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INCOME TAX REFORM: A MICROSIMULATION APPROACH

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1. Introduction

The Commission on Taxation identified equity, efficiency and simplicity as the main criteria against which the structure of a tax system should be judged, for a given level of revenue. In evaluating proposals for reform it is relatively straightforward to judge the impact on simplicity and compliance costs. But assessing the likely effects on revenue, incentives and the distribution of income presents a greater challenge. This paper sets out a new response to that challenge in the Irish context, drawing on the rapidly expanding international work on microsimulation modelling of tax and benefit changes.

Microsimulation models are designed to analyse the effects of policy changes on a representative sample of individual families. Specifically, tax/benefit models do so by comparing the results of two simulations. First, a simulation of how a family's direct income is transformed into net income by direct taxes and cash transfers under the rules of the current system. Second a simulation of how the family would fare if the rules were changed in certain ways - for example, a cut in tax rates, or a change in the rates of payment for certain social welfare schemes. By comparing the results of the two simulations it is possible to see how particular kinds of family are likely to be affected, and to estimate the overall cost of the change. In this way, microsimulation models can provide evidence on the revenue, incentive and distributional implications of changes in taxes and benefits which cannot be derived by other means. Section 2 discusses the advantages and limitations of this approach. The current implementation of the approach for Ireland is set out in Section 3. Analysis of some base-broadening and rate-reducing policy options, as recommended by the Commission on Taxation and the National Economic and Social Council, is contained in Section 4. Incentive effects are discussed in Section 5. The main themes are drawn together in the final section.

2. Microsimulation: Advantages and Limitations

2.1 Why is it needed?

Why are tax/benefit models needed? Perhaps the best way to answer this question is to ask how would tax reforms be analysed without one. As far as the costing of policy changes

goes, an adequate answer might be expected from administrative statistics. This is true for many policy changes, but by no means all. The current lack of integration between our income tax and social welfare system makes it difficult to estimate the benefits of integration; a tax-benefit model can be useful just to cost the effects of making social welfare benefits taxable, for example.

In assessing prospective policy changes it is important to know not only what the aggregate costs or revenues will be, but also to know how they affect individual families. It is in terms of the welfare of individuals or households, after all, that economics typically characterises the social welfare function. In the absence of a tax-benefit model, calculations for supposedly typical families are often used to illustrate the effects. For instance, the Budget statement is accompanied by calculations of the effects of tax changes for a number of examples. The most "typical" of these - and the one which dominates in media coverage - is the married couple with two children, and one earner taxed under PAYE. But less than 1 family in 20 falls into that category; and even those who do differ widely in terms of income, housing tenure and other characteristics relevant to their treatment by the tax benefit system. In the UK a systematic attempt was made by the Department of Health and Social Security to construct a limited number of hypothetical households which would adequately represent the effects of changes. The 8 family types selected by them covered 70 per cent of actual families in terms of demographic composition; but when assumptions about housing tenure, spouse's earnings and the like are taken into account, the coverage falls to under 5 per cent. (Atkinson, King and Sutherland, 1983). The sternest warning about the use of hypothetical families comes from the Institute for Fiscal Studies, pointing out that "It is usually possible to prove anything with a well-chosen 'typical' household" (Stark, 1989).

Even apart from these problems, analysis of hypothetical examples could not answer many important questions such as: how would those at particular points in the income distribution be affected (the top, the bottom, those on low pay); how much do the effects on net incomes and marginal tax rates vary within income groups; what is the effect on the income distribution itself.

2.2 Advantages

Tax-benefit modelling offers a way around these problems. Instead of trying to expand the number of hypothetical examples to cover the population - which would very soon become unmanageable - one can use a nationally representative sample. This ensures adequate representation of the diversity of actual household circumstances. It allows a better answer to questions about the overall impact of proposals on particular groups (the low paid, two-earner couples, families with children) and on the variation in impact within these groups than is currently possible.

From the point of view of policy makers, there are several distinct advantages:

1. Policy changes can be specified in terms of the instruments at the government's disposal - rates of tax, tax free allowances and social welfare rates.

2. The cash effects on families and households can be calculated. This allows the policy maker to establish how many people gain or lose in cash terms, a first approximation of the likely gains and losses, and to identify the main characteristics of cash gainers and losers. Alternatively it can be used to show the first-round effects on prespecified groups.

3. When considering the effects of changing one policy the interactions with other policies can be taken into account. For instance, a change in long-term social welfare rates also affects tax liabilities: part of the gross cost is recouped, and the distribution of net benefit differs from the distribution of the gross increase.

4. Fundamental policy reforms as well as incremental changes can be analysed.

5. It facilitates direct comparisons between alternative packages of policy changes, as well as between any given reform and the status quo.

6. It allows statements about "typical households" to be based on households with average characteristics in a representative sample, rather than characteristics chosen by the investigator.

2.3 Limitations

All the structural advantages listed above can be gained by simply modelling the rules of the tax and transfer systems under the status quo and a reform, and applying them to calculate the immediate cash effects on families. Such calculations are usually called "cash gain", "first

round" or "static" effects. But the limitations of these figures should be recognised. The static revenue cost estimates are biased: as King (1988) puts it "schemes which have beneficial effects on incentives will appear more expensive than they actually are, and the cost of schemes which reduce efficiency will be underestimated". The modelling approach can, however, be used to document the effects of policy changes on marginal tax rates and replacement rates, which can assist in the assessment of likely behavioural responses. Modelling procedures can be further extended to what is called "dynamic microsimulation", attempting to take into account behavioural responses to policy changes.

In the tax/transfer area, labour supply responses are generally considered the most important. Incorporating labour supply responses into a dynamic tax/benefit model is a challenging undertaking. Extensive international efforts have so far met with limited success, and most work with tax-benefit models still relates to cash gains and losses. Atkinson and Sutherland (1988) suggest two main reasons why this is so.

> The first is that the present state of the debate about tax reforms has scarcely moved beyond the use of simple hypothetical examples, and the use of sample survey data is in itself a major step which needs careful explanation... The complexity of the tax and social security system, coupled with the diversity of individual circumstances, means in our experience that the first-stage calculations are often as much as can be profitably introduced into the policy debate....
>
> The second reason ... is that welfare calculations taking account of behavioural responses are conditional on estimated responses....Experience has shown that estimated behavioural relations are sensitive to the choice of data, to the sample studied, to the specification of the relationship, to the modelling of the policy parameters, to the treatment of unobserved characteristics etc. Moreover the available evidence is often confined to sub-samples of the population and cannot legitimately be extrapolated to the whole population. So that, although great progress has been made in recent years in the estimation of behavioural responses, in our view the routine incorporation of these responses into tax-benefit models is some distance in the future. (Atkinson and Sutherland, 1988, p. 3).

In the Irish context, we are currently working on the estimation of labour supply responses, aiming ultimately to incorporate them into the modelling process. But the diversity of results in the international literature on labour supply models suggests that even when it is possible to incorporate estimated responses, the "cash gain" calculations will continue to play an important

role as a benchmark. The implications of the international experience might be summed up as follows. Static microsimulation models must be built first, and cash-gain calculations represent an important first step for policy analysis; microeconometric estimation of labour supply responses comes next; and incorporation of labour supply responses into microsimulation models, still in its infancy internationally, should attempt to take into account the uncertainty of the estimated results, perhaps through sensitivity analyses. Estimation of labour supply responses can also provide individual utility functions which can be used in the calculation of welfare gains and aggregated into a Samuelsonian social welfare function; this would open up a range of other possibilities, including some of those explored in relation to indirect tax reform by Madden (1989). In principle, third round ("labour market") or fourth round ("general equilibrium") effects could also be modelled; but international experience would suggest that the prospects for progress in these areas are even more limited.

Having outlined the strategy into which the current model fits, and the length of the road to be travelled, it is now time to emphasise the importance of the first steps. The current version of the tax-benefit model for Ireland is based on cash gain calculations, but it does also allow a calculation of the effects on marginal income tax rates, which can be used to inform assessments of the likely behavioural responses. Both features (cash gain and marginal tax rate calculations) represent significant advances in the analysis of policy options in Ireland. Policy decisions will have to be made before the more elaborate dynamic models can be constructed. The applications in this paper will show that the current tax transfer model can play a useful part in informing policy, as similar models have done in many other countries. Most of the policy analyses undertaken in the UK, for example, are still based on modelling of cash gains.

3. Implementation

The first requirement for a tax-benefit model is a sample survey including the information relevant to the calculation of income tax liabilities and social welfare entitlements. These informational requirements were taken intoa account in the design of the ESRI Survey of Income Distribution, Poverty and Usage of State Services, which was conducted in 1987. The survey

interviewed a national sample of over 3,300 households, randomly drawn from the electoral register. It gathered detailed information on current and recent labour market experience, income from work, social welfare and other sources and so on. Every adult in the household was interviewed, where feasible, in order to obtain the most accurate and comprehensive responses possible. In cases where a full individual interview could not be completed an abbreviated questionnaire with key information on income and labour force status was obtained.

The basic unit used in the modelling of tax and transfer policies will be referred to as the "tax unit". It corresponds to an individual or married couple, together with dependent children, if any. A dependent child is defined here as aged below 15 or still in full-time education: roughly the same as the income tax unit in Ireland when child tax allowances were still in place. Many social welfare schemes operate at approximately this level. Approximately two-thirds of households in the sample contain just one tax unit, but 21 per cent contain two tax units and 13 per cent contain three or more. A total of just under 6,000 tax units in the sample represents approximately 1.5 million tax units in the country. Given the nature of the sample, this can be seen as representing the total population of tax units resident in private households.[1] It includes many low-income tax units not covered by the Revenue Commissioner's statistics; for many of these, social welfare receipts would be the sole source of income.

The survey gathered information on gross and net income from employment (for the last pay period), self-employment (for a 12 month period) and social welfare not only for those currently receiving such income, but also for those who had received it during the 12 months before the interview; information on the number of weeks worked or in receipt of social welfare was also obtained. This, combined with information on annual income from more variable sources such as rent, interest and dividends allowed the construction of a measure of 12 month income which is used here for the first time. Annualised current income is still used here for those individuals for whom only an abbreviated questionnaire was completed. Some specific

1 The institutional population - residents of old people's homes, army barracks etc. - is excluded.

implications will be noted where relevant in the interpretation of the results. The estimation of farm incomes, based on a detailed farm questionnaire covering output/activity levels and costs is described in Callan, Nolan et al. (1989). Here it is important to note that the concept of farm income used is family farm income as defined by Teagasc in the National Farm Survey: this can be significantly higher than taxable farm income because of provisions in the tax code for capital allowances and stock relief.

Full details of the survey are set out in Callan, Nolan et al. (1989). In the present context, however, it is worthwhile to draw together the information available on the representativeness of the survey. The overall response rate was 64 per cent of the effective sample. This compares with a response rate of 56 to 57 per cent in the CSO's 1973 and 1980 Household Budget Surveys, and just under 60 per cent in the 1987 HBS.[2] Responding households were reweighted using special tabulations supplied by the CSO so that they were fully representative of the national position as found in the 1986 Labour Force Survey in terms of the following characteristics: household size, urban/rural location, and age and socio-economic group of the head of household.[3] Independent checks then confirm the representativeness of the sample in terms of the following variables:

1. Age distribution of the population (Table 4.2 of Callan, Nolan et al. 1989, showing comparison with 1986 Census).

2. Distribution of households classified by number of members engaged in paid work (Table 4.1 of Callan, Nolan et al. 1989, showing comparison with 1986 Labour Force Survey)

3. Distribution of households classified by number of members unemployed

4. Distribution of entitlements to health services (medical cards, hospital services cards and others) (Nolan et al. 1989)

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2 A much improved response rate from farm households, achieved through co-operation with Teagasc's National Farm Survey was a major factor in the increased overall response rate.

3 Details of the procedure are set out in Callan, Nolan et al., Section 4.5. A similar procedure is used to reweight the responses to the CSO's Household Budget Survey.

From the point of view of policy analysis, it is particularly important that the sample adequately represents the income tax base and the social welfare client population. There are a number of ways one could examine this issue. UK experience has shown that it is possible for models to be very good at predicting the revenue effects of tax changes, but rather poor at predicting the overall level of tax revenue. In the case of the Irish model, however, both the level and the changes seem to be predicted rather well. For example, the predicted aggregate income tax revenue from the sample was within 10 per cent of the actual take of around £2500m in the nearest tax year, 1986/87. If the survey was underestimating the income tax base, one would expect an underprediction; in fact the model's prediction of tax revenue is higher than the actual take.[4] As will be seen in later sections, the predicted revenue effects of policy changes are even closer to those of the Revenue Commissioners.

Coverage of the social welfare client population served by the major schemes is also excellent, as shown by Table 1 below. The only major area where there seems to be a significant problem is that of widow's pensions. The extent of the problem may not be as great as it appears, because some respondents may have misclassified widow's pensions as old age pensions. There also to be some underestimation of the numbers in receipt of sickness payments. Atkinson and Micklewright (1983) found much greater underestimation in the Family Expenditure Survey, on which most UK tax-benefit models are based: they suggested that higher non-response by those in receipt of such payments was the most likely explanation.

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4 A number of factors could be expected to contribute to this discrepancy. First, the fact that most of the interviews were undertaken between March and September 1987 means that a comparison with a weighted average of 1986/87 and 1987/88 tax years would be more appropriate. Second, the differences between family farm income and taxable farm income referred to above would also operate in this direction. Further investigation and any adjustments which might be necessary must await the Revenue Commissioners' detailed statistics for the 1987/88 income tax year.

Table 1: Number of Recipients of Major Social Welfare Schemes

	Recipients in population ('000s)		*Recipients in grossed-up ESRI sample*
	end-1986	*end-1987*	
Old Age/Retirement Pension	215.4[a]	218.0[a]	223.3
Unemployment Benefit	87.7	84.6	82.0
Unemployment Assistance	146.0	153.6	145.6
Disability & Disablement Benefit, Invalidity Pension	114.8	98.6	86.9
Widow's Pension	97.2	99.2	62.8
Unmarried Mothers Allowance	12.0	13.9	6.9
Deserted Wife's Benefit/Allce	10.6	12.2	7.9
Supplementary Welfare Allce	n.a.	11.8	10.2
Family Income Supplement	4.9	5.5	3.1

[a]Adjusted to exclude proportion of age group resident in institutions: if a greater (lesser) proportion of pensioners than of non-pensioners is resident in institutions, these numbers are overestimates (underestimates).

Sources: Statistical Information on Social Welfare Services, 1986, Table 3 and 1987, Table 4; Callan, Nolan et al. (1989) Table 4.3.

The second requirement for microsimulation analysis of tax/benefit policies is the processing of this information by a suite of computer programmes, often referred to as a tax/benefit model. The current version of the model I have constructed allows one to choose a set of policy parameters, including income tax and PRSI rates, tax bands and allowances and the levels of certain social welfare payments. Once these parameters are set (for instance at their status quo values in 1987) the model takes each family unit in turn and calculates its social welfare receipts and its income tax liabilities, based on its gross income and other circumstances.[5] This calculation then yields the level of net income for the tax unit and the marginal income tax rate it faces. We can then repeat the process for some other set of policy parameters (for instance,

5 At present social welfare entitlement is calculated on the basis of current receipt of social welfare. It is hoped to develop the social welfare side of the model to simulate the complex means tests involved in order to allow a fuller analysis of policy options in this area.

the 1988 Budget) and therefore derive the first round change in net income and the change in the marginal tax rate for each tax unit. Aggregating the changes in net income yields the net cost or revenue of the change; other summary statistics indicate the distribution of the cash gains.

4. Analysis of Policy Options using Microsimulation

The Commission on Taxation emphasised that its proposed reforms should be regarded as an integrated package, rather than a menu from which certain items should be chosen. One approach to its analysis, therefore, would be simply to report the results for as much of the package as can presently be modelled. But important insights into what underlies these overall results can be gained by analysing some of the important constituent parts of the Commission's package separately. For this reason, section 4.1 deals with an analysis of the taxation of short-term social welfare benefits; section 4.2 deals with the cash impact of removing tax relief on mortgage interest, medical insurance and life assurance; while section 4.3 deals with the incorporation of these elements into into base-widening, rate-reducing, band-widening packages.[6]

For some purposes, we might wish to update the information gathered in the survey to take account of recent changes in incomes and policy parameters. This is common practice internationally in the analysis of short-term changes, and some steps in that direction have been taken with the present Irish model. But for the analysis of fundamental policy reforms, it is simpler, and quite sufficient to explore the options in terms of the income distribution and policy parameters at the time of the survey. In what follows, the baseline is given by the data gathered in the ESRI Survey of 1987, and the policies in force in July of that year i.e., the budget changes of 1987 to income taxes and social welfare policies have been taken into account, but not the further changes in 1988, 1989 and 1990.

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6 The model could, of course, be used to analyse many other packages.

4.1 Taxation of Short-Term Social Welfare Benefits

One of the recommendations for reform of the income tax system suggested by the Commission on Taxation was the inclusion of short-term social welfare benefits in the income tax base. This proposal has aroused considerable controversy. In support of the proposal it can be argued that it would remove a horizontal inequity: the exemption of short-term social welfare payments from tax when persons on similar incomes from other sources have to pay tax. The proposal has perhaps received even greater support on efficiency grounds: taxation of short-term benefits would increase the incentive to take up employment and reduce the incentive to leave work.[7] Against this, it has sometimes been argued that short-term welfare recipients tend to be concentrated in the lower reaches of the income distribution, so that taxation of the benefits would be regressive. Thus far, very limited empirical analysis of the distributional consequences of the proposal has been possible, for the reasons discussed in Section 2. The following analysis will help to clarify the likely revenue effects and distributional implications of taxing short-term social welfare benefits.

Before discussing the distributional effects, it is important to establish the magnitude of the total tax take which could be expected from the measure. The Revenue Commissioners report for 1986/87 (Table 77) estimates of the cost of exemption of certain social welfare schemes is set out in Table 2, along with the model-derived estimate of the total revenue effect of taxing short-term social welfare. The ESRI estimate includes not only the schemes named in the table, but all other short-term social welfare schemes. Thus, the ESRI estimate would be expected to exceed the sum of the estimates for the four schemes from the Revenue Commissioners report, which it does.

There are two factors which suggest that the ESRI estimate represents a lower bound on the actual tax foregone by exempting short-term welfare payments in 1987. First, the fact for a significant proportion of respondents the estimates of 12-month income are based simply on

7 Marginal tax rates would be increased rather than reduced, but replacement rates would be lowered.

annualised current income: this misses movements between periods of short-term welfare recipiency and employment which would tend to be associated with a tax liability under the proposals being investigated. Second, there appears to be some underrepresentation of disability benefit, partly associated with a misclassification of payments into invalidity pensions, a long-term welfare payment.However, there is no reason to suppose that any of these factors makes a major impact on the *distributional* implications of such a policy change, examined below.

Table 2: Estimates of Revenue Effects of Taxing Short-Term Social Welfare

	Estimated revenue foregone by exemption of short-term social welfare payments from income tax	
	Revenue Commrs. 1986/87[a]	*ESRI Model*
	£m p.a.	*£m p.a.*
Disability, Unemployment & Injury Benefit, Maternity Allowance	77.4	n.a.
Total of above, plus all other short-term social schemes:	n.a.	93.8

[a]Revenue Commissioners (1989) Table 77.

As regards the relevance to current policy debates, it should be noted that the figures shown above refer to 1987 and have not been uprated to reflect changes in incomes, social welfare payment rates, and income tax rates and allowances since then. On the income tax side, the most important developments would have been the reduction in the standard rate from 35 per cent to 30 per cent, and substantial increases in exemption limits, including the institution of child additions to the exemption limits. An approximate uprating procedure was applied, which included not only these changes in tax policies, but also increases in incomes and social welfare rates. It yielded a figure of about £60m in tax foregone in 1990. For the two reasons discussed

above, this would constitute a downward biased estimate of the revenue from taxing short-term social welfare. It is somewhat greater than the recent Department of Finance estimate of £52m[8] which, like the Revenue Commissioners' estimate in 1987, did not include all of the relevant schemes (unemployment assistance being the most notable exclusion).

The distributional effects of the proposal, which have been the subject of much concern and debate, are analysed in the following way. Tax units are ranked from poorest to richest using the criterion of equivalent net income, and then split into ten groups of equal size ("deciles"). Equivalent income is simply net income adjusted for family size and composition: it can be thought of as "income per head" where the first head counts as 1, a second adult as 0.66, and all children as 0.33. Table 3 then reports for each decile, from poorest to richest, the percentage of tax units which would experience a cash loss of greater than 50 pence per week, the average extent of that loss, the percentage loss and the aggregate loss.

Table 3: Distributional Effects of Taxing Short-Term Social Welfare

Decile of equivalent income (Equivalence scale 1, 0.66, 0.33)	*% of decile who lose (at least 50p p.w.)*	*Average loss of those affected*		*Aggregate loss*
		£ p.w.	*Per cent*	*£m p.a.*
Bottom decile	0.0	0.0	0	0
2nd	4.6	3.24	2.6	1.1
3rd	6.2	6.03	4.8	2.8
4th	10.5	6.33	4.9	5.7
5th	12.8	8.82	6.9	9.7
6th	22.6	12.39	9.3	23.0
7th	19.1	11.66	8.0	17.9
8th	11.8	12.43	6.9	11.8
9th	13.6	10.87	5.4	11.8
Top decile	9.8	12.56	4.6	9.9
ALL	11.3	10.39	6.5	93.8

8 Dáil Debates, xx November 1990, p.xxx

From the first column it is clear that those who would experience cash losses are concentrated in upper middle area of the income distribution. Almost 70 per cent of tax units affected by the change are in the upper half of the income distribution. Less than 10 per cent of those affected are in the bottom three deciles. The average loss for those affected is quite large: just over £10 per week across all income groups, and £3 to £6 per week in the lower income groups. But less than £5m of the total cost of £94m of exempting short-term social welfare payments from taxation goes to the bottom three income groups. Over £70m of this "tax expenditure" goes to the top half of the equivalent income distribution. The fact that 12-month income has not yet been constructed for those individuals for whom limited information was collected means that each of these figures is an underestimate; but there is no particular reason to expect the *pattern* to be markedly altered by this.

Even allowing for possible revisions to the exact figures, the results are striking. In the light of these figures, the distributional argument against taxation of short-term social welfare benefits appears unsustainable. This does not mean that social welfare expenditure is itself ill-targetted. Other analysis has shown that recipients and expenditure are concentrated in the bottom half of the current income distribution (see, for example, Callan and Nolan, 1989)[9]. But the distribution of liabilities from taxation of short-term welfare benefits reflects the progressivity of the existing income tax structure. Thus the benefit of exempting short-term social welfare payments from taxation is ill-targetted.

It is useful to clarify how different tax units might be affected by the taxation of short-term social welfare benefits. First, if a social welfare payment was the only income, it is quite probable that no tax liability would arise, or that the tax liability would be small. Second, if social welfare income is received only for part of a year, and employment or other income for the remainder of year, the increased tax liability would in many cases simply result in the withdrawal of tax rebates paid under the current system, rather than a reduction in the actual social welfare payment

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9 A similar analysis in terms of the distribution of 12-month income would be enlightening.

received. Third, if other income is received concurrently with social welfare, either by the welfare recipient or his/her spouse the tax bill would now be based on wider income: it is this case which would be most likely to result in a net reduction of the actual social welfare payment.

Table 4: Cash Losses by Size and Equivalent Income Decile

Numbers ('000s) with cash loss in the range:

Decile of equivalent income (Equivalence scale 1, 0.66, 0.33)	*More than £10 p.w*	*£5-£10 per week*	*£1-£5 per week*	*ALL over 50p p.w.*
Bottom decile	0	0	0	0
2nd	0	1.2	3.7	6.4
3rd	1.9	2.5	3.6	9.0
4th	4.5	4.4	6.3	17.3
5th	7.6	5.7	7.5	21.1
6th	18.2	6.2	10.8	35.7
7th	15.8	7.5	5.5	29.5
8th	9.6	3.5	4.7	18.2
9th	9.2	4.8	6.6	20.9
Top decile	8.3	1.7	4.3	15.0
ALL	75.1	37.5	53.1	173.0

Some idea of how many tax units fall into these different categories can be gained from Table 4. The total number experiencing a loss (of over 50 pence per week) is under half of all those potentially affected i.e., those currently receiving short-term social welfare, or those who have received it at some point during the past 12 months. Thus, more than half of all short-term welfare recipients would be not be adversely affected by the change. The cash effects on those to whom the change did matter would tend to be quite large. About 75,000 tax units would experience cash losses of over £10 per week: but almost all of these are above the bottom three deciles, and most are in the upper half of the equivalent income distribution. These results are subject to the qualifications mentioned above, but the broad picture is unlikely to be substantially altered by revisions.

4.2Abolition of Relief for Mortgage Interest, Medical Insurance and Life Assurance

One of the other main extensions to the tax base proposed by the Commission was the abolition of special reliefs such as the deductions for mortgage interest, medical insurance and life assurance.[10] Such reliefs, it was argued, distorted decisions in these areas, and by narrowing the tax base required higher tax rates to achieve any given revenue. Furthermore, it was argued that the benefits from such reliefs were concentrated at the upper end of the income distribution.

This section first examines the revenue effects of removing each of these reliefs. Then the distributional effects of removing all three simultaneously are reviewed. The next section (4.3) deals with the use of the additional tax revenue from removing these special reliefs and taxing social welfare benefits to cut tax rates and widen tax bands.

Given the importance of the special reliefs in the policy debate, the ESRI Survey made special efforts to obtain accurate data which would permit the analysis of different policy options in this area. The requirements included not just accurate income data, but also accurate data on mortgages, VHI coverage and life assurance premia. Since most respondents were found in pilot surveys to be unable to provide information on the interest element of repayments, information was obtained on the term, amount and and interest rate of the mortgage as an alternative. This allowed the estimation of the interest component of the repayment. Information on which members of the household were covered by VHI was also obtained, though not on the amounts of premia or type of scheme.[11] Premia are estimated by reference to the known total subscription income of the VHI, and the family composition of tax units covered by VHI[12]: the average estimated premium works out slightly below the cost of the VHI's plan B. Direct data on life assurance premia were gathered.

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10 The basic recommendation was for abolition of each of these reliefs without compensation, except in the case of first-time buyers in the early years of their mortgages.

11 The already daunting length of the questionnaires made it impossible to request any further information.

12 Nolan et al. (1989) shows that the survey's coverage of VHI membership is reliable.

Table 5: Estimates of Cost of Mortgage Interest, Medical Insurance and Life Assurance Reliefs

	Estimated revenue foregone	
	Revenue Commrs. 1986/87	*ESRI Model 1987*
	£m p.a.	*£m p.a.*
Mortgage Interest Relief	137[a]	136
Medical Insurance Relief	36	42
Life Assurance Relief	32	26
Total of above:	205	204

[a]Adjusted to take account of restriction of allowance to 90% of interest paid.

Source: Revenue Commissioners (1989) Table 77.

Table 5 sets out the cost of the mortgage interest, medical insurance, and life assurance reliefs as estimated by the Revenue Commissioners and as predicted using the ESRI tax-benefit model. These independent estimates are remarkably similar, suggesting that the survey data are accurate not only in respect of the overall income tax base and expenditures on mortgage interest and life assurance premia; but also in the distribution of such expenditures over marginal tax rates.

Table 6: Distributional Effects of Abolition of Reliefs for Mortgage Interest, Medical Insurance Premia and Life Assurance Premia

Decile of equivalent income (Equivalence scale 1, 0.66, 0.33)	*% of decile who lose (at least 50p p.w.)*	*Average loss of those affected*		*Aggregate loss*
		£ p.w.	*%*	*£m p.a.*
Bottom decile	0	0	0	0
2nd	0.8	3.79	3.1	0.2
3rd	3.2	2.65	2.0	0.7
4th	7.3	3.11	2.3	2.0
5th	19.9	3.70	2.7	6.4
6th	38.3	4.91	3.0	15.5
7th	51.9	6.52	3.7	27.3
8th	54.2	6.35	3.3	27.7
9th	63.7	8.50	4.1	43.4
Top decile	84.3	12.15	4.2	81.8
ALL	32.7	7.83	3.8	205.0

The fact that these tax expenditures are concentrated on the upper end of the income distribution is strikingly illustrated by Table 6: this is despite the fact that mortgagors tend to be at a stage of the life cycle where the number of child dependants peaks. The proportion of tax units benefitting from the reliefs rises sharply with income. The average value of that relief is also particularly high for taxpaying units in the top two deciles. This combination means that the total value of the tax expenditures is very heavily concentrated on the upper income groups: over 60% of the benefit goes to the top two deciles, for example. Substantial numbers of those in the middle of the income distribution, however, also benefit from the reliefs, which may make it politically more difficult to remove or restrict them. A move to a tax credit scheme (allowing

the reliefs only at the standard rate of tax) might therefore encounter less political resistance than outright abolition. An alternative option, abolition accompanied by tax cuts, is explored in the next section.[13]

4.3 Base-broadening, rate-reducing, band-widening packages

Having examined some of the main elements of broadening of the income tax base which the Commission on Taxation envisaged, we now turn to some packages which would use the revenue gains to reduce tax rates and/or widen tax bands. Two approaches are taken here. First, we explore a combination of the taxation of short-term social welfare benefits and abolition of special tax reliefs with a pre-determined reduction in rates and simplification of the direct tax system. The details are set out as "Reform A" in Table 7. The main features were abolition of PRSI, the health contribution and the youth employment/training levy, a standard tax rate of 30 per cent (which could be thought of as incorporating a social security element), a single top rate of 50 per cent, and a widening of the standard rate band by the amount of the old high rate (48 per cent) band. Such a package has many attractions. It greatly simplifies the direct tax system; and it reduces the rates of tax facing most workers. The net cost of this package, in the absence of behavioural responses to the tax cuts, would be over £700m. If the PAYE allowance were abolished, the static cost estimate would fall to around £500m.

What does this imply for the financing of the Commission on Taxation's overall package? In order to answer this question it is important to establish what are the important revenue-gaining and revenue reducting elements of the Commission's package which are not yet modelled. The two most important elements of this nature are the institution of a property tax, and the abolition of employer contributions to PRSI. The Commission estimated that a property tax would raise about £300m in 1983/84 terms: an updated figure might be of the order of £500m. But employer

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13 This by no means exhausts the relevant options. In the tax treatment of housing, for instance, abolition of mortgage interest relief would not remove the basic distortion arising from non-taxation of the imputed income from housing. A property tax on house values, coupled with the retention of some form of mortgage interest tax relief, might well be superior.

contributions to PRSI (net of the government's contribution as employer) were also of this order of magnitude in 1987. Thus, on balance, the two exclusions may have a relatively minor impact on the net revenue of the Commission's package.[14] Reform A includes most of the other major revenue-raising elements of the Commission's first phase package. Some of the other elements of the Commission's package involved abolition of allowances with provision for compensatory payments; and elimination of some minor exemptions and reliefs which even in aggregate would not raise much revenue. The other elements of the package which might raise significant revenues would be more effective taxation of fringe benefits; taxation of lump-sum incomes (pension gratuities, redundancy payments etc.); determination of business expenses; and, possibly, the move to a current basis of assessment for self-employment income.[15]But even taking these into account it is likely that a static estimate would show a considerable shortfall because of the high revenue cost of reductions in the standard rate of tax. These results could be quite consistent with the Commission's own analysis (Appendix 13 of the Fifth Report), which illustrates some revenue neutral packages with higher standard rates, of the order of 35 to 40 per cent, and a direct expenditure tax replacing higher rates of tax.

14 The distributional effects of the exclusions are, on the other hand, much more difficult to assess.

15 de Buitleir (1983) indicates that the Revenue Commissioners considered the gain from this latter factor would be offset by some of the other recommendations. The fall in inflation would, in any case, have reduced the importance of the possible gain.

Table 7: Comparison of Policy Parameters in 1987 and Reform A

Policy parameters	*1987*	*Reform A*	*Reform B*
Income tax parameters			
Standard rate	35%	30%	35%
High rate	48%	none	none
Top rate	58%	50%	50%
Standard rate band	4700	7500	4700
High rate band	2800	none	none
PAYE allowance	700	0	0
PRSI allowance	286	0	0
Tax short-term social welfare	NO	YES	YES
Qualifying percentages for income tax relief:			
Mortgage interest	90%	0	0
Medical insurance premia	100%	0	0
Life assurance premia	50%	0	0
Social insurance parameters:			
PRSI rate: higher rate	5.5%	0	0
PRSI rate: reduced rate	0.9%	0	0
Health contribution rate	1.25%	0	0
Employment/training levy	1.0%	0	0

It should be noted, on the other hand, that a gap of this magnitude is substantial, but not unbridgeable. The tax reductions in the 1988, 1989 and 1990 Budgets, after making allowance for what would be needed simply to index bands and allowances come to a figure of the order of £350m. So it might have been feasible to phase in a package of this type over the past few years. Whether there will be similar room for manoeuvre in future is uncertain. But in general terms, it could be argued that it would be possible to design a feasible package using static cost estimates, and, as NESC (1986) have suggested, treat any increase in revenues from incentive effects as "a bonus". The strength and extent of such incentive effects might be an important part, however, of the rationale for such a package.

The final set of policies explored in this paper, is an approximately revenue neutral base-broadening and rate cutting package (reform B). PRSI, the health contribution, the youth employment levy and the PAYE and PRSI allowances are abolished. The standard rate is 35 per cent, representing a 7.75 per cent reduction for many workers; the two high rates are merged at 50 per cent (a drop of 8 points in the top rate, and a drop of around 5 points for higher rate taxpayers on full PRSI); short-term social welfare is taxed and the set of special tax reliefs are abolished. Table 8 summarises the distribution of cash gains and losses over the income distribution.

Table 8: Distributional Effects of a Revenue Neutral Base-Broadening, Rate-Reducing Package (Reform B)

Decile of equivalent income	*% of decile who lose*	*Average loss* £ *p.w.*	*% of decile who gain*	*Average gain* £ *p.w.*	*Aggregate gain/loss* £*m p.a.*
Bottom decile	0	0	15.7	1.31	1.8
2nd	4.1	3.37	14.9	2.28	1.5
3rd	6.7	6.22	18.5	3.12	1.2
4th	12.6	6.25	18.6	2.97	-2.0
5th	28.0	5.58	19.1	3.99	-6.9
6th	38.1	9.12	31.5	4.51	-16.9
7th	40.2	9.28	45.1	4.08	-15.2
8th	35.7	8.68	58.7	4.00	-6.1
9th	44.0	10.16	53.4	4.95	-14.6
Top decile	31.0	15.77	65.9	18.15	56.5
ALL	24.4	10.7	34.2	6.63	-0.7

The distributional effects of the reform are quite complex. There tend to be more gainers than losers, but the losses are more concentrated. Gainers outnumber losers in all but the fifth decile while gains outweigh losses up to the third decile, and again in the top decile. The gains in the lower deciles are related mainly to the abolition of PRSI. The losses in middle income

deciles are related to the extensions of the tax base. Net gains are heavily concentrated in the top decile, though it contains a substantial proportion of losers. The concentration of gains at the top of the distribution is a feature of several reforms involving tax cuts, even when financed by measures which eliminate tax expenditures also concentrated at that end of the distribution.[16]

The overall picture raises a number of interesting issues. First, the idea that tax cuts financed by abolition of special reliefs would return similar aggregate amounts to top income groups does not seem to be borne out. Second, a package of this type would involve significant net gains and losses within most income groups. As the Commission on Taxation recognised, those who tend to lose are those especially favoured by the current system. Third, much of the progressivity of the 1987 tax system may have arisen not through explicit choices, but through non-indexation of bands and allowances since, say, 1980; gains to the top of the distribution may represent a correction for this failure to index. If this is so, there may be a strong case for making indexation a mandatory starting point for budgetary calculations.[17] The model will make it possible to examine this issue by comparing the effects of 1987 policy parameters with those of indexed 1980 policy parameters.[18] Fourthly, there is the question of the responsiveness of incomes, particularly top incomes, to changes in the incentive structure: this will be explored in future work[19]

5. Income Tax and Incentives

The current model is capable of documenting the effects of policy changes on marginal income tax rates. Results for the reforms considered above are not reported, however, for two reasons. The first is a practical one. The reduction of direct tax rates in reforms A and B came mainly through abolition of PRSI. This would not show up in the current version of the model,

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16 This effect is even stronger if, as in Reform A, there is a net revenue loss from the tax change.

17 See, for example, de Buitléir (1989).

18 Similarly, one could analyse the effects of the series of budgets from 1988 to 1990.

19 On this topic, Lindsey (1987) and Dilnot et al. (1988) come to somewhat different conclusions.

because it deals with marginal income tax rates: future work will remedy this deficiency. Secondly, there is a conceptual problem raised by the taxation of short-term social welfare benefits. This change would raise marginal direct tax rates; but it would be widely regarded as improving the incentive to work by reducing replacement rates. One way of coping with this combination might be to report the effects on both marginal tax rates and replacement rates: this would involve considerable extra work. This section, therefore, deals with some more general issues concerning the effects of tax changes on work incentives.[20]

There has been a great deal of discussion of high marginal tax rates as constituting a disincentive to work. But the effects of this disincentive on economic behaviour depend on the responsiveness of the groups to which they apply. A widespread finding in international research is that married women's participation in the labour market is much more sensitive to the wage offered than that of men. In the Irish context, potential migrants might also be a group with potentially high labour supply elasticities: these tend to be young and single. If these groups are particularly responsive, then concern with incentive effects should focus particularly on the rates of tax faced by these groups.

For example, the work of Blundell, Meghir, Symons and Walker (1986) in estimating labour supply responses for incorporation into a dynamic tax-transfer model suggests that in the UK married men's labour supply is close to perfectly inelastic, while married women's labour supply is relatively sensitive to economic variables. Such results suggest that a tax system which treats husbands' and wives' incomes independently (thereby setting a low marginal tax rate on initial earnings) will offer efficiency gains over a system which taxes the aggregate income (thereby imposing the same marginal tax rate on the first pound of a non-earning spouse as already applies to the last pound of the higher earning spouse). This has been one of the

20 Tax changes may also affect the incentives to take remuneration in different forms. For example, a tax on the provision of fringe benefits, as proposed by de Buitléir (1989), would remove existing incentives to take remuneration in the form of various fringe benefits.

considerations in the recent UK move towards greater independence of taxation for married couples. A wider perspective (using the rather crude classification scheme in Table 9 below) suggests that joint taxation of family income is now chosen by a minority of countries.

Table 9: Tax Treatment of Married Couples in OECD Countries

Separate/ independent taxation	*Intermediate systems*	*Joint taxation/ income-splitting*
Australia	UK	Belgium
Austria	US	France
Canada	Portugal	Germany
Denmark	Turkey	Luxembourg
Italy		Norway
Japan		Switzerland
Netherlands		IRELAND
New Zealand		
Sweden		

Source: OECD (1989) The Tax/Benefit Position of Production Workers, 1985-88.

The present tax treatment of married couples in Ireland was introduced in the 1980 Budget. It represented a response to the Supreme Court decision on the Murphy tax case. The court ruled, in effect, that it was unconstitutional for the income tax bill on a married couple to be higher than if they were taxed as independent individuals. The 1980 Budget response went further than simply addressing this issue. It is instructive to ask what would be the aggregate revenue gain from a move towards greater independence in the taxation of married couples, along the lines of the majority of countries in Table 9. Two options of this type were explored. First, a move towards independence along the lines of the current UK reform, whereby 60% of the basic personal allowance would be transferable between married couples. Second, a more limited move towards independence, which would allow full transferability of the basic personal

allowance, but no doubling of rate bands. The aggregate revenue gain from the more extensive change would be of the order of £350m. Even the more limited change would increase the tax take by over £200m.

The revenue gain from such a change could be used to fund a substantial general reduction in tax rates, or to support child-rearing in a way which offered less disincentive to undertake paid work. The present structure concentrates high tax rates on two of the most responsive groups: married women and single people. A reform in the direction of independent taxation would shift the high marginal tax rates onto groups which have typically been found less responsive. A move toward independent taxation would, of course, raise wider issues concerning the unit of taxation, the effects of increasing marginal tax rates on many husbands, and the appropriate means of providing support to child rearing. But a recognition of the cost of the present system is a prerequisite for any sensible discussion of whether it, or an alternative reform, achieves the best balance between competing objectives.

6. Conclusions

While microsimulation modelling has limitations which have been discussed, it has become an important tool of policy analysis in many countries. Perhaps the best way of summing up these advantages is the following. It is difficult enough, without microsimulation models, to know what have been the effects of changes even *after* they have been implemented. It requires pictures of the relevant population before and after the change, and some means of accounting for the effects of contemporaneous changes other than the one of interest. Microsimulation modelling offers the chance to explore policy options *before* they are implemented. Using this tool, it is possible to avoid some of the unintended side-effects which often accompany policy changes. A proposal can be examined, revised in the light of problems shown by this examination, and re-evaluated. This iterative process offers the chance to make significant improvements in the design of policy.

This paper has set out the current implementation of this approach for Ireland. The data requirements were taken into account in the design of the ESRI Survey of Income Distribution, Poverty and Usage of State Services. The reliability of the data in terms of broad demographic and economic characteristics was noted, and its accuracy in covering the income tax base and social welfare client population was established. The current structure of the model was then outlined.

Some specific examples of how this approach can be used to analyse policy options were given. Perhaps the most clearcut example of the value of the approach was in the analysis of the proposal to tax short-term social welfare benefits. This proposal has generated substantial controversy. In particular, it is sometimes argued that short-term welfare recipients tend to be concentrated in the lower reaches of the income distribution, so that taxation of the benefits would be regressive. Analysis of the proposal using the ESRI tax-benefit model shows that this is not, in fact, the case. The total cost of the "tax expenditure" is over £90m. Over £75m of this goes to the top half of the equivalent net annual income distribution. A majority of short-term welfare recipients would be unaffected; and less than 10 per cent of those who would lose are in the bottom 30 per cent of the income distribution. The results do not imply that social welfare expenditure is itself ill-targetted; but they do imply that the benefit from exempting social welfare expenditure from taxation is ill-targetted. Similar analysis showed that the distribution of benefit from the reliefs for mortgage interest, medical insurance, and life assurance was highly skewed towards the top of the income distribution.

Alternative packages of base-broadening and rate-reducing measures were then examined. It was shown that the high cost of reducing the standard rate of tax limited the reductions which could be financed by the broadening of the income tax base by the measures outlined above. Significant reductions could be achieved, however, even without allowing for any favourable response in terms of increased labour supply. The distributional effects of an approximately revenue-neutral package were found to be extremely complex.

The limitations of the current implementation of the model were noted, and the broader research strategy into which it fits was outlined. The current model will itself facilitate the estimation of labour supply responses which can then be used to explore the issue of behavioural responses to policy changes. In the interim, however, the modelling of cash gains and effects on marginal tax rates represent significant advances in the analysis of policy changes. The applications in this paper have served to illustrate the value of the approach. Many other policy options could be analysed in a similar fashion. For example, making PRSI payable only on the excess above a certain allowance could be examined. Such an option might be financed by the abolition of the PRSI allowance in the income tax code, which can also be dealt with by the model. It could be considered either as a proposal on its own merits or as a stepping stone towards integration of income taxes and PRSI. Possible changes in the structure of the Family Income Supplement could be modelled, and the interaction with income tax exemption limits could be taken into account: this would allow "poverty trap" type issues to be addressed. Other options in child income support can also be examined, such as the increased, taxable child benefit analysed in an earlier paper for the Foundation (Callan and Nolan, 1988). This is only a selection of the issues which can be addressed; broadening the range of options which can be considered and "deepening" the analysis are priorities for further research.

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