WHAT HAS HAPPENED TO REPLACEMENT RATES?

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1. Introduction

Financial incentives to take up and stay in work, and the impact of the tax and social welfare systems on these incentives, have become a major preoccupation of Irish policy-makers. Recent Budgets have highlighted measures to "reward work" through income tax and PRSI relief for the low paid, and one aim of the expert working group set up to advise on the integration of the tax and social welfare systems is to point towards ways of improving work incentives. Empirical studies of work incentives generally measure the financial incentive facing individuals in the form of replacement rates, the ratio of income when unemployed to income when in work.[1] In calculating replacement rates, choices about precisely what is to be included in the numerator or the denominator have to be made and can matter. More fundamentally, though, different approaches to deriving replacement rates, relying on different types of data, can be distinguished and may not tell the same story about the situation at a particular point in time or changes over time. This paper sets out the alternative approaches which have been used to measure Irish replacement rates, compares the pattern they show for these rates over time, and assesses the implications for our picture of how work incentives have evolved and for measurement practice.

Three distinct approaches have been employed in measuring replacement rates for Ireland:

1. Social welfare payment rates and average industrial earnings have been used to calculate replacement rates for a set of hypothetical cases, and indices constructed by weighting these different cases. This approach has been used in a number of studies of the Irish labour market, notably Hughes and Walsh (1983) and Blackwell (1986). It is also the basis on which the Department of Finance calculates replacement rates for illustrative cases, reproduced by the National Economic and Social Council (e.g. NESC 1993). (There are significant differences across studies in the way these measures are constructed, for example in the illustrative cases chosen and in whether an estimate of the value of non-cash benefits is included). Reliance on such hypothetical cases has been criticised on the basis that they fail to reflect the great diversity in the actual circumstances of sample households revealed by survey data, and may mislead as to the circumstances of many of the unemployed (Atkinson and Micklewright 1985).[2] The trend shown by hypothetical rates over time could still reflect that in actual rates on average, however, so the critique may have less force in a time-series than a cross-section context. Nolan's (1987) comparison between a hypothetical

[1] Alternatives to replacement rates, such as the "average tax rate" on an unemployed person taking up a job or the absolute gain for an unemployed person on taking up a job, are also of interest but here we concentrate on the measure that seems to dominate policy debates.

[2] O'Mahony (1983) compared actual replacement rates from a sample of Irish registered unemployed with those produced by the hypothetical approach and concluded that there was a marked correlation between the two, but as Nolan (1987) showed his results in fact provide support for the argument that hypothetical rates fail to accurately reflect the actual variation in replacement rates across different situations.

Unemployment Benefit (UB) series derived from Hughes and Walsh[3] (1983) and the average Unemployment Benefit received by claimants showed that over the 1967-1978 period the hypothetical series tracked the changes in the actual average benefits quite well, though it did significantly overstate the effects of the introduction of Pay-Related Benefit in 1974.

2. The second approach constructs average replacement rates from the average receipt of UB and Unemployment Assistance (UA), calculated from aggregate expenditure and claimant numbers, compared with average earnings per employee. This is the basis for the replacement rate variable used by Browne and McGettigan (1993), McGettigan and Browne (1993) in their time-series analysis of Irish unemployment. It is intended only to provide a measure of the overall trend in replacement rates over time and has to be assessed in that light. However, this figure is not an average of replacement rates themselves: if the replacement rate is defined in its simplest form as B/Y= Benefit/net earnings, the "actual payments" series is [mean B/mean Y], not mean B/Y. Further, any given change in the average payment per recipient could arise from a variety of shifts in the underlying distribution of receipts, and it may be important to know how that overall change has come about. For example, a situation where all receipts increase by x% may have a very different impact on behaviour to one where the amounts going to those with below-average replacement rates increase much more rapidly than average and those with high replacement rates have below-average increases.

3. The third approach involves microsimulation modelling of in-work and out-of-work incomes for a large sample of households to estimate replacement rates for those currently unemployed or employed based on actual or predicted entitlement versus actual or predicted in-work income. The full distribution of replacement rates and its evolution over time can only be seen from micro-data on individuals and their families. For Ireland, the 1987 ESRI large-scale household survey on income distribution, poverty, and use of state services has provided the basis for the construction of a tax/benefit simulation model (Callan 1991). Using this model Callan, O'Donoghue and O'Neill (1994) estimated replacement rates for both the unemployed and employees in the 1987 sample, using modelled Unemployment Assistance entitlements and, for the unemployed, wages predicted by estimated earnings functions for men and women. The results showed that in 1987 about 10% of the unemployed faced (long-term) cash replacement rates of 80% or over, and 32% had rates of between 60% and 79%. Of the unemployed who were married with children, though, one-quarter had replacement rates of 80% or above. For the currently employed, on the other hand, about 4% faced replacement rates of 80% or over and 17% faced rates of 60%-79%.[4] With sample data for two points in time one could fully evaluate changes in the distribution of replacement

[3] Hughes and Walsh combined hypothetical replacement rates for three family types into an index using fixed weights for each type, to avoid endogeneity in their time-series estimation; since this would not provide a fair comparison with the actual amounts paid series, Nolan (1987) applied the actual weights for each year for the family types in constructing a hypothetical index.

[4] Callan, O'Donoghue and O'Neill (1994) Tables 5.2 and 5.3, pp. 55-6.

rates, but at this point 1987 is the most recent suitable data available[5] : as we will demonstrate, much can be learned from the up-rating of modelled data from a single sample on the basis of changes in the parameters of the tax and welfare system and in average earnings over time.

This paper examines the evolution over time of Irish replacement rates from each of these three different perspectives. In Section 2, some general issues in the measurement of incentives via replacement rates are discussed. Section 3 updates the work of Hughes and Walsh (1983) to produce consistent series based on hypothetical cases, looks at variants of the Browne and McGettigan approach to producing actual average receipts/earnings, and explores the conceptual and empirical differences between these measures. In Section 4 we then develop the microsimulation-based measures to provide a detailed picture of the distribution of replacement rates in 1987 and 1994 (the latter based on an up-rating of the 1987 sample), and an alternative view of the evolution of replacement rates between these two dates. This allows us to assess in the concluding section the degree to which measures based on hypothetical households or national averages represent the situation of actual households in a given year, and the extent to which the hypothetical and national average measures can adequately represent the complex patterns of change in the distribution of replacement rates revealed by the microsimulation estimates.

2. Some Issues in Measuring Replacement Rates

Replacement rates are intended to provide a measure of the balance between income in work and income out of work, to reflect the financial incentives which an unemployed person has to seek employment or which an employee has to continue in employment. They are also relevant to assessment of the adequacy of the income replacement package for those becoming unemployed, using the income they would receive in work as a benchmark. Replacement rates can be defined in different ways and no one definition is best for all purposes. Earnings from employment (or potential employment) and cash benefits (or potential cash benefits) from unemployment are clearly central elements, but calculated replacement rates may or may not take into account other income such as the earnings of a spouse or other household members, secondary non-cash benefits (such as free health care), and work expenses (such as travel and child-minding). Furthermore, the replacement rate may be forward-looking or backward-looking, in that it can be based on prospective or past earnings. Both unemployment compensation and net earnings will depend in addition on the time horizon adopted, in that benefit entitlement is time-limited and net earnings will be affected by the cumulative nature of tax payments under PAYE.

From the point of view of income adequacy, a replacement rate based on the relationship between benefits and after-tax earnings in the last job, or on after-tax incomes out of work and in the last job, may be most relevant. Atkinson and Micklewright (1985) suggest that from an incentive point of view the ratio of benefits

[5] Data from the 1994 Living in Ireland Survey carried out by the ESRI, the first wave of the Irish element of the European Community Household Panel, will be available shortly, as will the 1994 Household Budget Survey.

to net earnings in the last job may be of interest, in that it may play a role as a "rule of thumb" which influences the reservation wage of the unemployed. (Some results based on this measure from the 1987 ESRI sample were presented in Callan and Nolan 1994). However, in empirical studies employing micro-data to examine incentive effects and search behaviour the most common definition is after-tax income when unemployed compared with after-tax income in a prospective job. This is the concept employed in estimating replacement rates from the 1987 ESRI sample in Callan, O'Donoghue and O'Neill (1994), and in the results from that sample presented in Section 4 of this paper. The income recipient unit is the family or tax unit and it is disposable family income which is the focus: in comparing incomes in versus out of work the gross earnings of the spouse are held constant, but their net earnings or benefit receipt may be affected by their partner's employment status. Non-cash benefits such as the value of medical card entitlement, fuel vouchers, and differential rent for local authority tenants are not taken into account in these calculations. A comprehensive microsimulation study of incentives would build entitlement to these benefits into the modelling procedure, but our aim in this paper is the more limited one of comparing alternative ways of constructing cash replacement rates.

In constructing hypothetical replacement rates, the standard approach has been to assume that for married couples only one spouse is earning or receiving social welfare, and to compare cash benefit/assistance with after-tax earnings at the average industrial wage (or some proportion of that average). The benefit/assistance received and the net earnings corresponding to a particular level of gross earnings will then vary with the individual's marital status and, for social welfare payments, the number of child dependants. Cash income other than earnings/unemployment compensation of the main earner are thus not taken into account. While the Department of Finance's hypothetical replacement rates include an estimate of the value of medical card entitlement and travel-to-work costs, these have not been included in the hypothetical series employed in Irish time-series studies such as Hughes and Walsh. Family Income Supplement, payable to those in low-paid employment with child dependants, is also included in the Department of Finance's calculations but not in the Hughes and Walsh series.

As far as the average "actual payments" series is concerned, this is obviously strictly confined in coverage to a comparison between unemployment compensation and after-tax earnings. No account is taken of other income or non-cash benefits, and the variation in replacement rates by family type is subsumed within a single figure. As already noted, average receipts/average net earnings is not of course an average of replacement rates themselves. Average net earnings can be derived in various ways, but in the Irish case National Accounts aggregates for income from employment adjusted for tax paid have been used. Since this refers only to earnings, cash transfers to those in employment - FIS - are not taken into account.

3. Comparing Average Benefits/Earnings and Hypothetical Replacement Rate Series

We now construct and compare time-series based on average unemployment compensation/average earnings versus hypothetical cases. Given the scope for confusion it is particularly important in doing so to be precise about the data sources and the way the calculations are done.

The expenditure-based series relies almost entirely on data from the ESRI-Department of Finance Databank, based on the National Accounts. To calculate mean unemployment compensation per recipient, aggregate annual expenditure on UB (including Pay-Related Benefit) and UA are summed and averaged over the number of recipients. The databank series on Pay-Related Benefit relates to the total expenditure without distinguishing that going to recipients of UB versus Disability Benefit: we have therefore estimated the proportion going with UB using figures published by the Department of Social Welfare.[6] Whereas Browne and McGettigan used Labour Force Survey data on the numbers unemployed, given the increasing gap between numbers unemployed in the Labour Force Survey and the Live Register it seems preferable to use administrative data on numbers of recipients for this purpose.[7] For mean net earnings, the National Accounts aggregates for wages and salaries outside agriculture, less revenue from tax on personal non-agricultural incomes and employees' social insurance contributions, are divided by the number of employees outside agriculture as shown in the Labour Force Survey. (A full description of the construction of these series from the variables in the databank is available from the authors).

The average compensation/average wage series derived in this way for the period 1961-1992 is shown in Table 1, Col. (1). The series shows mean unemployment compensation as a percentage of mean net earnings increasing from 22% at the start of the 1960s to a peak of about 40% in the early 1980s, then declining substantially to 36% in 1987 and falling further to 32% by 1992. It should be noted that this differs from the figures produced by Browne and McGettigan (1993, Chart 11) because they averaged unemployment compensation over the LFS unemployed rather than the number of recipients, because they included all PRB rather than the element going with UB, and also because of an error in the computation of their earnings total. The net effect of these factors is that their annual figures were considerably lower than those in Table 1, and though the changes from one year to the next generally show a similar pattern, their series shows a larger overall increase, from 13% in 1961 to 27% in 1992.[8]

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[6] See for example Statistical Information on Social Welfare Services 1990, Table G5.

[7] The administrative data in fact refers to the numbers of claimants, but this will not diverge substantially from the number of recipients.

[8] We are grateful to Donal McGettigan for assistance in clarifying this point.

Table 1: *Expenditure and rates-based replacement rates, 1961-1994*

	Expenditure-based replacement rates			*Rates-based replacement rates*	
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Year	*Overall*	*UA*	*UB*	*UA*	*UB*
1961	22.3	14.6	28.0	21.3	31.2
1962	23.3	16.7	27.9	22.9	28.2
1963	24.2	17.2	29.2	23.7	32.1
1964	24.0	17.4	28.4	23.3	32.0
1965	26.1	20.0	30.2	25.7	30.8
1966	29.6	24.4	32.1	25.2	35.0
1967	27.1	22.4	30.0	27.1	33.3
1968	27.4	22.9	30.0	28.0	33.1
1969	28.7	25.2	30.9	28.9	33.1
1970	28.3	26.0	29.7	29.1	34.5
1971	32.5	30.4	33.7	31.7	34.8
1972	27.7	26.0	29.0	29.4	34.3
1973	29.8	27.9	31.5	30.7	35.1
1974	30.2	23.8	33.2	29.9	35.0
1975	34.0	28.9	32.0	30.8	35.3
1976	35.0	29.0	32.9	31.1	35.9
1977	34.5	28.8	32.2	31.0	35.8
1978	33.7	28.2	31.5	30.4	34.9
1979	33.0	26.7	30.4	28.8	32.4
1980	37.6	29.2	34.0	30.3	34.0
1981	37.2	29.2	32.8	30.7	35.1
1982	40.7	33.0	36.6	35.3	40.6
1983	38.3	33.3	34.9	34.5	38.9
1984	37.0	33.9	34.4	37.1	39.4
1985	36.9	33.3	35.8	35.3	37.3
1986	35.8	33.0	34.8	35.3	35.6
1987	35.7	32.7	36.0	34.2	34.8
1988	36.6	34.8	36.6	35.7	35.7
1989	33.7	32.6	33.7	37.2	32.9
1990	32.9	33.2	30.1	37.4	32.2
1991	32.0	32.3	29.3	37.5	32.1
1992	32.1	32.4	29.2	36.5	31.6

1. Column (1) includes expenditure on PRB; columns (3) and (5) do not include expenditure on PRB.
2. Column (1) incorporates adjustments and corrections to the Browne and McGettigan series as described in the text.
3. The rates based series use information on maximum payment rates for UA and UB and the numbers in corresponding marital status and dependency categories in the Dept of Finance-ESRI databank; they also incorporate a correction to the formulae used in respect of those in receipt of half-rate CDAs.
4. All series use the same denominator: the average net wage defined in national accounts terms as total wages and salaries less income tax and employee PRSI contributions, divided by the number of employees in all sectors (from the Labour Force Survey).

In understanding how these trends are produced it is useful to construct sub-series in the same manner for UA and flat-rate UB. This can be done using the series on annual expenditure of UA and UB, dividing each by the average net earnings figure as before. These mean UA/mean earnings and mean UB/mean earnings series are shown in Table 1, col. (2) and (3) respectively. The UA series starts the period well below the UB one but by the 1970s the gap between them had narrowed a good deal; by the early 1980s it had virtually disappeared and in the early 1990s average UA actually exceeded average (flat-rate) UB. The UA series reached a peak in 1984 but did not decline significantly from that peak in subsequent years. The UB series, on the other hand, peaked in 1982 at almost 37% but by 1992 was down to 29%. The fall in the overall average from the early 1980s thus reflects three factors: the decline in average flat-rate UB as a percentage of average net earnings, the very sharp reduction in Pay-Related Benefit paid with UB (which fell from about 14% of total expenditure on unemployment compensation in 1982 to less than 2% in 1992), and a marked decline in the proportion of all recipients receiving UB, the higher payment at the outset, rather than UA. While full data to up-date these series to 1994 is not yet available, estimates show a further decline between 1992 and 1994 in the overall average, implying a fall of about 5 percentage points in that series between 1987 and 1994.

Before turning to replacement rates based on hypothetical cases a la Hughes and Walsh, it is worth exploring a method of constructing series which adopts an intermediate route between reliance on average expenditure or hypothetical rates-based cases. This is to calculate the average unemployment compensation per recipient by applying the rates of payment for different family types, distinguishing UB and UA, to the numbers in receipt in each category. The ESRI-Department of Finance Databank contains both the payment rates and the numbers in receipt for UB and UA for ten dependency categories,[9] and within the databank these are used to calculate a weighted average rate of payment for UB and UA separately as well as an overall average rate. Dividing the UA and UB rates-based series by mean net earnings as before, one arrives at the figures shown in Table 1 cols. (4) and (5). (The overall average rates-based series does not include Pay-Related Benefit, and so is not shown here because it is not directly comparable with col. (1)).

In both cases the rates-based series are almost always above the expenditure-based ones.[10] This is because the rates-based series effectively assume that all recipients are being paid at the maximum rate of UA or UB, whereas in fact some will receive less. This arises in the case of UA because the payments are means-tested and some recipients (or their spouses) have income from other sources, and in the case of UB it arises because some recipients do not have sufficient PRSI contributions to be entitled to the full rate. In the 1990s the gap between the rates-based and expenditure-based series has been wider for UA than UB, so means-testing has more impact than insufficient contributions. The year-to-year changes in the rates-based and

[9] The dependency categories are no dependants, adult dependant only, 1 adult plus 1 child, ... up to 1 adult plus 6 child dependants, 1 child dependant only, 2 child dependants only.

[10] The exception is the years 1987-89 for UB: this arises because transitional payments were being made in those years in connection with the implementation of the Directive on Equal Treatment, which are not reflected in the payment rates series but will have affected expenditure.

expenditure-based series are generally similar, though the gap between the two UA series was considerably wider in the first few years covered than subsequently. Some differences in the post-1987 pattern shown by the two approaches are also worth noting. The expenditure-based UA series remains stable while the rates-based one rises by 2 percentage points from 1987 to 1992, and while both UB series fall the expenditure-based one falls by 7 percentage points compared with 3 for the rates-based one. One therefore gets a rather different picture of recent trends from the two approaches. The advantage of the rates-based approach is that unlike average expenditure it provides a basis for comparison of the position of recipients in the various dependency categories and how these have evolved over time, since one can construct separate average rate/average earnings series for each dependency type. This allows changes in the position of the group with the highest replacement rates on average, those with large numbers of dependants, to be distinguished.

Turning now to the hypothetical cases approach, we construct replacement rates in the manner employed by Hughes and Walsh (1993).[11] This involves calculating separate replacement rates for a single man, a single woman and a married man with four children, for both UA and for UB. Social welfare payment rates in force at the time are used in calculating the numerator (assuming the maximum rate is paid in all cases), and the average industrial wage net of calculated income tax and PRSI contributions is the denominator. Hughes and Walsh present figures from 1967 to 1978, and we have updated the sub-series to 1994. In arriving at summary series for UA and UB, and for overall replacement rates, Hughes and Walsh applied fixed weights based on the number of males with no dependants/females with no dependants/males with dependants in 1973. This procedure was adopted because the distribution of the unemployed across family types could be endogenous, influenced by the evolution of replacement rates for the different categories. Here, to show how a series constructed on this basis compares with other approaches, we use the same fixed weights throughout. The calculated hypothetical series for UA, flat-rate UB and UB with Pay-Related Benefit are shown in cols. (1), (2) and (3) of Table 2.

[11] Thanks are due to Gerry Hughes for assistance in replicating the original Hughes-Walsh analysis.

Table 2: *Hypothetical Replacement Rates at Average Industrial Wage, Hughes-Walsh Method, 1967-1994*

	(1)	(2)	(3)	(4)	(5)
				Weighted averages	
Year	*Maximum UA rate*	*Maximum flat-rate UB rate*	*UB with PRB at average wage*	*(2) and (3) UB recipients*	*(1), (2) and (3) UA and UB recipients*
1967	25.0	32.4	32.4	32.4	28.8
1968	26.2	32.1	32.1	32.1	29.2
1969	27.0	31.9	31.9	31.9	29.5
1970	24.7	32.7	32.7	32.7	28.7
1971	24.7	32.8	32.8	32.8	28.8
1972	23.8	31.8	31.8	31.8	27.9
1973	23.7	32.2	32.2	32.2	28.0
1974	25.8	34.0	51.6	39.3	32.7
1975	30.4	39.8	60.2	45.9	38.3
1976	33.1	42.3	65.3	49.2	41.3
1977	31.3	40.4	64.4	47.6	39.6
1978	31.3	39.7	61.7	46.3	38.9
1979	31.5	39.1	71.5	48.8	40.3
1980	34.4	42.0	74.3	51.7	43.2
1981	35.5	43.0	73.8	52.3	44.1
1982	41.6	50.1	82.3	59.8	50.8
1983	43.4	52.0	72.5	58.2	50.9
1984	44.7	50.9	71.3	57.0	51.0
1985	43.7	49.7	71.9	56.4	50.2
1986	42.8	48.1	69.0	54.4	48.7
1987	41.3	46.6	57.1	49.8	45.6
1988	43.7	46.8	57.3	49.9	46.9
1989	45.5	45.8	55.8	48.8	47.2
1990	47.3	46.6	56.1	49.5	48.4
1991	47.6	46.4	55.3	49.0	48.3
1992	47.1	46.3	54.6	48.8	48.0
1993	47.9	47.3	55.5	49.7	48.8
1994	46.4	47.8	47.8	47.8	47.1

1. The UB series (both flat rate and with PRB) are calculated for single men and women, and for married men with 4 children; the UA series is calculated for single men, and for married men with 4 children. Weights reflect the Live Register dependency breakdown in 1973, as shown in Hughes and Walsh (1983).
2. The denominator in the replacement rate calculations is given by the disposable income for a (man or woman) with average weekly male (female) industrial earnings.
3. Column 4 gives a weight of 0.7 to flat rate UB and of 0.3 to PRB, reflecting the average proportion of UB recipients who obtained PRB in the 1974-1979 period - the years studied by Hughes and Walsh for which PRB was in existence.

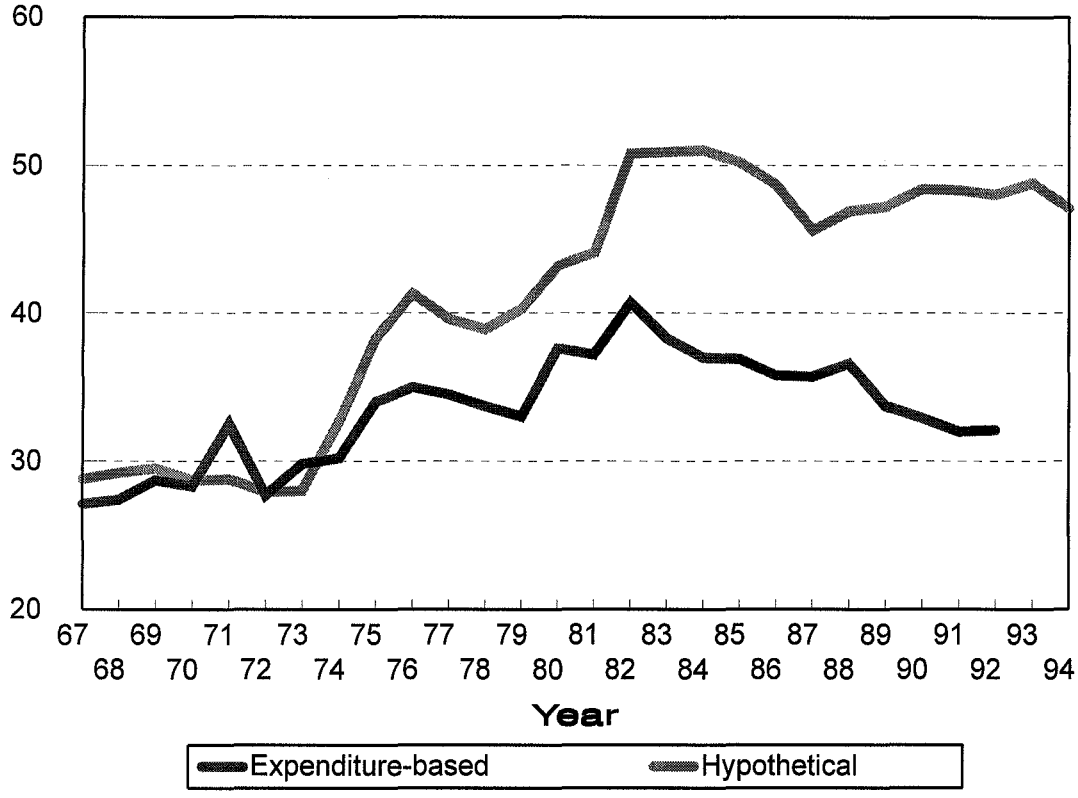
The hypothetical UA series shows a rise in the average replacement rate in the mid-1970s from 25% to 30%, a further increase to over 40% in the early 1980s, a peak of almost 48% in 1993, and little decline from that peak by 1994. The expenditure-based UA series in Table 1 had shown a lower level than this hypothetical one. This comes about because the hypothetical series not only assumes

all recipients get the maximum rate, the averaging procedure also attributes the rate for a married man with an adult and four child dependants to all those with dependants. This was done because the series was intended for use in time-series analysis, but comparison of year-to-year changes with the expenditure-based series also reveals some interesting differences. The expenditure-based series is less volatile than the hypothetical series, ranging from a low of 23% to a high of 35% over the period from 1967 compared to 24%-48% for the hypothetical series. Most recently, the expenditure-based series peaked in 1988 and by 1992 was down 2.5 percentage points, whereas the hypothetical UA series continued to rise through the late 1980s and into the 1990s. The relationship between the hypothetical and rates-based UA series is more varied, the former being below the latter at the start of the period but well above by the end: these differences arise not only because of the way the rates are weighted, but also because, like the expenditure-based series, the rates-based one uses economy-wide net earnings rather than average industrial wage as the point of comparison.

The hypothetical flat-rate UB series in col. (2) of Table 2 can be compared with the UB series in Table 1, col. (3) and (5). The hypothetical series begins the period slightly above the expenditure- and rates-based series but from 1975 the gap grows rapidly as the hypothetical series rises much more rapidly than the other two. By 1983, when the hypothetical series peaks at 52%, it is 13-17 percentage points above the other two series, and the gap remains about the large in subsequent years. In addition, there are differences in the recent trend: whereas the expenditure-based series showed a decline of 7 percentage points between 1987 and 1992, the hypothetical flat-rate UB series shows almost no change over that period.

An important issue in the way a hypothetical series is constructed is the treatment of Pay-Related Benefit (PRB). Nolan (1987) showed that, compared with an expenditure-based UB series, a hypothetical UB with full PRB series substantially overstated average UB receipts and the impact of the introduction of PRB in 1974. In Table 2 col. (3) shows a hypothetical replacement rate series for recipients of UB with full PRB, which rises by 20 percentage points in 1974 and reaches 82% in 1982 before declining steadily as PRB was cut back up to its elimination (for new claimants) in 1994. An assumption which approximates to the underlying reality in the period covered by Hughes and Walsh is to attribute PRB to 30% of UB recipients from its introduction, and a hypothetical UB replacement rate series based on this assumption is shown in Table 2, col. (4). The increase in 1974 is now much less marked, and the 1982 peak is 60% rather than 82%, with again a decline from that point until the three hypothetical UB series converge in 1994 with the phasing out of PRB.

Figure 1: *Expenditure-based versus Hypothetical Measure of Replacement Rates, 1967-1994.*



An overall average hypothetical replacement rate series for all recipients of UA or UB, embodying the same PRB assumption, is shown in col. (5). This can be compared with the overall average expenditure-based series in Table 1, as is done in Figure 1. The hypothetical and expenditure based series start at similar levels (about 28%) , but begin to diverge in 1974, when the hypothetical series starts to rise above the expenditure based series. By the early 1990s when the figures are 32% versus 48% the gap has grown considerably. Once again the trend from 1987 is rather different, with the hypothetical series rising but the expenditure-based one falling from that point.

4 Microsimulation evidence

Microsimulation modelling provides a third, and quite different, approach to the measurement of replacement rates. The approaches discussed earlier have attempted to summarise incentives facing the unemployed using aggregate, national accounts type information, or using a small number of hypothetical cases. The microsimulation approach, on the other hand, simulates the replacement rates facing the unemployed (and/or, indeed, the employed) on the basis of detailed micro-level data gathered in a large-scale household sample. In this way, it is possible to take account of the full diversity of the population, in terms of the characteristics relevant to their tax and benefit position when in and out of work. For example, replacement rates may vary depending on whether one or both partners in a couple is unemployed;

and for single people living in the parental home, amounts of benefit households may depend on parental income. Micro-level modelling of the replacement rates facing the unemployed can then allow us to examine the distribution of replacement rates, rather than simply summarising all those in a particular category by the mean, and can allow us to examine the evolution of the distribution over time.

Again, it is important to be clear on the precise nature of the calculations carried out. In this paper, we concentrate on estimates of replacement rates facing the unemployed; replacement rates facing the employed may also be of great interest, but replacement rates facing the unemployed are more relevant for comparisons with the figures discussed in Section 3. Estimates of replacement rates for the unemployed can be highly sensitive to the wage rate which they are assumed to be able to command. For this reason, we have undertaken calculations for three different wage scenarios, described below

- *Average industrial earnings*: under this scenario, unemployed men (women)are assumed to obtain a job at average male (female) weekly earnings.

- *Predicted wages:* under this scenario, wages for single and married men and women are predicted of four human capital type wage equations for single and married men and women (Callan and Wren, 1994), including information on past labour market experience and educational qualifications. The depreciation effect of years spent unemployed or out of the labour force is taken into account, so that wages facing the long-term unemployed are affected by the length of their unemployment.

- *Two-thirds of average industrial earnings:* The average predicted wage using wage equations comes to about two-thirds of average industrial earnings. For this reason, we also consider a scenario in which unemployed men and women each face a wage of two-thirds of the corresponding average industrial wage.

The tax and social welfare policy changes between 1987 and 1994 are captured by changes in the relevant parameters (tax rates and bands, social welfare rates, etc.) in the microsimulation model. The 1987 data has also been uprated to approximate 1994 levels by a combination of static ageing techniques: for a full description of the uprating procedures, see Callan, O'Donoghue and O'Neill (1996). In the present context, however, we are particularly interested in investigating the evolution of replacement rates for a fixed population of the unemployed, so we abstract from that part of the usual uprating procedure which involves reweighting of cases to reflect changes in the demographic and socio-economic composition of the population in the 1987 to 1994 period.

Increased incomes are taken into account by separate uprating factors for wage and salary income, self-employment income, and farm income. For the population of interest, it is essentially the uprating of wage and salary income which is of critical importance. Changes between 1987 and 1994 in social welfare rates, including UB, UA and PRB, are captured very precisely by the model. The change in average pay levels over that period is rather more difficult to determine. The average industrial

wage increased by about 35 per cent. National accounts data, together with information from the Labour Force Survey on numbers in employment, suggest that pay per person employed rose by approximately 41 per cent. It is this more broadly based figure which is used in uprating *predicted earnings* in the wage-equation based analyses which follow; but the lower earnings growth figure is implicit in the microsimulation analyses based on (two-thirds of) average industrial earnings. The differences between the growth in earnings in industry and the economy-wide figure, suggest possible changes in the distribution of earnings which can only be analysed with new microlevel data, such as that in the 1994 Household Budget Survey, and the ESRI's *Living in Ireland* survey. But at present the replacement rate analysis can only be undertaken with the 1987 data. Given that more than 70% of men and 80% of women are employed outside of manufacturing industry, we use the more broadly based earnings growth figure in most work with the model.

Essentially, the replacement rates are estimated as follows. First, the tax-benefit model is used to simulate the disposable income of the tax unit when unemployed. This involves simulation of the relevant social welfare benefit (UB or UA) and of income tax liabilities, as well as the universal child benefit. The counterfactual situation, where the unemployed person is attributed a job at one of the wage levels specified above, is then modelled. Again, the tax-benefit model is used to estimate the disposable income the tax unit would have in that situation, taking into account changes in social welfare entitlements and tax liabilities, and, where relevant, entitlement to Family Income Supplement (FIS) - the social welfare benefit targeted at low income families depending on wage earnings. The replacement rate is then calculated as the ratio of family income when out of work to family income when in work.

Under the average earnings and two-thirds of average earnings scenarios, the unemployed person is attributed a wage at (two-thirds of) average industrial earnings (for men or women, as appropriate). This means that the uprating parameter for wage and salary income is of little relevance in these scenarios: the wage growth in the microsimulation estimates is the same as that for the hypothetical analyses, as far as the unemployed person is concerned.[12] But under the predicted earnings scenario, the uprating parameter comes into play, and the growth in the income for unemployed people in the in-work scenario is faster than that of average industrial earnings.

While Family Income Supplement has been given a key role in policy development between 1987 and 1994, take-up of the scheme appears to be low. For this reason, we consider a variant of the predicted wage scenario in which only 1 in 3 of those entitled to FIS actually receives it. In all other analyses, we assume full take-up of the benefit by all those qualified to receive it.

Table 3 shows microsimulation estimates of the mean replacement rate for all those in receipt of unemployment compensation payments, and the means classified by the type of payment (UA, flat rate UB, and UB with PRB).

[12] The uprating parameter does affect the income of the spouse of an unemployed person.

Table 3: *Alternative Measures of Replacement Rates, 1987 and 1994*

Measure	*1987*	*1994*	*Change*
		Overall	
Expenditure	35.7	30	-5.7
Hypothetical	45.6	47.1	1.5
Microsimulation @ average wage, full take-up	45.6	46.8	1.2
Microsimulation @ predicted wage, low take-up	62.3	61.0	-1.3
		Unemployment Assistance	
Expenditure	32.7	30.3	-2.4
Hypothetical	41.3	46.4	5.1
Microsimulation @ average wage, full take-up	39.2	42.6	3.4
Microsimulation @ predicted wage, low take-up	56.4	57.9	1.5
		Flat-rate Unemployment Benefit	
Expenditure	36.0	27.3	-8.7
Hypothetical	46.6	47.8	1.2
Microsimulation @ average wage, full take-up	52.4	52.9	0.5
Microsimulation @ predicted wage, low take-up	68.3	65.8	-2.5
		Unemployment Benefit with PRB	
Expenditure	n/a	n/a	n/a
Hypothetical	57.1	47.8	-9.3
Microsimulation @ average wage, full take-up	63.7	56.2	-7.5
Microsimulation @ predicted wage, low take-up	79.9	67.1	-12.8

The overall figures show that the hypothetical (Hughes-Walsh) means are close to the corresponding microsimulation estimates at the average industrial wage. However, the expenditure-based estimates (and, indeed, the rates-based estimates which are not shown in the table) are quite different. For example, in the overall figures, the expenditure based series shows a large fall in the average replacement rate between 1987 and 1994, while the hypothetical and microsimulation series at the average industrial wage show a small rise.. Part of this difference may be due to the use of fixed weights in the hypothetical and microsimulation series, as against weights based on the current composition of the unemployed in the expenditure and rates based series; but some additional analysis of the microsimulation-based figures suggests that this explains only a small part of the divergence.

A second major feature of these comparisons is that the microsimulation estimates of the mean replacement rate at the *predicted* wage for the unemployed is substantially higher than at the average industrial wage. This reflects the fact that the average predicted wage for the unemployed is only about 2/3 of the average industrial

wage. The trend at the predicted wage is also somewhat different from the trends at the average wage. The overall replacement rate shows a small fall at the predicted wage as against a small rise at the average industrial wage; the same applies to the sub-series for those on UB or PRB; and for UA, the rise in the mean replacement rate at the predicted wage is less than that at the average wage. These differences are due in part to the faster growth factor applying to predicted wages than to the average industrial wage; but also to tax and social welfare policy changes targeted on those with below average earnings.

Table 4: *Distribution of Replacement Rates at Average and 2/3 Average Industrial Earnings, 1987 and 1994*

	Average Earnings		*2/3 Average Earnings*	
	1987	*1994*	*1987*	*1994*
0<10	2.0	2.9	1.3	2.1
10<20	4.9	4.6	3.5	2.7
20<30	20.1	7.2	3.5	3.9
30<40	19.2	24.3	25.4	5.5
40<50	12.7	15.1	3.0	24.1
50<60	18.0	19.3	16.3	10.3
60<70	10.8	13.4	9.7	14.5
70<80	6.5	8.8	20.4	27.9
80<90	3.6	2.5	8.5	2.7
90<100	2.3	1.9	5.9	5.5
Over 100	0.0	0.0	2.6	0.7
Total	100	100	100	100

Table 5: *Distribution of Replacement Rates estimated using Predicted Wages, 1987 and 1994*

	Full take-up of FIS		*33 per cent take-up of FIS*	
	1987	*1994*	*1987*	*1994*
0<10	1.0	1.7	1.0	1.7
10<20	1.7	2.4	1.7	2.4
20<30	4.3	3.3	4.3	3.3
30<40	9.3	8.5	9.3	8.5
40<50	11.6	11.7	11.7	11.8
50<60	16.5	15.3	16.4	15.3
60<70	18.9	21.6	19.1	19.6
70<80	16.6	28.4	13.9	22.0
80<90	14.4	4.5	13.1	9.1
90<100	4.0	2.4	5.4	4.6
Over 100	1.7	0.1	4.0	1.6
Total	100	100	100	100

As noted earlier, developments in *mean* replacement rates tell us only a part of what is going on. A relatively constant mean is consistent with little change throughout the distribution, or with a fall in the replacement rates at the highest levels, offset by a rise in replacement rates by those initially facing rather lower levels. In order to examine this question we must rely on the microsimulation based estimates. .

Tables 4 and 5 show distributions of estimated replacement rates for the unemployed, at alternative earnings assumptions, for 1987 and 1994. The 70 per cent cut-off is the one most often used in identifying "high" replacement rates in UK discussion of these issues and, coincidentally, tends to be a marker for roughly equal proportions of the unemployed population in both 1987 and 1994 i.e., the proportions of the unemployed population facing replacement rates above (below) 70 per cent, tend to be approximately constant in Tables 4 and 5. Under the average earnings assumption, about 13 per cent of the unemployed faced a replacement rate of over 70 per cent. At two-thirds of average earnings, this proportion rises to about 37 per cent and a similar level obtains for the predicted earnings variants. Thus, while about 1 in 8 of the unemployed would face a replacement rate of over 70 per cent, more than 1 in 3 would face a replacement rate of this magnitude at the wage level they could expect to command based on their qualifications and labour market experience.

Figure 2: *Distribution of Replacement Rates, 1987 and 1994; Microsimulation estimates at predicted wage, full take-up of FIS*

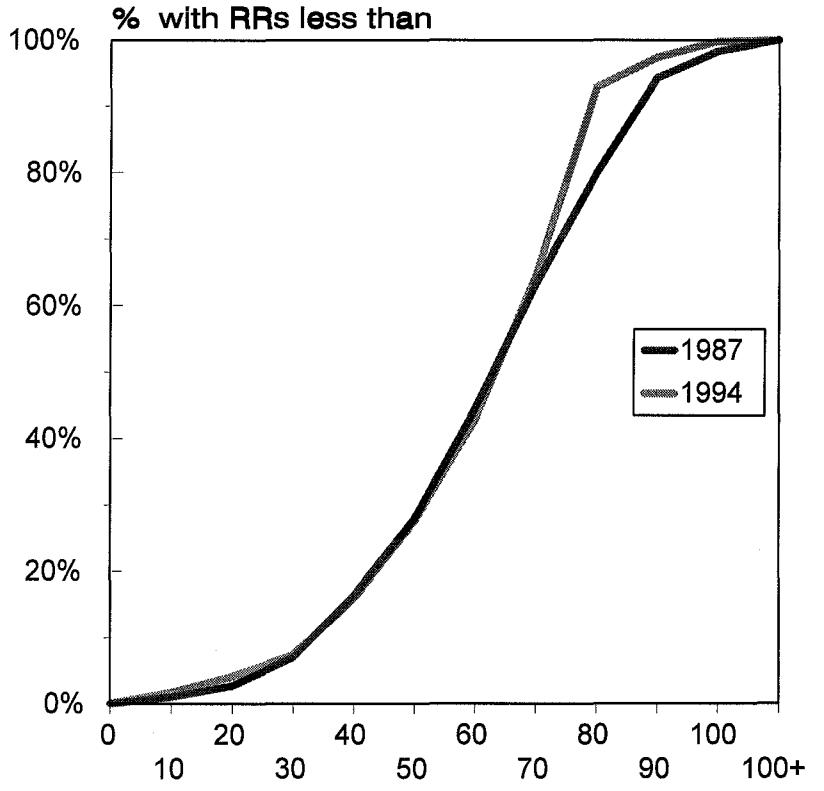
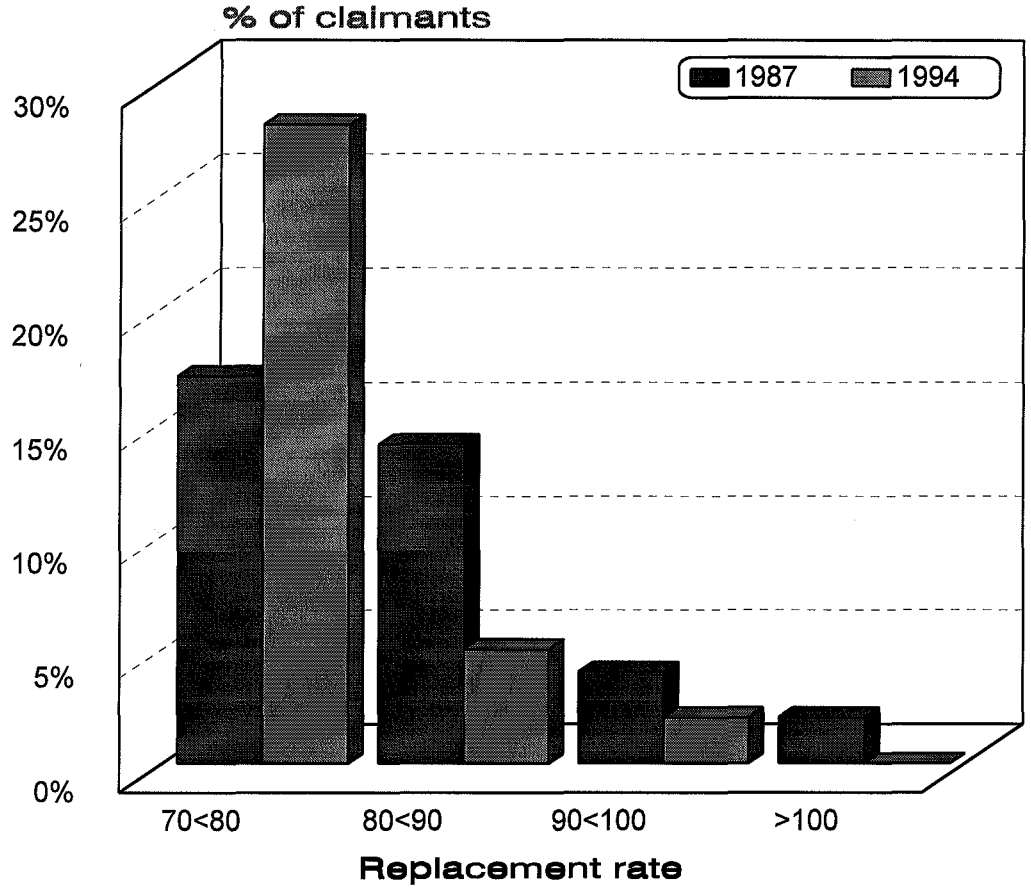


Figure 2 summarises the figures for the predicted wage, full take-up scenario, showing the proportion of the unemployed facing replacement rates below the interval cut offs (equal 10 percentage point intervals). A scenario in which some replacement rates fell, while none rose, would give rise to a curve for 1994 which lay entirely above the 1987 one, and *vice versa.*; more complex changes could give rise to crossing curves, somewhat analogous to crossing Lorenz curves. Figure 2 makes it clear that in the case of the predicted wage scenario, changes are concentrated towards the top of the replacement rate distribution, where the 1994 curve lies above the 1987

one. Figure 3 focuses on this change at the top of the distribution, and shows sharp falls in the numbers facing replacement rates of over 80 per cent, accompanied by a roughly equal rise in the numbers facing replacement rates of 70 to 80 per cent.

Figure 3: *Distribution of Replacement Rates over 70 Per Cent, 1987 and 1994; Microsimulation estimates at predicted wage, full take-up of FIS.*



Similar distributional changes, indicating some reduction in the incidence of the highest replacement rates, are found for those on wages below the average industrial wage. At the earnings levels predicted for each individual by the wage equations, the incidence of replacement rates above 80 per cent falls from about 20 per cent to about 7 per cent, if full take-up of FIS is assumed; and from about 23 per cent to 15 per cent, under a low take-up assumption. Similarly, at two-thirds of average earnings, the incidence of replacement rates above 80 per cent falls from 17 per cent to 9 per cent (when take-up of FIS is assumed to be complete). In each case, the fall in the numbers facing replacement rates above 80 per cent is accompanied by a roughly equivalent rise in the numbers facing replacement rates of between 70 and 80 per cent . These tendencies are not evident at the average industrial wage (the incidence of replacement rates above 80 per cent falls only from 5.9 per cent to 4.4 per cent); but the incidence of such replacement rates at average earnings is already rather low..

The evidence on changes in the distribution of replacement rates below 70 per cent is more mixed. At the average industrial wage, or two-thirds of that figure, there is evidence of an upward shift in replacement rates below the 70 per cent cut off. But

the faster earnings growth incorporated in the predicted wage analyses suggests that there has been little change in the distribution of replacement rates below 70 per cent. Thus the predicted wage analyses suggest that the major change in the overall distribution has been a reduction in the incidence of very high replacement rates (over 80 per cent), to levels of 70 to 80 per cent; while the average wage and two-thirds of average wage analyses suggest some upward shift in replacement rates below the 70 per cent level.

5. Conclusions

Our exploration of replacement rates gives rise to conclusions on the substantive question of what has actually happened to replacement rates, particularly in recent years, and on the issue of how the evolution of replacement rates can best be tracked in future.

During the 1987 to 1994 period, our microsimulation results suggest that the average replacement rate facing unemployed persons was roughly constant, with a small rise in the average for those on Unemployment Assistance offset by other changes, notably the reduction in replacement rates caused by the abolition of Pay-Related Benefit. Similar findings obtain for the replacement rate measures based on (weighted averages of) hypothetical cases, as developed by Hughes and Walsh (1983). But the expenditure-based series and rates-based series, which use aggregate data sources such as the national accounts, produce rather different findings - a sharp fall in the overall figure, and a fall in each of the component series (UA, UB and PRB). While other explanations are possible, the most likely seems to be that the expenditure and rates based series focus on mean unemployment compensation divided by mean employment income per employee: this bears no necessary relationship to the mean of replacement rates for either the employed or the unemployed. During the 1987 to 1994 sub-period, it seems to behave rather differently from series which focus on average replacement rates for either selected hypothetical cases or the large number of unemployed persons in the ESRI's 1987 Survey. While some other results may be sensitive to possible changes in the distribution of wages, and to the precise change in mean wages between 1987 and 1994, this finding is unlikely to be affected by such considerations.

The microsimulation analysis also suggests that the relevant wage for the unemployed is a good deal lower than the average industrial wage - the mean predicted wage being about two-thirds of that average figure. This has implications both for the level of replacement rates facing the unemployed, and the changes wrought by policy and other developments in the 1987 to 1994 period on the entire distribution of replacement rates. As regards the level, the mean replacement rate at predicted wages (or at the average predicted wage) is about 15 percentage points higher than that at the average industrial wage. Many policy developments since 1987 (including improvements in FIS as well as alterations to income tax bands, allowances and exemption limits) have been focussed on those with incomes below the average. The impact of such changes does not always show up in calculations which focus exclusively on the average industrial wage; but analyses based on two-thirds of that figure, as well as analyses based on predicted earnings for the unemployed, taking

account of their qualifications and labour market experience, suggest that such policy measures have served to reduce the incidence of replacement rates above 80 per cent, while the incidence has increased for those in the 70 to 80 per cent replacement rate category.

Turning to the question of best practice for measuring replacement rates in future, it is clear that regular collection of survey data, which can take account of changes in the distribution of wages and other characteristics relevant to replacement rates, would provide the ideal base for measurement of changes in the distribution of replacement rates. Uprating procedures applied to a relatively recent data source can, however, provide useful information on the impact of policy changes on incentives as measured by replacement rates. A detailed matrix of hypothetical cases can be of some help in identifying trends in mean replacement rates, but is not likely to be able to identify shifts in the distribution of replacement rates of the type that policy may be aimed at achieving - a rise in unemployment compensation for those on the lowest incomes, while reducing replacement rates for those facing the greatest disincentives to work. Microsimulation based measures offer the best chance of monitoring such the achievement of such targets, and can, indeed, be used to assess the likely impact of policy changes on work incentives in advance of their implementation.

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Appendix: Detailed Comparisons of Hypothetical and Microsimulation Estimates, 1987 and 1994

Tables A1 and A2 show estimates of the mean replacement rate for recipients of Unemployment Assistance, flat-rate Unemployment Benefit, and Unemployment Benefit with Pay-Related Benefit under the average and two-thirds of average earnings assumptions. The microsimulation estimates can be compared with estimates based on hypothetical calculations of the type performed by Hughes and Walsh. In this comparison, we have used a more extensive set of hypothetical cases than that employed heretofore: our hypothetical series is a weighted average of replacement rates calculated within the following classification:

Sex	*Marital Status*	*Benefit Category*
Male	Single	Unemployment Assistance
Female	Married, no children	Flat-rate Unemployment Benefit
	Married, 2 children	Unemployment Benefit with PRB
	Married, 4 children	

This classification yields a total of 24 hypothetical cases - three times as many as were used by Hughes and Walsh. The weights for these 24 cells are provided by a breakdown from the ESRI 1987 Survey, so that differences between the hypothetical and actual series in this Appendix cannot arise from differences in weighting procedures: essentially identical weights are being used for both, with the married, 2 child case being used to represent those with 1, 2 or 3 children, and the married, 4 child case being used to represent families with 4 or more children.

Comparisons between the levels of replacement rates show that the hypothetical UA replacement rates tend to be 2 to 5 percentage points higher than those shown by the microsimulation estimates. This is most likely due to the effects of means-testing. By contrast, mean hypothetical replacement rates for UB recipients, with or without PRB, are up to 4 percentage points *lower* than those emerging from the microsimulation estimates. The existence of other income, usually the earnings of a spouse, is the major cause of this difference: it tends to raise both numerator and denominator in the replacement rate calculation, but can also affect the absolute "gap" between in-work and out-of-work incomes because of the nature of the tax treatment of couples (with non-working partners allowances being fully transferable to offset the taxable income of a working partner).

The trend in the overall mean replacement rate under all earnings assumptions is relatively flat, for both the hypothetical and microsimulation based analyses. The average earnings based figures show a small rise, while the predicted earnings figures show a small fall in the overall mean replacement rate, reflecting the faster earnings growth which is incorporated in the predicted earnings figures. The average earnings based figures show a rise in the average replacement rate for UA recipients of about 3 percentage points in the case of the microsimulation estimates, and close to 5 percentage points for the hypothetical estimates. The predicted earnings based figures show a much smaller rise of 1 to 1.5 percentage points. Both hypothetical and

microsimulation estimates show a sharp fall in the replacement rate facing those in receipt of PRB in 1987, as Pay related benefit was abolished (for new applicants). Estimates of the extent of the fall vary somewhat. Estimates for flat-rate UB recipients show somewhat mixed results: at the average industrial wage, or at two-thirds of that figure, most calculations show little change, but the hypothetical calculations at two-thirds of the average wage show a 3 percentage point fall. The faster earnings growth of the predicted wages leads to a fall of a similar magnitude.

Table A1: *Average replacement rates at average industrial wage, hypothetical and microsimulation estimates, 1987 and 1994*

	Weighted hypothetical calculations		*Microsimulation model*	
	1987	*1994*	*1987*	*1994*
Unemployment Assistance	40.9	45.6	39.2	42.6
Flat-rate Unemployment Benefit	50.5	50.5	52.4	52.9
Unemployment Benefit with Pay-Related Benefit	60.0	51.0	63.7	56.2
All	45.7	47.4	45.6	46.8

Table A2: *Average replacement rates at 2/3 of average industrial wage, hypothetical and microsimulation estimates, 1987 and 1994*

At 2/3 of average industrial wage	*Weighted hypothetical calculations*		*Microsimulation model*	
	1987	*1994*	*1987*	*1994*
Unemployment Assistance	54.2	58.7	50.4	53.4
Flat-rate Unemployment Benefit	65.3	62.5	65.3	65.2
Unemployment Benefit with Pay-Related Benefit	73.2	65.2	80.0	70.1
All	59.4	60.5	57.8	58.4

Table 3c: *Average replacement rates at predicted wages, with full or partial take-up of Family Income Supplement, 1987 and 1994*

Microsimulation estimates at predicted wage	*Full take-up of FIS*		*33 per cent take up of FIS*	
	1987	*1994*	*1987*	*1994*
Unemployment Assistance	55.5	56.4	56.4	57.9
Flat-rate Unemployment Benefit	67.0	63.9	68.3	65.8
Unemployment Benefit with Pay-Related Benefit	79.3	66.3	79.9	67.1
All	61.3	59.5	62.3	61.0