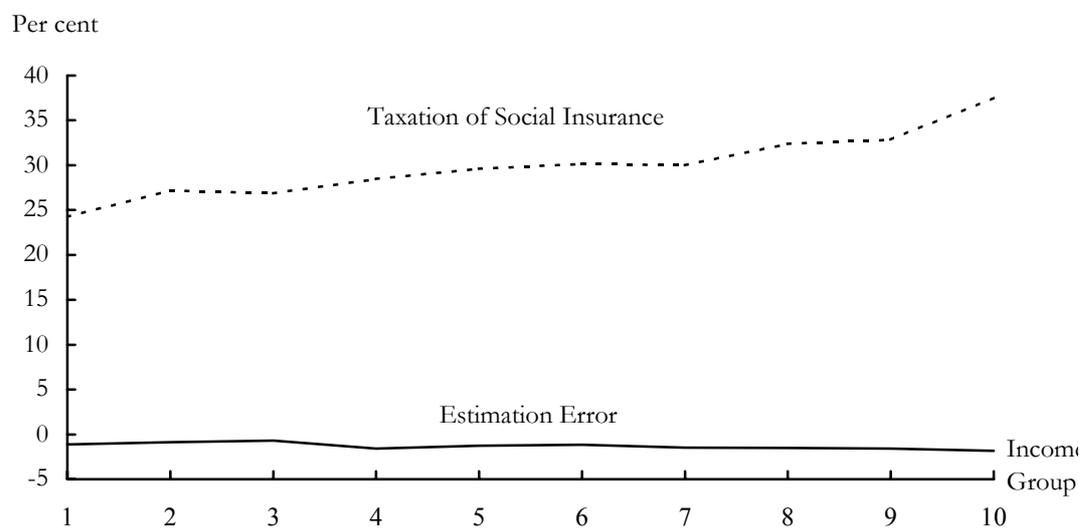
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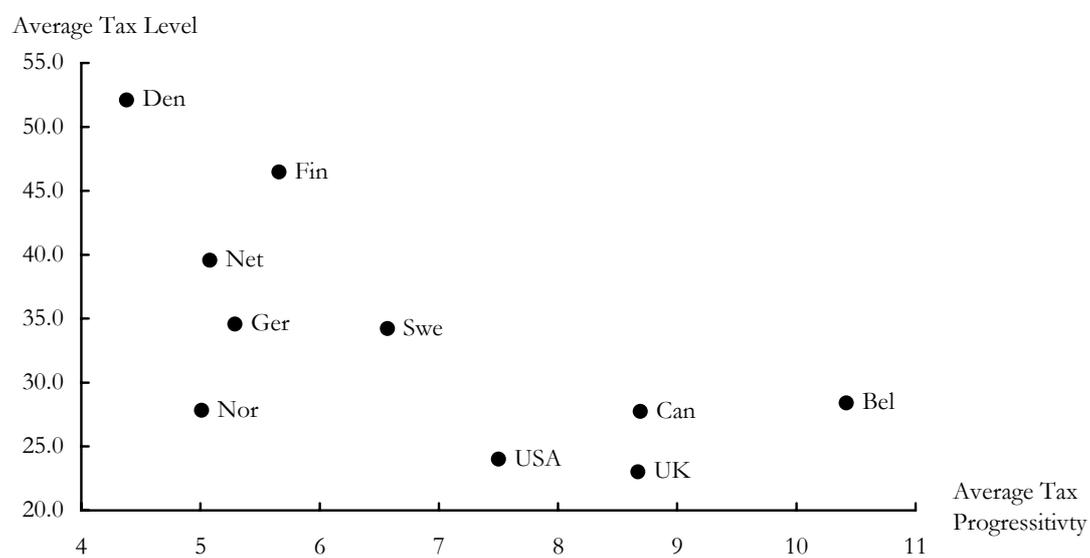
**Figure 1** Relative Estimation Error\* of Net Social Insurance and Taxation of Social Insurance in Ten Income Groups in Sweden 1991, Couples 20-59 Years.



Source: LNU

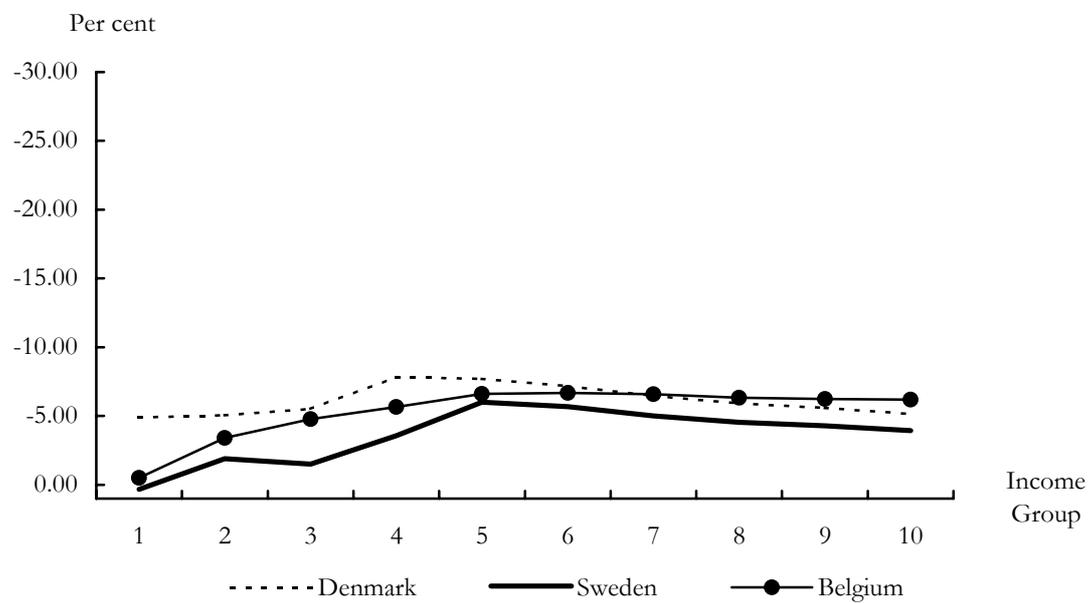
\*The relative estimation error shows the absolute estimation error as a percentage of the actual level of social insurance.

**Figure 2** Institutional Characteristics of Income Taxes in Ten OECD-countries in 1995.  
Average Tax-level and Average Tax Progressivity (Figures Based on Fictitious Income Data)



Source: National tax legislation (tax year 1995).

**Figure 3** Relative Simulated Estimation Errors of Net Social Insurance in ten Income Groups in Denmark, Sweden and Belgium (Figures Based on Fictitious Income Data)



Source: National tax legislation (tax year 1995).