Chapter 8.

Redistribution across the Life Course in Social Protection Systems: An Overview

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Public social spending varies a lot across OECD countries. Its share of GDP is closely related to the degree of "universality", i.e. *the extent to which individuals receive benefits. The lowest figures are currently found in Anglo-Saxon countries, while the highest appear in the Nordic countries. This chapter highlights the fact that in countries with highly universal welfare state arrangements, most social spending generates intra-individual redistribution rather than inter-individual redistribution of lifetime income, in contrast to countries whose welfare systems have a strong element of targeting.*

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1. The redistributive effects of social protection

A central issue is how the distribution of income is affected by taxes and benefits in the public transfer system. This is a controversial issue and the perspective from which the public transfers are considered is highly significant: what may seem progressive from one perspective may appear regressive from another. This warrants a nuanced debate on distribution policy.

Each year the public sector redistributes large sums among different individuals and households, a redistribution carried out by means of taxes, transfers, benefits and publicly financed consumption. The various systems have widely differing motives, and in many cases the redistribution of economic resources may not be the primary objective. In the case of means-tested social allowances and wealth tax, for example, it is obvious that one of the primary objectives is the direct redistribution of income. Other systems, such as income-related sickness benefit and unemployment benefit, serve in the first instance to redistribute risk. Most people who work are covered by the social insurance system, but only those who become sick or unemployed, etc. receive any compensation. The cost is high if there is no insurance system in place, with all the insured parties sharing the risk in the same way as in a commercial insurance system. Pensions, child benefits and study allowances are examples of systems whose primary purpose is redistribution over the life course. The progressivity of taxes also acts as a source of income smoothing as individuals pay proportionally higher taxes during periods of higher income and vice versa. All of these mechanisms may be regarded as being redistributive, whether among individuals (inter-personal) or across an individual's life course (intra-personal).

The impact of socio-political measures on income distribution is frequently the subject of current research, but there are weaknesses inherent in most of these studies. One is that the comparison standard – what would happen to distribution without such intervention – is usually inadequately explained. Disposable incomes are certainly more evenly distributed than factor incomes, but many make the mistake of concluding from this that the public system has an income-smoothing effect. The situation is viewed such that income distribution "after" the transfers is more even than income distribution "before". But this is based on a highly questionable inference. For this to be correct, each person's disposable income, without the reported transfers, would have to be precisely equal to the factor income the person now actually has alongside these transfers. This assumption can be called into question for two reasons.

First, it is doubtful whether factor incomes are independent of public transfers. Rather, it is likely that people's labour supply, savings, etc., vary with these and that this in turn has repercussions for the wage and interest-rate structure. If the tax and benefits systems did not exist or were structured differently, individuals' choice of working hours, wage structure and yield requirements, etc., would be different. If this is the case then it needs to be incorporated into the analysis.

Second, it is doubtful whether the private transfer system is independent of public transfers. It is highly probable that people's purchasing of private pension policies, etc., varies with the scope and structure of public transfers. If this is the case then it must be taken into account. If the distributive effects of public transfers are to be specified, this must be based on reasonable assumptions of what would have happened to incomes in the absence of public transfers or if the transfers had been structured differently. Disregarding the impact of public transfers on factor income may be acceptable as a first step in the analysis, especially since the secondary effects are difficult to

determine. Still, it is difficult to understand the usefulness of an alternative for comparison which consists in a situation lacking transfers altogether. It is impossible to ignore the fact that some form of transfer is a necessary element in the social picture, especially if any claim to at least a minimum of realism is to be made. No one can live by their own labour in all stages of life. In the first place there are periods in everyone's lives when their capacity for work is inadequate: childhood, old age, periods of sickness and so on. Second, there are periods when the capacity for work certainly exists but cannot be utilised or provides only a low return: unemployment, crop failure. If studies of the effects of distribution policy are to be taken seriously, they cannot be based on comparisons with a situation where much of the population is left without income and means of support. The relevant alternative for comparison must be that children, the elderly, the sick, the unemployed, etc., have their means of support organised in a way other than by means of the public transfers studied. If we imagine that the alternative for comparison is a system of private transfers, then this could take many forms. Historically, private solutions have primarily been cooperative/collective schemes organised by local communities, guilds, trade unions and the like. Today, non-cooperative schemes/schemes offered at market terms by banks and insurance companies could also make a passable contribution to meeting the need for transfers. A study of the distributive effects of current public transfers does not necessarily require a private alternative for comparison. The means of comparison may also take the form of a public system which is neutral in some sense. What is important is that the alternative for comparison is not left blank. Although heavily criticised (Reynolds and Smolensky, 1977) the most commonly used reference point is the zero-government counterfactual.

Another shortcoming in studies of distribution policy is that the distributive effects are usually only calculated on the basis of disposable incomes and do not include other welfare components, for example the use of public services. A third weakness is that the distributive effect is mostly calculated on the basis of citizens' income for one or a few years, while it would often be more interesting to know the impact on citizens' lifetime incomes.

While it is clearly invalid to measure the redistributive effect of government against the original distribution of pre-tax and pre-transfer income, such an assumption is implicit in the following, simply because there is no data available to indicate how the annual and lifetime factor income would have changed if a policy alternative had been implemented.

This chapter focuses on redistribution over the life course in social protection systems. How do inter-personal and intra-personal distributions differ in countries that have chosen completely different principles for shaping social policy? Particular importance is attached to comparing a country, such as Sweden with its highly universal welfare-state arrangements, with countries, such as Australia and Ireland, whose welfare systems have a strong element of targeting.

2. Why is there an interest in intra-personal redistribution?

Based upon cross-section data, numerous studies of the income redistribution achieved by various government taxes and expenditures in industrialised countries have generally concluded that the net effect of such programmes is to successfully redistribute income from rich to poor. But do these conclusions still hold when a much longer time period, such as an entire life cycle, is considered? The accounting period used may influence the degree of redistribution measured; short accounting periods will tend to increase the degree of income inequality measured within a population. For example,

income distribution over a single year will be influenced by temporary factors. Individuals with high paid employment will be classified as poor during a short period of unemployment, but, over their lifetime, may be classified as rich. Pensioners will tend to be lower down the income distribution, but may have been higher up the distribution during their working lives. Study grants are a transfer to those who have low incomes for the year because they are students. This has a strong income-smoothing effect on an annual basis, but it is not particularly likely that university students as a group will be viewed as poor and that grants to this group will have a strong income-smoothing effect. Those with the means to study represent a privileged group in society, and real poverty is more likely to exist among young people who are not students. Hence, it is impossible to gain the correct perspective on who is rich and who is poor without extending the measurement period to cover the entire life course. Nonetheless, it must be noted that shorter accounting periods may be more appropriate as a measure of welfare when short-term concerns are more important, for example when considering the very poor who may be credit constrained.

The distribution of lifetime incomes may be assumed to be more even than the distribution of annual incomes, and the effect of the public sector may be assumed to be greater in any given year than over the life course. If the level of self-financing in public subsidies and transfers is significant and only a small part of the redistribution taking place via the public sector entails an actual redistribution of resources, it may be important to reflect on the public sector's undertakings in the light of expected future demographic trends and the problems inherent in financing the public sector, which may already be predicted today.

The existence of intra-personal redistribution in tax-benefit systems implies that such objectives might be achieved through private savings mechanisms. It would reduce total tax rates and related distortions created by the tax system. Another objective is that enforced state decisions about transfers over one's lifetime reduce individual choice and thus total welfare.

Scattered evidence suggests that voluntary private income insurance and social insurance are rather close substitutes. In particular, government-provided pension benefits tend to be topped up by occupational pensions in countries with only modest public benefits (Pearson and Martin, 2005). In Forssell *et al.* (1999) social insurance transfers to older people are compared with non-state employment-related (occupational) transfers in eight western European countries (Denmark, Finland, France, Germany, the Netherlands, Norway, Sweden and the United Kingdom). In Figure 8.1 public spending on old age pensions per elderly person in 1995 has been broken down into basic pensions, supplementary pensions and "contracted out" pensions. Denmark and the Netherlands have social insurance pension schemes that bear no relation to earnings at all, and in the United Kingdom social insurance pensions are only weakly related to earnings. These are the countries with the most comprehensive occupational pensions. Germany and France, with state pension schemes based on the corporate model, provide good standard protection with high replacement rates even for those who have had high salaries. Non-state employment-related pensions are less important in France and Germany than in the other countries in the study.[2] A comparison of the Nordic countries shows a varied choice of solutions to the problem of old age provision in spite of the fact that they are similar in many respects. All have a basic provision given to everyone irrespective of

2. Mandatory supplementary pensions in France have been defined as public provision.

income. Finland, Norway and Sweden, but not Denmark, have national supplementary pensions based on the principle of compensation for loss of income. However, as the replacement rate is higher in Finland than in the other Nordic countries, there is little scope there for occupational pensions, which are most comprehensive in Denmark.

Figure 8.2 shows that the average disposable income for the group of elderly people as a whole does not vary very much from country to country. This is in spite of the large differences in public spending on pensions and benefits, and in spite of the fact that the public pension systems follow completely different principles in linking the level of compensation to previous income. Low compensation from the public system is largely made up for by high payments from other compensation systems, while high compensation from the public system is complemented by other compensation systems to a lesser extent. However, the proportion of elderly people with very low incomes is lower in the countries that have guaranteed basic pensions.

It is also noticeable that total (public plus private) pensions are at least as large a share of GDP in the United States as in Western Europe despite the fact that the GDP share of public pensions is higher in Western Europe and that the population is younger in the United States. This is evident from Table 8.1. Another example is that *total* per capita sick-pay benefits do not vary much among six western European countries studied by Kangas and Palme (1993), in spite of quite different replacement rates in government-operated systems – although the substitution is not complete. It is the composition of sick pay, sickness benefits from social insurance and occupational insurance plans which varies. Similar results are to be found in OECD (2005). When considering net expenditure on social insurance together with private mandatory and occupational supplementary insurance, there is similarity in the overall income situation in the different countries.

3. Dynamic microsimulation

Inter-personal redistribution is what has been traditionally investigated in cross-section analyses, namely how much is redistributed from one category of individuals to another. Intra-personal redistribution on the other hand focuses on the redistribution which takes place over the life cycle from periods of wealth, such as at the height of one's earning ability, to periods of need, such as when bringing up children.

To examine whether the welfare system results in greater lifetime intra-personal redistribution requires data for complete lifetimes. Methods to create income profiles of this type are either historical or hypothetical, the advantage of the historical method being that it deals with actual historical incomes and that all the observed correlations are true. Longitudinal data sets are required to carry out analysis of this kind. Panel data is one of the most useful forms of longitudinal data, but there are not many sources available. The main datasets are household panel surveys, which ask the same questions of households year after year. Detailed administrative data containing economic and social characteristics over their lifetime is available in some Scandinavian countries. It is rare, though, to find data with such a long-time horizon. An exception is Björklund (1993) who used a dataset, containing 39 years of Swedish income data taken from register information, to look at lifetime versus annual income distribution.

Therefore, an examination of such a distribution of income normally necessitates the use of simulation. Dynamic microsimulation models can be used to generate simulated life histories of individuals, in effect simulated panel datasets, so that these issues can be examined. The disadvantage is that the life histories are constructed and not necessarily

true, making validation of the model's characteristics vitally important for the credibility of the analysis.

Microsimulation models use data at the micro level, *i.e.* data on individuals, households, etc., and may be static or dynamic. In contrast to the static model, the dynamic model changes the characteristics of the model population on a continuous basis – dynamic aging. A dynamic microsimulation model ages a sample over time, modelling for individual agents, life-course events, such as demographic changes like marriage and giving birth, educational achievement or labour market changes, such as movements in and out of employment or changes in earnings. Events such as these are assumed to occur with probabilities that depend in turn on the characteristics of the individuals. The correlation between the individuals' characteristics and the likelihood of various events occurring is estimated with the help of statistical models. The estimated probabilities can then be used to randomise various events among the individuals in the model population. Statistical models are also used to simulate values for other types of variables, for example incomes, and in this way a simulated panel data set is generated for each individual in the base sample.

Some of the difficulties associated with microsimulation modelling are insufficient knowledge and weak economic behavioural components, large data requirements, large cost and effort and validation problems. The limited behavioural processes included in dynamic microsimulation models depend heavily on the micro-behavioural econometric studies and household datasets on which they are based. The data necessary for estimating behavioural processes for use in dynamic microsimulation models is quite limited at present. However, panel surveys are continuing so that, in the near future, panel surveys lasting ten years or more will be available in many developed countries. Scandinavian countries have developed models based on very rich, extensive and detailed register information, such as the MOSART model in Norway and SESIM in Sweden.

Microsimulation models were pioneered in economics by Orcutt *et al.* (1961) in the United States in the 1960s. Initially, the perceived benefits did not outweigh the very high costs of development and therefore dynamic microsimulation models were only built in a few countries. Panel data was also rare. However, the field has expanded as computing costs have decreased and as the availability of micro-data has increased. But the construction of a dynamic model is an enormous task, both in terms of understanding the types and forms of behaviour that take place over a lifetime and the effort in programming thousands of lines of code. However, there is now a critical mass of international expertise in this area. Many models are now in their second, third or even later generations. Each new model reflects a considerable amount of learning that followed from building the previous model.

According to O'Donoghue (2001b), about 30 dynamic microsimulation models have been constructed internationally so far, with approximately ten models in active use at present. Table 8.2, taken from O'Donoghue (2001a), summarises the principal uses of the different dynamic microsimulation models, classified into the headings: Projections, Evaluations of Public Policy, Designing Policy Reform, Studies of Inter-Temporal Processes and Behaviour, and Investigating Inequality and Redistribution. Studies using dynamic microsimulation models have concentrated on two types of investigation, lifetime income and intra-personal redistribution, and concern countries like Australia, Ireland, Italy, the Netherlands, Sweden, the United Kingdom and the United States.

A number of models (*e.g.* the HARDING model in Australia, LIFEMOD in the United Kingdom, O'Donoghue's model for Ireland and SESIM in Sweden) are simulated in

a steady state world in which the demographic characteristics, government policies, etc., for the base year are used for the entire modelled period. The advantage of the steady state approach is that the effects of regulatory systems are viewed in isolation. Utilising a steady state approach and focusing on just one system with unchanging behavioural patterns allows one to look at the actual forces within a particular tax-benefit system. Varying behaviour and systems over time can complicate the causes of various effects. Cohort models are typically run in a steady state world. A cohort may live its entire life within the framework of the economic and demographic circumstances prevailing at a specific time. Clearly, a steady state model would not be effective in examining the impact of changing demographic or labour market patterns, or changes in the wider economy. Dynamic population models age entire cross-sections and have focused on analyses of future populations, for example the impact of demographic changes on the income distribution. The disadvantage of this approach is that regulatory systems may change greatly over the period of analysis and it then becomes difficult to comment on the characteristics of the current systems. Some of the major models, such as CORSIM (United States) and DYNACAN (Canada), are simulated in non-steady state worlds; another example is NEDYMAS (the Netherlands). Doing this comes at a cost, as many more parameters need to be specified in the model and many more datasets may be required.

The remainder of this chapter focuses on steady state models that have been used to investigate life-course redistribution in tax-benefit systems and the degree of redistribution between life-rich and poor versus redistribution over one's life course.

The Australian HARDING model (Harding, 1993) uses what is known as a dynamic cohort model, which ages a single cohort over its entire lifetime, predicting each individual's major life-cycle events. The British LIFEMOD model (Falkingham and Lessof, 1992) is analogous to Harding (1993) but refers to a steady state approach based on the British situation. LIFEMOD "gives birth to" 4 000 synthetic individuals, whose sex and socioeconomic group are determined using probabilities and randomisation. The life course is advanced a year at a time until the individuals die according to the probability appropriate to their age, sex and socioeconomic group. Individuals are randomly allocated different forms of education during their childhood and youth, and a family history is created, with members getting married and divorced. During their working years, a decision is made each year as to whether the individual is part of the labour force. If this is the case, they may be full- or part-time employed, a business owner or unemployed. Incomes depend on sex, age, family type, labour force status and previous income, and are calculated using an estimated regression function. Each individual is also randomly allocated a specific talent factor. Greater talent, for those privileged enough to be accorded it, is assumed to have a positive impact on their income via a career factor. Based on the family's characteristics, the transfers received and the taxes and contributions payable are calculated for each year of life. At the end of the life course the accounts are closed and both gross and net lifetime salary are calculated, as is disposable lifetime income per unit of consumption. One of the difficulties in the model is that indirect taxes and government expenditures on services are not included. The impact of government is limited to the major cash transfers and the income tax and no account is taken of the underground economy and possible tax evasion.

SESIM (Swedish Ministry of Finance, 2003, Pettersson and Pettersson, 2007) is a dynamic microsimulation model for Sweden covering most of the transfer systems. The database (LINDA) comprises a sample of approximately 3.5% of the Swedish population in 1999, equivalent to approximately 308 000 individuals. Members of the households of the sample individuals have also been added, making a total sample of approximately

786 000 individuals for the year 1999. The individuals included in the sample are followed up on an annual basis, with data collected from various administrative registers and incorporated in the database. Registers contain individual information on income, taxes, salary, education, sickness, parental benefits, pensions, pension points and unemployment benefits. Information on past periods is also collected. The database thus has a longitudinal structure such that the individuals included can be observed repeatedly. SESIM's basic population comprises a random sample of approximately 104 000 individuals extracted from the 1999 LINDA database. The various statistical models forming the basis for SESIM have in most cases been estimated with the help of LINDA data. Most models that describe dynamic processes based on information from a continuous period of two or more years require access to longitudinal data. SESIM generates an income distribution largely conforming to that observed in reality.

The income concept in SESIM includes publicly financed private consumption, and indirect taxes in the form of VAT and specific taxes paid by households (taxes on alcohol, tobacco, etc.) are calculated and also included in the model. Data on households' utilisation of public services is used to calculate the subsidy value of the public services that may be related to a specific individual. Examples of public services included in the analysis are childcare, elderly care, schools, health and medical care and labour market measures. The subsidy value of health care and elderly care, for example, is assumed to be equal to the premium for an equivalent hypothetical insurance policy the recipient would have needed to take out if the service had not been subsidised. Indirect taxes in the form of VAT and specific taxes paid by households cannot be observed directly in LINDA but have been estimated using data from Statistics Sweden's survey of households' consumption habits.

O'Donoghue (2001a) has used a dynamic microsimulation model to generate a set of simulated life histories for a single cohort in Ireland. The model covers most of the transfer systems and studies the level of self-financing in the Irish transfer systems. The source of data is the four waves of the *Living in Ireland Survey*, a cross-section survey of Irish households carried out as part of the European Community household panel survey for collecting information on incomes, labour market status, illness, education and demography. The primary source of data is the 1994 survey, with 4 048 responding households and a response rate of 57.1%. In some cases, especially for education and demographic processes, official statistics are used to specify the processes.

Behaviour is simulated according to a steady state world, assuming that all individual behaviour takes place in the mid 1990s. Disposable income is market income after taxes, contributions and benefits. Not considered are social insurance contributions paid by employers, as it is not clear to whom they are actually incident.

The characteristics of these four dynamic microsimulation models are summarised in Table 8.3.

4. Lifetime redistributive impact of the social insurance system is smaller than the annual incidence suggests

How do inter-personal and intra-personal distributions differ in countries that have chosen completely different principles for shaping social policy? In the following we compare a country such as Sweden with its highly universal welfare-state arrangements, with countries such as Australia and Ireland, whose welfare systems have a strong element of targeting.

4.1. Sweden

Sweden is an interesting case because social expenditure as a share of GDP is higher than in most countries. Sickness benefit insurance, unemployment insurance, occupational injury insurance, pensions, parental insurance, etc., are income-related and financed by a proportional contribution based on salary formally paid by the employer. The level of compensation is relatively high for those in low- and middle-income groups. But the social insurance system does not pay compensation for loss of income above the social insurance ceiling, which is equivalent to slightly more than the average salary. For those with low or no income, for example, there is uniform basic protection in the form of a minimum compensation payment for unemployment insurance, retirement pension, early retirement pension and parental insurance. There are also means-tested benefits, such as housing allowances, and social allowances. One might predict that a social-insurance system such as Sweden's, with its emphasis on income-related benefits and contributions, would result in a high degree of intra-personal redistribution.

This is indeed the case. According to calculations in SESIM, inter-personal redistribution (how incomes are redistributed among individuals) is only 18%. Intra-personal redistribution, *i.e.* the proportion of self-financed transfers and subsidies, therefore amounts to 82%. This means that just over eight out of every ten Swedish kronor received by the average individual in transfers and subsidies over the life course has been financed by the individual himself at some point.

Table 8.4 shows the calculated Gini coefficient for annual and lifetime incomes for various income concepts. The Gini coefficient is a common measure for inequality of income, and a value of zero corresponds to perfect equality, with everyone having the same income, while a value of one means total inequality, with one person receiving all the income. In SESIM the disposable income is defined as the household's income from labour and capital plus transfers minus (direct) tax paid and study allowances repaid. Study allowances are viewed as a transfer. Disposable income is supplemented by the value of the individual's public consumption (see previous page) while indirect tax paid in the form of VAT and specific taxes is deducted from disposable income. A so-called equivalence scale, giving each household a certain consumption weighting depending on how many adults and children are living together, is used to obtain comparable incomes. The lifetime income is calculated as the individual's mean value of the annual amounts. Mean values, rather than aggregates, are used to correct for variation in the length of life of different individuals. Different taxes and benefits have different effects on income distribution. However, only the direct effects are considered here.

The distribution of the incomes generated in the market is very uneven. If the value of subsidised public consumption is added to disposable income, this reduces the inequality in income distribution, measured using the Gini coefficient, from 0.217 to 0.189 from a cross-sectional perspective. Inequality of income is thus reduced by approximately 10%. This fairly moderate effect is explained to some extent by the inclusion of indirect taxation, which has a regressive effect and cancels out some of the income-smoothing effect of public consumption.

Changing the time perspective and analysing lifetime incomes instead of annual incomes has an even greater effect. The Gini coefficient falls from 0.189 for annual incomes to 0.086 for lifetime incomes, *a reduction of almost 60%.* The fact that the distribution of lifetime incomes is more even than the equivalent distribution of annual incomes is due to the individuals' position in the income distribution varying from year to year, for example, low incomes in one given year are often compensated for by high

incomes in other years. The higher the income variation, the greater the smoothing-out. The inequality is less than half that found when analysing cross-sectional incomes, which corresponds well to a previous Swedish study which used a different type of microsimulation model based on statistical matching (Hussénius and Selén, 1994). This obtained a reduction of just over 60% in the Gini coefficient for disposable income per unit of consumption by shifting the perspective from annual to lifetime incomes. The Gini coefficient was 0.221 for disposable income per unit of consumption and 0.086 for average disposable income per unit of consumption over the lifetime.

Björklund (1993) too used Swedish data to calculate the smoothing-out effect of moving from annual to lifetime incomes, but using actual data. He found that the dispersion in lifetime incomes is approximately 40% lower than in annual incomes. One explanation for the smaller effect may be that Björklund studied aggregate net income at individual level, an income concept which is fairly remote from disposable income per unit of consumption and total income. The study was based on actual data on individuals over 39 years of age, from 1951 to 1989, and was as such time-limited and did not include any whole lifetime incomes.

Most of the transfer systems in SESIM impact income distribution in the same direction over the lifetime as over one year. For example, social allowances and housing allowances are progressive from a cross-sectional perspective but also have a smoothing-out effect from a life-cycle perspective. The force of the effects is, however, influenced by the time perspective. A transfer system that demonstrates the opposite effect over the lifetime compared with over one year is the retirement pension, which is progressive over a year but regressive over the lifetime. Recipients of a retirement pension, who have a relatively low total income on average as they do not have any other sources of income, show a progressive effect in a cross-section. A high pension generally does not provide an income at the top of the distribution but somewhere between the middle and the top. Those with high pensions had high incomes when they were economically active, which is why they are found at the top of the lifetime income distribution. Retirement pensions therefore have a regressive effect over the lifetime. Note, however, that this analysis refers solely to pensions received and does not take into account contributions paid.

Calculation of the inter- and intra-personal redistribution components is carried out in accordance with a method used in Falkingham and Harding (1996). Each cohort is assumed to balance itself out financially over the life cycle, *i.e.* the sum of taxes and contributions paid is exactly equal to the sum of transfers and subsidies for public services received. By allowing each cohort to achieve financial balance, the method disregards any public financing deficit or surplus (for a given cohort over its lifetime) arising during the period of analysis. In the simulation the cohorts' total taxes paid will exceed the sum of transfers and subsidies because the taxes will also be used to finance certain items of public expenditure not included in the analysis. A certain adjustment to the total tax burden is therefore required to achieve financial balance over the life cycle for each cohort. In one method public sector expenditure is financed by total social insurance contributions and as large a proportion of direct and indirect taxes as is required to balance the cohort.[3]

3. According to a different method, all indirect taxes and as high a proportion of social insurance contributions and direct taxes as is required are used.

Individuals may receive transfers and subsidies for public services at the same time as paying taxes and contributions. If an individual receives more in transfers than he pays in taxes, he has a positive net balance with respect to the public sector for that year. Conversely, a negative net balance is the result of an individual paying more in taxes than he receives back in the form of transfers. The sum of the individual's annual net balances over the lifetime is equal to the individual's lifetime net balance. The sum is equivalent to the funds redistributed among individuals (inter-personal redistribution) within the cohort. As each cohort is assumed to pay an amount of tax equal to what it receives in transfers over the life cycle, the sum of the positive lifetime net balances is equal to the sum of the negative lifetime net balances.

If an individual receives transfers in a specific year at the same time as he is paying tax, the transfers can be seen as being financed by the taxes paid, called here the "yearly give-and-take". An individual with a positive lifetime net balance with respect to the public sector may nevertheless have negative net balances for specific years, *i.e.* when taxes paid exceed transfers received. These taxes can then be assumed to finance transfers received in other years in the individual's life, called here the "life cycle give-and-take". Taken together, the yearly and the life cycle give-and-take provide a measure of how much of the transfers received is self-financed, *i.e.* via taxes paid by the individual himself at some point in his life.

If taxes exceed transfers, the latter are financed in full by the taxes paid, *i.e.* the yearly give-and-take is equal to the transfers. If transfers exceed taxes, only that part of the transfers which does not exceed taxes is financed, and the yearly give-and-take is then equivalent to the taxes paid.

The inter-personal and intra-personal redistributions of lifetime income are shown in Table 8.5.

The yearly give-and-take represents 45% of the total funds redistributed. The inter-personal redistribution is calculated to be 18%, which means that the proportion of self-financed transfers and subsidies is 82%. Just over 8 out of every ten Swedish kronor received by the average individual in transfers and subsidies over the life course has therefore been financed by the individual himself at some point. Only 18% of the redistribution via taxes, transfers and public consumption is genuine redistribution among individuals. Leaving the yearly give-and-take out of the account, the inter- and intra-personal redistributive components amount to 32% and 68%, respectively. Overall, these results show that, in the main, the public systems in the Swedish welfare state bring about a matching of resources over the life cycle.

Hussénius and Selén (1994), in similar calculations, point to a somewhat higher level of inter-personal redistribution, approximately 24%. Leaving the yearly give-and-take out of the account, inter-personal redistribution here too is 32%, which is wholly in line with the results of SESIM.

The lifetime net balance with respect to the public sector, *i.e.* the sum of all subsidies and transfers received over the lifetime minus corresponding taxes, is, on average, positive for those with a low lifetime income and negative for those with a high lifetime income. This means that the public sector also achieves a smoothing-out of lifetime incomes. Over the life course an individual from the highest lifetime income quintile registers on average a net loss of approximately SEK 3.3 million and an individual from the lowest quintile on average a net gain of approximately SEK 2.5 million. The redistribution is achieved in the first instance via public subsidies and other transfers and

not via the retirement pension system. The level of self-financing of transfers and subsidies increases with individuals' lifetime income, but individuals with lifetime incomes in the lowest 20% still finance over 60% of their transfers and subsidies themselves at some point in life.

4.2. Australia and the United Kingdom

Redistributive characteristics in *Australia* and *the United Kingdom* in 1986 and 1985, respectively, were compared on the basis of two dynamic cohort models with some aspects of their model structure in common (Falkingham and Harding, 1996). A number of the transfer system's redistributive characteristics were analysed from both annual and lifetime income perspectives. Both models ignore benefits in kind and indirect taxes and are limited to the major cash transfers and income taxes administered by the central government. During the 1980s the British government pursued a policy of shifting the tax burden from one of tax as you earn to tax as you spend, and this had obvious implications for redistribution.

In the 1980s Australia undertook a radical reform of its social insurance system that left it with perhaps the purest social security system in the industrialised world. The system principally consists of income-tested payments that are available to those with particular characteristics. The British system entitlement to benefits within the British social security system, which had its foundation in the Beveridge Report (1942), depends on an individual's national insurance contribution record. A primarily social assistance-based system, such as Australia's with its emphasis on poverty alleviation, results in a greater degree of inter-personal redistribution of income. Conversely, a system such as Britain's, with its link between contributions and benefits, results in a greater degree of intra-personal redistribution. The calculations in the HARDING model show that approximately half of the lifetime income redistribution in Australia takes place among individuals. Inter-personal redistribution is between 48 and 62% for Australia and between 29 and 38% for the United Kingdom, depending on the method used to determine the tax burden (see footnote 3).

4.3. Ireland

In *Ireland* 45% of the lifetime income redistribution is among individuals, as shown by O'Donoghue's (2001b) calculations. One of the main distinguishing features of the Irish tax-benefit system, relative to other European tax-benefit systems, is the minor role of insurance in the benefit system. The primary role is one of poverty alleviation. Although the largest benefit instruments are normally called insurance benefits and depend on the payment of insurance contributions, the objective of these instruments is primarily redistribution rather than income replacement. For longer term contingencies, such as old age, the provision for income replacement is left to the private sector.

The Irish personal tax-benefit system is in many respects typical of an Anglo style of welfare state, with relatively insignificant social insurance systems, where means testing and progressive income taxes are more important. For single persons, replacement rates in general are quite low by European standards. There are a number of important differences between the UK and Irish tax-benefit systems. Firstly, means testing tends to be more important in the Irish case. Social insurance is less well developed than in the United Kingdom, with benefits payable at a flat rate and with no earnings-related components. Although flat rate benefits tend to be of higher value than in the United Kingdom, the absence of an earnings-related old age pension results in lower

social insurance contributions. Having a larger self-employed population, the coverage of social insurance tends to be lower. Structurally, means tested benefits are designed differently to the United Kingdom. Instead of almost universal coverage for a common means tested benefit, Income Support, Ireland has a set of categorical instruments covering contingencies such as unemployment, old age, disability, lone parenthood, etc., with different means tests and eligibility conditions, but similar levels of benefit. All in all, though, the system covers the same set of contingencies as in the United Kingdom. Housing benefits are less important, but growing in importance with the high house price growth in the country (O'Donoghue, 2001a).

Overall, the entire tax-benefit system in Ireland is less redistributive when one considers the entire lifetime compared with a point in time. The system is more progressive when the annual accounting period is used instead of the lifetime one. The principal reason for this is that social insurance benefits are much less redistributive over the lifetime than at particular points in time. It is found that the lifetime rich (top quintile) are on average net contributors to the system, while the poorest in the bottom are net beneficiaries of the system over their entire life course. Overall, intra-personal redistribution is found to be less important than for the United Kingdom, but more important than for Australia, highlighting the targeting nature of the Irish tax-benefit system.

4.4. The Netherlands

The analyses in Falkingham and Harding (1996), O'Donoghue (2001a) and the Swedish Ministry of Finance (2003) refer to a steady-state situation. The disadvantage of this approach is that it gives limited information when it comes to the situation of the current population. Owing to, for example, the aging of the population, the lifetime incidence will differ from generation to generation and the steady-state annual incidence will differ from all observed ones.

In Nelissen (1998) a dynamic cross-sectional microsimulation model, NEDYMAS, has been used to examine both the annual and lifetime incidences of the social security system in the Netherlands. This approach makes it possible to derive results for specific generations, which is not possible with the longitudinal microsimulation model used by, for example, Falkingham and Harding (1996).

One can distinguish two types of social insurances in the Netherlands, namely general insurances and employee insurances (Nelissen, 1998). Flat-rate benefits, normally about 70% of the net minimum wage, cover all residents and the premiums are proportional to income. The starting-point is the solidarity principle, not the insurance principle. The insurance or equivalence principle is the point of departure for the employee insurances. Benefits are related to income (up to a ceiling).

Nelissen compared the redistributive impact of the Dutch social security on an annual basis with the lifetime redistributive impact. The lifetime incidence is considerably smaller and there are also differences between generations and schemes. The lifetime income of the Dutch cohorts under consideration is about 35% less unequally distributed than annual income.

Table 8.6 summarises the redistribution of lifetime income in the four steady state-models above.

The relatively low level of inter-personal redistribution in Sweden can be explained by the fact that a high proportion of transfers in Sweden comprises social insurances linked to the insured's incomes. Another explanation is that a higher proportion of

pensions in Sweden is paid for by the public sector, resulting in a higher level of public intra-personal redistribution over the life course. Calculations show that the Swedish retirement pension system accounts for approximately 56% of all transfers. Another important difference leading to higher yearly giving and taking is that transfers in Sweden are to a greater extent taxable, thus contributing to intra-personal redistribution (*i.e.* a higher yearly give-and-take).

5. Conclusions

Public social spending varies a lot across developed OECD countries. Its share of GDP is closely related to the degree of "universality" of public social spending, *i.e.* the extent to which benefits are received by individuals. Broadly speaking, the lowest figures are currently found in the Anglo-Saxon countries, while the highest appear in the Nordic countries. In countries with highly universal welfare-state arrangements, most of the social spending consists of intra-individual redistribution rather than inter-individual redistribution of lifetime income, in contrast to countries whose welfare systems have a strong element of targeting. The universal character of public social spending in Sweden and Italy explains the high shares of aggregate social spending that constitute intra-individual redistribution over the individual's life cycle in these countries (82 and 76%, respectively, according to the Swedish Ministry of Finance, 2003; and O'Donoghue, 2001a). By contrast, the Australian social system has a strong element of targeting, which explains its rather modest share of public social spending that consists of such intra-individual redistribution (38–52%, according to Falkingham and Harding, 1996). As pointed out above, in countries with large intra-individual redistribution over each individual's life cycle, what remains of public social spending (and its financing) is often sufficient to generate considerable inter-individual redistribution of yearly income.

Though it is clearly invalid to measure the redistributive effect of government against the original distribution of pre-tax and pre-transfer income, such an assumption is implicit in the studies referred to above. There are, nonetheless, examples of studies where the alternative for comparison has not been left blank. In a study of the direct distributive effects of the Swedish public pension system (before the 1998 reform) from a life-cycle perspective, I (Ståhlberg, 1989, 1995) was unable to demonstrate any clear smoothing-out effect of the Swedish retirement pension. The chosen social policy alternative was a public system with identical benefits, but neutral in a distributive sense. It meant that those who gained (lost) from a change in policy regime were those who paid more (less) than the proper actuarial price for their pensions. It was found that the progressive tendency in the national basic retirement pension was virtually neutralised by the regressive tendency in the national supplementary pension scheme (ATP). There is a similar study by Söderström (1988), but his analysis is largely conducted in qualitative terms and does not include any empirical investigations. In order to analyse the annual redistributional aspects of Swedish social policy (pensions, sickness benefits, unemployment assistance, and family assistance) the policy alternative in Söderström's study is a non-controversial social policy. In general terms, such a social policy can be said to consist of the non-controversial political interventions that are made to remove the "market-imperfections" that exist in private insurance markets. Söderström's conclusion is that Swedish social policy has a progressive effect on income distribution, but that this progressive tendency is being gradually eroded by the increasing priority given to the principle of a standard of living guarantee at the expense of the objective of securing a minimum standard of living.

In reality, this does not seem to be inconsistent with the results of the calculations in the dynamic microsimulation models, but it must nevertheless be emphasised that these do not reveal the overall effects of distribution policy, but only show the partial effect of the respective transfer. In assessing the actual effects of distribution policy it is impossible to disregard what is happening to factor incomes and transfers in other respects.

References

Beveridge, W. (1942), *Social Insurance and Allied Services*, Cmd. No. 6404, HMSO, London.

Björklund, A. (1993), "A Comparison between Actual Distributions of Annual and Lifetime Income: Sweden 1951–89", *Review of Income and Wealth*, Vol. 39, No. 4.

Falkingham, J. and A. Harding (1996), *Poverty Alleviation versus Social Insurance Systems: A Comparison of Lifetime Redistribution*, Contributions to Economic Analysis, Vol. 232, Amsterdam, North Holland.

Falkingham, J. and C. Lessof (1992), "Playing God: the construction of LIFEMOD: A Dynamic Cohort Microsimulation Model", in R. Hancock and H. Sutherland (eds.), *Microsimulation Models for Public Policy Analysis: New Frontiers*, STICERD Occasional Paper No. 17, London School of Economics, London.

Forssell, Å., M. Medelberg and A. Ståhlberg (1999), "Unequal Public Transfers to the Elderly in Different Countries – Equal Disposable Incomes", *European Journal of Social Security*, Vol. 1, No. 1, pp. 63–89.

Harding, A. (1993), "Lifetime vs Annual Tax-Transfer Incidence: How Much Less Progressive?", *The Economic Record*, Vol. 69, No. 205, June, pp. 179–191.

Hussenius, J. and J. Selén (1994), *Skatter och socialförsäkringar över livscykeln – En simuleringsmodell* (Taxes and Social Insurances over the Lifecycle – A Simulation Model), Report to the Expert Group for Studies in Public Sector Economics (ESO), Ministry Paper, p. 135, Stockholm.

Kangas, O. and J. Palme (1992), "The Politics of Universalism: The Case of Finnish Sickness Insurance", *Journal of Social Policy*, Vol. 21, pp. 25-52.

Kangas, O. and J. Palme (1993), "Statism eroded? Labor market benefits and challenges to the Scandinavian welfare states", in E.J. Hansen, S. Ringen, H. Uusitalo and R. Erikson (eds.), *Welfare Trends in the Scandinavian Countries*, M. E. Sharpe, New York.

Lindbeck, A. (2006), *The Welfare State – Backgrounds, Achievements, Problems* (new edition of *Palgrave*, forthcoming).

Microsimulation Models for Public Policy Analysis: New Frontiers, STICERD Occasional Paper No. 17, London School of Economics.

Nelissen, J.H.M. (1998), "Annual versus Lifetime Income Redistribution by Social Security", *Journal of Public Economics*, Vol. 68, No. 2, pp. 223–249.

O'Donoghue, C. (2001), "Redistribution in the Irish Tax-Benefit System", PhD Thesis, London School of Economics, London.

O'Donoghue, C. (2001b), "Redistribution over the Lifetime in the Irish Tax-Benefit System: An Application of a Prototype Dynamic Microsimulation Model for Ireland", *The Economic and Social Review*, Vol. 32, No. 3, October, pp. 191–216.

OECD (2005), *Net Social Expenditure 2005*, Paris.

Orcutt, G., M. Greenberg, J. Korbel, A. and Rivlin (1961), *Microanalysis of Socio-economic Systems: A Simulation Study*, Harper and Row, New York.

Pearson, M. and J.P. Martin (2005), "Should We Extend the Role of Private Social Expenditure?", IZA Discussion Paper No. 1544, Bonn.

Pettersson,T. and T. Pettersson (2007), "Lifetime Redistribution Through Taxes, Transfers and Non-Cash Benefits", Chapter 8 in Harding and Gupta (eds.), *Modeling Our Future – Population Ageing Social Security and Taxation*, International Symposia in Economic Theory and Econometrics, Vol. 15, Elsevier.

Reynolds, M. and E. Smolensky (1977), *Public Expenditures, Taxes, and the Distribution of Income*, Academic Press, New York, San Francisco, London.

Söderström, L. (1988), "The Redistribution Effects of Social Protection: Sweden", in J.-P. Jallade (ed.), *The Crisis of Redistribution in European Welfare States*, Trentham Books.

Ståhlberg, A. (1989), "Redistribution Effects of Social Policy in a Lifetime Analytical Framework", in B. Gustafsson and A. Klevmarken (eds.), *The Political Economy of Social Security*, Amsterdam, North Holland, pp. 51–65.

Ståhlberg, A. (1995), "Women's Pensions in Sweden", *Scandinavian Journal of Social Welfare,* Vol. 4, pp. 19–27.

Swedish Ministry of Finance (2003), *Fördelning ur ett livscykelperspektiv. Bilaga 9 till Långtidsutredningen 2003* (Distribution from a Lifecycle Perspective. Annex 9 to the Long-term Study 2003), Official Government Report, p. 110, Stockholm.

Table 8.1. Composition of total public expenditures, 2001

(% of GDP)

	United States			Western Europe*		
	Public	Private	Total	Public	Private	Total
Cash transfers	7.9	4.3	12.2	14.2	1.8	16.0
Pensions	*6.1*	*3.8*	*9.9*	*8.5*	*1.0*	*9.5*
Human services	11.9	7.2	19.1	15.1	0.9	16.0
Health	*6.2*	*5.0*	*11.1*	*6.4*	*0.4*	*6.8*
Education	*5.1*	*2.3*	*7.3*	*5.4*	*0.4*	*5.8*
Active labour market programmes	*0.1*		*0.1*	*0.9*		*0.9*
Total social expenditure	19.8	11.6	31.3	29.3	2.7	32.0

* Unweighted averages have been calculated for Austria, Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, the Netherlands, Norway, Spain, Sweden and the United Kingdom. Note that the private health spending figures only cover private insurance programmes and exclude individual private health costs.

Source: Lindbeck (2006).

Table 8.2. Uses of dynamic microsimulation models

Model	Country	Uses
DYNAMOD I and II	Australia	Potential areas, such as superannuation, age pensions and education, long-term issues in labour market, health, aged care housing policy, broad long-term distributional issues within the population and across generations, asset accumulation retirement incomes, future characteristics of the population or the projected impact of policy changes.
HARDING	Australia	Analysis of lifetime tax-transfer.
Melbourne Cohort Model	Australia	Analysis of income inequality in a lifetime context.
FAMSIM	Austria	Demographic behaviour of young women.
Pensions Model	Belgium	Analyses and forecasts the medium term impact of a change in the pension regulations.
DYNACAN	Canada	Models Canada Pension Plan and its impact on the Canadian population.
LifePaths	Canada	Health care treatments, student loans, time-use, public pensions and generational accounts.
DEMOGEN	Canada	Distributional and financial impact of proposals to include homemakers in the Canadian pension plan.
DESTINIE	France	Public pensions and intergenerational transfers.
Sfb3	Germany	Analyses of pension reforms, the effect of shortening worker hours, distributional effects of education transfers, inter-personal redistribution in the state pension system.
Dynamic Model	Ireland	Inter-temporal issues relating to the degree of redistribution in the tax-benefit system.
DYNAMITE	Italy	Examines household level microeconomic questions and the impact of macroeconomic and institutional changes on distribution of resources.
ANAC	Italy	Examines the effect of demographic changes on the Italian saving rate and the reform of the pension system in Italy.
Italian Cohort Model	Italy	Analyses lifetime income distribution issues.
Japanese Cohort Model	Japan	Looks at the impact on household savings of changes in the demographic structures.
NEDYMAS	Netherlands	Intergenerational equity and pension reform, the redistributive impact of social security schemes on lifetime labour income, demographic projections, annual versus lifetime income redistribution by social security, lifetime income redistribution by old-age state pension, vertical and horizontal lifetime redistribution, pension reform.
MIDAS	New Zealand	Wealth accumulation and distribution.
MOSART	Norway	Modelling the future costs of pensions, carrying out micro level projections of population, education, labour supply and public pensions and incorporating overlapping-generation modelling in a dynamic microsimulation framework.
MICROHUS	Sweden	Studies the dynamic effects of changes in the tax-benefit system on the income distribution.
SESIM	Sweden	Analysis of income inequality in a lifetime context. Modelling budget estimates of student grants and loans, analyses of other intertemporal policy issues, such as labour supply, savings decisions and pensions.
SVERIGE	Sweden	Human ecodynamics (the impact of human cultural and economic systems on the environment).
LIFEMOD	United Kingdom	Modelling the lifetime impact of a welfare state.
Long Term Care Model	United Kingdom	Modelling long-term care reform options.
PENSIM	United Kingdom	The treatment of pensioners by the social security system, the regulations and coverage of private pension schemes and performance of pension funds, investment portfolios, projected demographic movements and movements in aggregate variables, such as unemployment and interest rates.
CORSIM	United States	Changes occurring in kinship networks, wealth accumulation, patterns of intergenerational mobility and whether individual paths depend on aggregate conditions in society, the progressivity and the life course of the current social security system as well as potential reforms, household wealth accumulation, socioeconomic mobility, health status, interstate migration, and international collaborations.
DYNASIM I & II	United States	Forecasts of the population to 2030 employing different assumptions about demographic and economic scenarios. An analysis of the cost of teenage childbearing to the public sector under alternative policy scenarios and linking with a macro model.
MINT	United States	Forecasts of the distribution of income of the 1931–1960 birth cohort in retirement.
PENSIM/2	United States	Analyses lifetime coverage and adequacy issues related to employer-sponsored pension plans in the United States.
PRISM	United States	Evaluation of public and private pensions.

Source: O'Donoghue (2001a), Table 4.1, pp. 118–119.

Table 8.3. The model characteristics

Model	HARDING	LIFEMOD	O'Donoghues' model	SESIM
	Australia	United Kingdom	Ireland	Sweden
Year of study	1986	1985	1994	1999
Sample size	4 000	4 000	4 000	104 000
Source of data	Synthetic	Synthetic	Four waves of panel data	Longitudinal register
Coverage	Cash transfers, income tax	Cash transfers, income tax	Cash transfers, income tax	Cash transfers, publicly-financed private consumption, income tax, indirect taxes

Table 8.4. Gini coefficient for annual and lifetime incomes for various income concepts: the SESIM model for Sweden

Type of income	Annual income	Lifetime income	Change
Factor income	0.490	0.196	-60%
Equivalent disposable income	0.217	0.102	-53%
- indirect taxes	0.224	0.104	-54%
+ public consumption (*i.e.* total income)	0.189	0.086	-55%

Source: Swedish Ministry of Finance (2003).

Table 8.5. Redistributive components (average amount per individual): the SESIM model for Sweden

Component	Thousands of SEK	Proportion (%)	Proportion, excl. yearly give-and-take (%)
Interpersonal redistribution	1 194	18	32
Annual intrapersonal	3 024	45	
Lifetime intrapersonal	2 540	38	68
Total	6 758	100	100

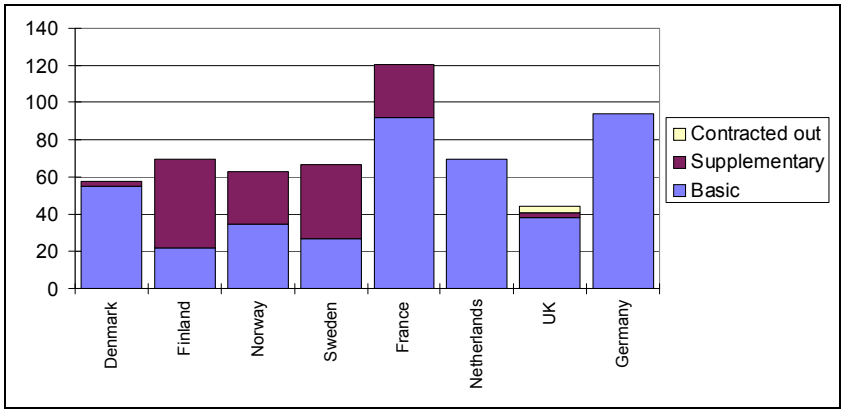
Source: Swedish Ministry of Finance (2003).

Table 8.6. Redistribution of lifetime income

	Welfare state programme	Intra-personal redistribution (%)	Inter-personal redistribution (%)
Australia	Strong element of targeting	38 - 52	48 - 62
Ireland	Strong element of targeting	55	45
United Kingdom	In between	62 - 71	29 - 38
Sweden	Highly universal	82	18

Figure 8.1. Net public spending on old age pensions per elderly person, 1995

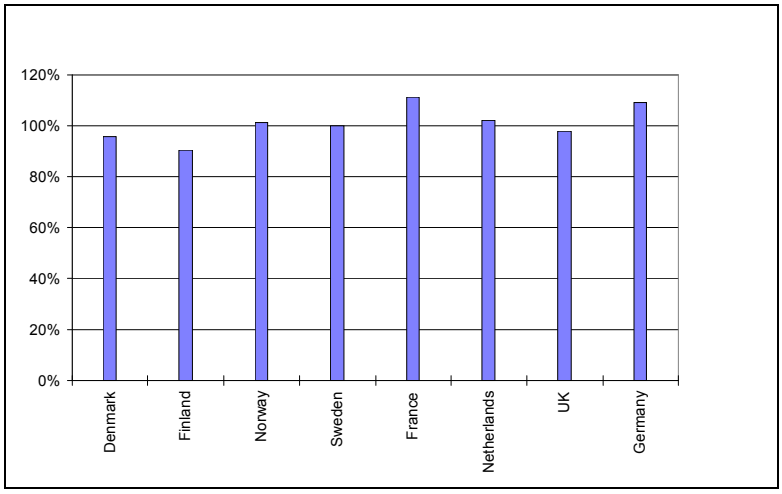
Thousands of SEK (corrected for purchasing power)



Source: Forssell *et al.* (1999).

Figure 8.2. Average disposable income of elderly people in 1994, as a percentage of that in Sweden

Values corrected for purchasing power



Source: Forssell *et al.* (1999).

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