Paying for Learning

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Editorial Note

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Abstract

Both the quantity and quality of education and training in Britain are being compared unfavourably with arrangements in other countries at a time when public expenditure is facing the most stringent constraints. This paper starts from the presumption that improvements in the quality and quantity of education and training will not primarily be financed by increased public expenditure; that mechanisms are therefore necessary to facilitate additional private spending; and that income-contingent loans offer just such a mechanism. The major advantages of the income-contingent approach which emerge from this paper are twofold: it protects individuals from a heavy repayment burden during time of low earnings, thus minimising deterrents to access; and it ensures that a high fraction of total borrowing is repaid. The paper compares different income contingent schemes with the current government scheme for higher education, and also investigates the long-run yield of a graduate tax and of an employer user charge for skilled labour. The results suggest that about 80 per cent of lending will be repaid under the government scheme; depending on the rate of earnings growth, an income-contingent scheme would repay up to 90 per cent of student borrowing in advanced further education and higher education, and up to 94 per cent of borrowing for non-advanced further education. The results suggest that it would be possible for the private sector to make student loans on the basis of a guarantee of between 10 and 20 per cent of total lending. Such an arrangement would result in *immediate* public expenditure savings, on plausible assumptions, of around £3.5 billion *per year*.

PAYING FOR LEARNING

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1 THE BACKDROP

1.1 The Issue

There is widespread agreement about the extent to which Britain lags behind other countries in the quantity and, in certain respects, the quality of education and training of its population. Earlier studies (Bennett, Glennerster and Nevison, 1992a, b) made two strategic points: that the *quality* of the education and training is important; and that the incentive to train is not strong enough, leading to a lack of demand. The need to encourage more people to continue with education and training is clear.

This paper discusses how to pay for the necessary expansion. In principle there are three sources of finance.

- It might be possible in some areas to make better use of existing resources. The Government regards this as a possibility, at least for further education. Once any efficiency gains have been exhausted, however, expansion and/or improved quality will require additional resources.

- There could be additional tax funding. It would be unwise for several reasons, however, to rely on this source. In the present economic climate it is unlikely in the foreseeable future that any goverment will be able (even if it is willing) to find substantial additional resources. The problem with tax funding is the extent to which it can *harm* access by constricting the supply of places in the interests of keeping public expenditure down.

- The only other sources of finance are individuals and employers, i.e. mainly the private sector. The problem here is that without careful policy design, private funding of post-school education and training will harm access.

The major focus of this paper is on ways of raising revenue from individuals and employers in ways which will increase access for everyone. The financing regime should have the following broad characteristics.

- It should encourage rather than deter young people from seeking additional education or training.

- It should avoid imposing excessive costs on employers; if employing skilled labour becomes too expensive, employers will demand less of it, leading to a downward spiral in the demand for skills and, in consequence, the numbers of people seeking to upgrade their skills.

- It should be as neutral as possible between different pathways: full-time education; part-time training whilst in full-time work; part-time training on its own; or training connected with unemployment programmes.[1]

- It should be as neutral as possible between choices by employers to provide in-house training, or to send employees for training elsewhere.[2]

The paper looks at *how* to raise revenue, at *how much* revenue is likely to be raised and, more briefly, at the *mechanisms* though which additional resources might be channelled to the providers (public or private) of education and training. The main body of the paper (sections 3 and 4) presents estimates of the fraction of total lending which will be repaid under a range of assumptions, and looks at the range of individual experience in repaying their loans. Section 5 gives a rough estimate of the amount of revenue likely to be raised under different assumptions, and indicates the numbers of extra places in different types of education and training which the additional revenue might finance. The key findings and conclusions are summarised in section 6.

Much of the empirical work centres on the revenue potential of loans and employer user charges for higher education. There are two reasons for the focus on higher education. First, funding sources for higher education must be diversified if recent and future expansion is to be sustainable without an unacceptable reduction in quality. Second, we look to savings in the higher education sector to make a contribution to funding additional opportunities in the 16-18 range. Neither mechanism, however, is exclusive to higher education. It is common ground that there is a major social interest in education up to age 16, which should therefore continue to be publicly funded. Equally, there is emerging agreement about the major private benefits (in addition to the social benefits) of higher education, giving both an efficiency and an equity case for mixed public/private funding. The mixture of social and private benefits in the 16-19 range is less clear. Section 3.3 discusses briefly the extension of loans and user charges to at least parts of further education.

Such an exploration of private revenue sources is not intended in any way to de-emphasise the continuing major role of government. It is important to distinguish its three very different roles as *regulator*, *funder* and/or *provider* of education and training. Regulation relates to the quantity of education (e.g. the minimum school leaving age) and its quality (regulation of teacher training, the content of the national curriculum, organisation of systems of inspection, and so on). There is also regulation of who may offer education/training, and on what terms. Whatever changes there might be in the two other aspects of government activity, it will remain a major actor in terms both of regulation and of finance.

1.2 Sources of Finance

The three major beneficiaries of education and training, are students, their employers and government, the last representing the broad social interest. There are a number of ways in which students and their future employers might contribute to the finance of post-school education and training.

Family resources. Excessive reliance on family resources (i.e. parental earnings or accumulated family savings) will penalise young people from poorer backgrounds. Certainly this source, on its own, cannot finance large-scale expansion. This is not an argument against the use of family resources to finance training but a caution against relying excessively on this approach.

Student's current earnings are a common source of educational finance in the USA. Given the present state of the job market this, again, is not an approach on which heavy reliance should be placed.

Loans. Students might be able to finance part of the costs of education or training out of their future income (i.e. through a well-constructed loan scheme which allows them to borrow against their future earnings). Two strategic aspects of loans require discussion: their type; and the source of loan finance.[3]

Types of loan. A key distinction must be made between *mortgage-type loans*, with repayment in fixed instalments over a fixed period, and *income-contingent loans*, whose repayment takes the form of x per cent of the individual borrower's subsequent annual income. Income-contingent loans are usefully divided into two sorts: under its *loan* variant, repayments are 'switched off' once the loan, plus any interest has been repaid; with a *graduate tax*, repayment continues until a specified time, e.g. for life, or until retirement.

With a loan, no-one repays more than he/she has borrowed; with a graduate tax, higher earners repay more than they have borrowed.

Mortgage loans have two strategic problems.

- Students bear a much higher fraction of the risk, thus deterring applicants, particularly from lower socioeconomic groups. This is inefficient because it wastes talent and inequitable because it reduces intergenerational mobility.

- Mortgage loans also create problems with the supply of loans. Lending for educational purposes is risky, since there is no security. The resulting capital-market imperfection leads to a shortage of loan capital for educational investment. The point was recognised a long time ago, *inter alia* by Milton Friedman (1962, pp. 103 *et sequ*.).

Separate from these arguments *against* mortgage loans, there are strong arguments *for* income-contingent repayments. They offer the borrower some protection against potential future poverty, thus minimising the impediment to access. A properly-designed scheme can also help to mobilise funds from which students can borrow.

The source of finance, to the extent possible, should be the private sector. In theoretical terms the source of funds should not matter. Suppose it is efficient to expand education/training, and that students borrow from public funds. If additional public borrowing crowds out private investment, it will only be less-efficient private investment which is crowded out -- a result which is itself efficient. That conclusion, however, rests on stringent assumptions, in particular that government and taxpayers must be rational and well-informed. Neither is true. Public funding requires that taxation is higher than would otherwise be the case, with possible disincentive effects; and higher public spending may affect financial and foreign-exchange markets. If students borrow from private funds no issue of taxation arises, and adverse incentives are minimised.

Thus, any loan scheme should have two fundamental characteristics. Repayments should be income-contingent, both to address capital market imperfections which hinder the provision of commercial loans to all but the best risks, and to assist access by protecting young people from some of the uncertainty of borrowing. Second, the repayment mechanism should be sufficiently secure to make it possible for the private sector to supply the funds which young people borrow.

User charges for employers. Students are one set of beneficiaries of education and training. Employers are another. That being the case, it might be argued that it would be in the interests of employers to pay for and/or provide training for their employees. That argument is self-evidently true for employers *as a whole*; it is not, however, generally true for any *individual* employer. Voluntary provision of training by individual employers made sense in times past when employees tended to stay with the same employer for most of his/her career. With today's job mobility, each employer faces the incentive to leave training to *other* employers, whose labour force can then be poached.

Enlightened employers resist such pressures. But any expansion of industry's contribution should get round these incentives to free-ride. One way of doing so is through a user charge on employers of trained men and women, the resources thereby derived being channelled back into the education/training of the next generation of young people. Under such an arrangement, employers would not contribute to the costs of training their competitor's work force; they would pay only for those workers whom they deemed it worthwhile to employ, and only for as long as they employed them. Such user charges get round the disincentive to provide training.

Policy design needs to avoid at least two of the potential problems discussed earlier. It should minimise a tendency to create a downward spiral in the demand for skills. It should also not discourage on-the-job training and other forms of in-house skills acquisition.

1.3 Channelling Resources into Education and Training

Section 5 briefly discusses how additional resources might be used. The aim is to devise ways which would empower individual demand, and which would also put in place an incentive structure which encouraged an efficient supply-side response.

Resources for education and training have tended to be administered through different sorts of planning mechanism, e.g. Local Education Authorities, the Training, Enterprise and Education Directorate, the Further Education Funding Council and the Higher Education Funding Council. In policy terms, institutions can be funded in either or both of two generic ways.

- Direct funding of institutions, e.g. through a block grant, is the common model in mainland Europe, where resources, by and large, are channelled to directly to institutions, with low or no fees for students.

- Funding institutions via students and other demanders of higher education services.

A variant of the second approach is the vouchers mechanism. The validity of this approach depends in large measure on the extent to which student choices are regarded as superior to those of planners. In the simplest model, the state gives students tax-funded vouchers which they spend at the institution of their choice, thus to some extent obviating the need for a central planning apparatus. To facilitate neutrality between external and in-house training, it should also be possible for trainees to 'spend' their vouchers on in-house training, though such a policy would require a regulatory regime to ensure quality. The approach is very flexible. It is possible (and desirable) to give larger vouchers to students from poorer backgrounds. If it is thought that some subjects (nursing, perhaps) are less suitable to competitive behaviour by institutions than others (banking, business studies) it is possible to issue vouchers tied to subjects (or institutions) which one wishes to protect. Vouchers can also be issued by firms, for instance tenable at a local institution.

Vouchers are thus a decentralised allocation mechanism whose flexibility is insuffiently appreciated. Training vouchers and higher-education vouchers are two options. Vouchers could pay some of the costs of training or the whole cost; could pay for external and/or on-the-job training; could vary by socioeconomic group (i.e. could be larger for young people from poorer backgrounds); could vary by educational background; could vary by the type of training being taken; could be higher for disabled people, and so on.[4]

2 APPROACH AND METHOD

2.1 Method of Investigation

This paper uses a microsimulation model to investigate a range of funding sources, including (a) loans, (b) the introduction of a graduate tax, and (c) user charges for employers. A complete evaluation of the distributional implications of these different schemes requires examination not only of the annual costs and benefits, but also of the impact over an individual's life-cycle. What is the average repayment period for someone receiving full-time male industrial earnings? How will this vary under different assumptions concerning real interest rates and real earnings growth? What does the distribution of repayments look like? Who are rapid repayers? Which groups of people will fail to repay the loan within a certain period given their diversity of labour market experiences, non-waged caring responsibilities and other demographic characteristics?

To answer such questions we require information on a range of characteristics, not just at a single point in time but across the life-cycle. No such source of longitudinal data

exists. Even where longitudinal surveys have been carried out,[5] the information is only for periods within the life course, not complete life histories. Economists have frequently attempted to estimate lifetime profiles or functions using a range of econometric and simulation techniques (e.g. Blinder, 1974; Lillard, 1977). While such approaches have shed light on particular aspects of lifetime profiles, they have all failed to a greater or lesser extent to capture the enormous degree of change in the circumstances of individuals over time. For example, plotting the life-cycle earnings profile of married men fails to take into account the fact that very few men stay constantly married and constantly in the labour force for their entire lives. But it is precisely these changes in marital and employment status which affect in important ways an individual's ability to repay a loan.

An alternative modelling option which endeavours to incorporate the diversity and constant change in the circumstances of individuals lies in dynamic microsimulation models. Microsimulation is the synthetic generation of data about social and economic 'micro' units. This paper relies on a dynamic cohort microsimulation model -- LIFEMOD -- to provide the necessary longitudinal element.

More detailed information about the model is given in the Appendix. However, it is perhaps important to say here what LIFEMOD is *not*, and what its results are not intended to be. First, although based on actual data for 1985, it is not a model of the *actual* British population in 1985 nor of redistribution between individuals in that year. Nor is it a *projection* of what will happen to cohorts of individuals alive or born in that year.[6] Instead, it represents what would happen to a single cohort if they lived their entire lives under demographic and economic conditions as they were in Britain in 1985.

2.2 Investigating Alternative Financing Options

This section briefly outlines the properties of each scheme as we have modelled them.

Loans. Section 3 analyses loans for full-time and part-time students in (a) advanced further education and higher education, and (b) non-advanced further education. It is assumed throughout, that all full-time students and 50 per cent of part-time students take out a loan, and that each borrows £1000 (a figure which can be rescaled to show different policy options) for each year of his/her studies. Three variants of loans are investigated.

- The first case is a pure mortgage scheme, under which students borrow £1000 which they repay in 10 equal instalments at a zero real interest rate.[7]

- The second scheme is the current UK government loan scheme for higher education. It is the same as the previous case, except that repayment is suspended in any year in which the individual's annual earnings fall below 85 per cent of the national average for full-time male employees.

- The third type of scheme is an income-contingent loan in which students borrow £1000, with repayments in the form of an additional 1 per cent on their national insurance contributions (NICs),[8] with repayment stopping once the loan, plus any interest, has been repaid. It is envisaged that the income-contingent scheme would be operated as an extension of the national insurance scheme, with repayments withheld at source alongside the main NIC.[9]

The three cases are investigated assuming real earnings growth of zero, 1½ and three per cent per year; and the income-contingent scheme is investigated for different real rates of interest charged on loans (zero, one, two and three per cent).

No loan scheme will have 100 per cent compliance. NICs are known to have a default rate of one to 1½ per cent. The rate is low partly because most NICs are deducted at source by employers. In addition, and importantly, there is little *incentive* to evade contributions; anyone who does evade is generally forgoing present or future benefit, in particular pensions. Furthermore, the administrative cost of such repayments will be small because collection is 'piggy backed' onto an existing, well-functioning system. Mortgage loans have none of the desirable built-in incentives of NICs. Schemes like the main federal schemes in the USA are well-known to have high default rates. Looking only at higher education, 'about 13% of students default on repayments and the federal government has $1.5 billion per year in bad debts.... The amount by which [students] default is often large, even though their total numbers are relatively small' (UK Department of Education and Science, 1989, para. 94; see also US, 1988, p. I-118; Reischauer, 1989). In addition, and separately, mortgage loans have high administrative costs, especially when (as in the UK) their administration is on a stand-alone basis. The estimates presented below assume a default rate of 10 per cent for the pure mortgage loan and the government scheme, and of 1½ for the income-contingent scheme.

A graduate tax. Section 4 investigates a graduate tax of one per cent of taxable income below the national insurance upper earnings limit for all persons who have attended at least two years of post-18 education or two years of certain types of non-advanced further education. This is directly equivalent to the repayments levied under the income-contingent

loan scheme just described, except that repayment continues for the entire working life of the individual. The default rate, once more, is assumed to be 1½ per cent.

Employer user charges. A key question is the likely yield of a user charge on employers of 1 per cent of the taxable income of skilled men/women under different assumptions about (a) their levels of income, and (b) the number of years they participate in the labour force. Section 4 therefore investigates a user charge of one per cent added to the national insurance contribution paid by employers for all employees with at least two years post-18 education and certain types of non-advanced further education. Unlike the graduate tax it is payable on *all* gross income, i.e. it is not limited to earnings below the NIC upper earnings limit. In doing so, it parallels the operation of national insurance contributions *per se*.

By using a simulation model it is possible to estimate repayment patterns for loans and the tax yield from a graduate tax or employer user charge based on data about individuals, such as the educational attainments of borrowers, their labour force participation behaviour, their marital status and family size, and the like. Thus, we look at the effect of the different schemes on individual borrowers as well as the distributional implications for the wider society.

Vouchers. Once we have obtained an estimate of the resources available, it is possible to investigate the effect of introducing vouchers either for the whole range of 16+ education/training activities or for a subset, including training vouchers for different qualifications under different assumptions. Of particular interest are different assumptions about the share of education/training costs (a) between the taxpayer on the one hand, and individuals and employers on the other, i.e. the extent to which there would be a continuing taxpayer contribution to costs, and (b) between the trainee and his/her subsequent employer, i.e. the respective contribution to costs by trainees (mainly, via loans, out of their future earnings) and by employers (mainly via a user charge).

3 RESULTS 1: ALTERNATIVE LOAN ARRANGEMENTS

3.1 Students in Higher Education

Table 1 shows the results for full-time students in advanced further and higher education for the three main types of loan scheme under different assumptions about the underlying rate of real earnings growth for all students (Table 1A), men (1B) and women (1C). The first column shows the proportion of *individuals* who have repaid their loan in full by retirement: any loan still outstanding at that stage is assumed to be written off by the government who is the guarantor of last resort; likewise the government absorbs the outstanding loan of

people who die before statutory pensionable age. This column is equivalent to a headcount measure which we term the *debtor count*. The second column provides a measure of the proportion of the total *debt* that the cohort as a whole repays, i.e. it measures the *debt-gap*. There is an exact equivalence in columns (1) and (2) with notions familiar in the poverty literature of a headcount measure of poverty (i.e. *how many* people are poor) and a poverty gap measure, which shows by *how much* people in total fall below the poverty line. The third column presents the average repayment period for individuals who repay in full. Inclusion of people who fail to repay in full would bias the mean repayment duration upwards. The last column shows loan repayments as a proportion of gross earnings for each scheme, i.e. it provides a measure of the burden of repayment imposed by the loan.

In all cases the size of the loan is £1000 (in real terms) per year of study. The figure was chosen because it is easy to rescale. However, it is worth noting that in 1985 full-time male average earnings were £190 per week, so a £1000 loan is somewhat over 10 per cent of average earnings. Thus a 3-year undergraduate leaves with debt of about 30 per cent of average male earnings, not an insignificant sum. The average loan for full-time students, taking account of two-year advanced further education courses and dropping out, was £2880, or about £4250 in 1993 prices.

Full-time students in advanced further and higher education. Table 1A presents the results for full-time students.

The benchmark case illustrates the situation for men and women assuming zero real earnings growth. Under the government scheme, seven out of ten borrowers repay in full (column (1)), compared with just over five out of ten under the income-contingent scheme. With zero earnings growth, therefore, only 53 per cent of people fully repay the income-contingent loan. The picture in column (2) is strikingly different: using the fraction of total borrowing which is repaid as a performance indicator, there is virtually no difference between the two schemes, each of which collects just below 80 per cent of total loans.

This result merits explanation. Under the government scheme, repayment is zero for people with incomes below 85 per cent of the national average; otherwise it is 10 per cent of the loan. In contrast, the income-contingent loan, precisely because it *is* income-contingent, allows people on lower incomes to make small repayments. Because repayments are lower, more people do not repay in full (column (1)). But the income-contingent loan collects repayments (albeit often low ones) on earnings above the lower earnings limit for NICs (£56 per week in 1993-4), whereas the government scheme collects only from people

whose earnings exceed 85 per cent of the national average (about £200 per week in 1993). Because the income-contingent scheme collects repayments in the £56 - £200 range, the debt gap to which it gives rise is no larger than that of the government scheme. Under the assumptions of Table 1 (in particular zero real earnings growth), both schemes could operate with a government guarantee of slightly over 20 per cent.

The average repayment period (column (3)) is 17 years for the government scheme, given the provision that repayment is suspended for people earning less than 85 per cent of the national average. Under the income-contingent scheme it takes an average of 28 years to repay. The longer repayment duration under the income-contingent scheme is a point in its favour. In efficiency terms, repayment should be spread over the life of the asset. Thus repayments should be spread over five years for new car, whilst for a university degree or similar long-lasting qualification they should be distributed over the entire duration of labour market activity. It is *not* a recommendation of the government scheme that it brings in repayment faster.

Because the government scheme is spread over a shorter period, repayments constitute a much higher proportion of income (column (4)) than under the income-contingent scheme (2.3 per cent compared with 0.9 per cent). Like any conventional mortgage loan, the scheme involves 'front-loading' of repayments, i.e. requiring high repayments at a time in the life cycle when income is low relative to later years.[10]

Earnings growth of 1½ and 3 per cent is investigated in the middle and lower parts of Table 1A. With mortgage schemes, repayment depends little, if at all, on earnings; thus repayments are higher and/or faster under the government scheme only to the extent that more people creep over the 85 per cent threshold. In contrast, earnings growth transforms the performance of income-contingent schemes, since repayment depends very directly on earnings. Repayments rise to 85 per cent of total lending (column (2)) with 1½ per cent earnings growth, and to nearly 90 per cent with 3 per cent earnings growth compared, in both cases, with about 79 per cent for the government scheme. In principle, the income-contingent scheme could operate with only a 10 per cent guarantee. It should be noted that real earnings growth of 3 per cent is not implausible: individual earnings rise over time both because the overall structure of earnings increases *and*, because of life-cycle effects, as individuals move up their pay ladder. The Government Actuary's estimate of long-run *overall* annual earnings growth is 1½ per cent is entirely compatible with 3 per cent growth in *individual* earnings.

Alternatively, with 3 per cent earnings growth, loans could pay a real interest rate of 2 per cent and still yield almost as much in repayments as the government scheme (which charges no real interest). At first sight, the results in Table 1A are curious: with zero earnings growth and a zero real interest rate, 79 per cent of total loans are repaid under the income-contingent scheme; with 3 per cent earnings growth and a 2 per cent real interest charge, only 76.4 per cent of loans are repaid. On the face of it, with earnings growth higher than the interest charge, the proportion repaid should rise, not fall. The reason why the effect of the interest effect dominates is that the interest charge applies to *all* borrowers, whereas the earnings increase, so far as loan repayments are concerned, is irrelevant to significant groups: those outside the labour force; those with earnings below the national insurance lower earnings limit; and those above the national insurance upper earnings limit. One of the great advantages of basing analysis on the experience of large numbers of individual borrowers is that it uncovers such effects.

Differences between men and women are significant. Under the income-contingent scheme, men are seen by lenders as good risks (Table 1B). The debtor count is low, although higher than for the government mortgage type model. Even with zero real earnings growth, men repay 90 per cent of total borrowing under the income-contingent scheme (column (2)), somewhat higher than for the government scheme. A ten per cent guarantee would cover the shortfall. With three per cent earnings growth, men repay 94 per cent of their total borrowing. Given the high proportion of men who repay their loan in full, the effect of earnings growth is more to speed up repayment than to increase the number of men repaying; the average loan duration falls from 28 years with no earnings growth to 21 years with 3 per cent growth.

Women (Table 1C) represent a much greater risk. Over half repay in full under government scheme, but only 22½ per cent under the income-contingent scheme (column (1)). Looking at the debt gap, however, we find again that women's total repayments are almost as much under the income-contingent scheme (65 per cent) as under the government scheme (68 per cent). With men the effect of earnings growth was mainly to speed up repayment of income-contingent loans. With women, in contrast, the effect of 3 per cent earnings growth is dramatically to increase the proportion who can repay their income-contingent loan in full (from 22½ per cent to nearly two-thirds); and the debt gap is smaller for women under the NIC scheme, women repaying over 80 per cent of their total borrowing, compared with 67 per cent under the government scheme.

Part-time students in advanced further and higher education. Table 2 is entirely analogous to Table 1 except that the borrowing population now includes part-time as well as full-time students. It is assumed that all full-time students and 50 per cent of part-time students take out a loan.[11] The comparison between Tables 1 and 2 is revealing.

The major conclusion is that the addition of part-time students has a fairly small but significant effect. There are two differences from earlier discussion: (a) relatively more women than men study part time; and (b) loans tend to be smaller because they are taken out for a shorter study period (the average loan for full-time and part-time students together is £2500, i.e. £300 less than for full-time students). The effect of (a), *ceteris paribus*, is to reduce the fraction of loans repaid; the effect of (b) is to increase the proportion repaid. For the government scheme, the first effect dominates: the proportion who repay in full (column (1)) falls from 71 per cent to two thirds, and the proportion of the loan repaid (column (2)) from 79 per cent to 77 per cent. For income-contingent loans, the second effect dominates, the fraction of total loan repaid *rising* from 79 to 81 per cent.

This is an important result -- that income-contingent repayments perform better for part-time students. The reason is the large number of (mainly) women whose repayments under the government scheme are deferred under the 85 per cent rule; the income-contingent scheme, in contrast, collects at least some repayment from people with earnings between the national insurance lower earnings limit and 85 per cent of average earnings.

Similar reasoning applies to the average repayment period. Factor (a) dominates for the government scheme, for which the duration of the loan rises very slightly, from 17.3 to 17.8 years. For the income-contingent scheme, (b) dominates, so that the average repayment period *falls* from 28.3 years to 25.5 years.

The effect of earnings growth, as before, is to improve the performance of the income-contingent scheme. With 3 per cent earnings growth, 90 per cent of lending is repaid, compared with about 77 per cent under the government scheme. Put another way, income-contingent loans could match the repayment rate of the government scheme and, in addition, could pay a 2 per cent real interest rate (Table 2A, column (2)). Figure 1, which applies to full- and part-time students in advanced further and higher education, shows cumulative repayment for the government and income-contingent schemes, assuming 3 per cent earnings growth.[12] The striking success of income-contingent schemes in repaying most loans emerges clearly, as does its superiority over the government scheme. For men, the government scheme brings in a slightly larger repayment flow in the earlier years, but the

income-contingent scheme repays more in total. For women, the income-contingent scheme produces a more rapid repayment stream from the first and, as the lower part of Figure 1 makes very clear, brings in considerably more in total repayment. What this shows (unsurprisingly) is the superiority of income-contingent repayments for groups with lower incomes. Harding's (1993) study of the operation of the Australian system produces very similar results.

3.2 Differing Individual Experiences

The differing duration of repayments. So far, the analysis has looked at the mean case. Figure 2 relates to full and part-time students (i.e. to the same population as Table 2), and shows the distribution of repayment duration for people who repay in full.[13] In the government scheme (Figure 2A) over a fifth of men repay the original loan in 10 years, compared with only 3 per cent of women. The distribution of repayments is highly skewed for men, whilst for women it is close to uniform. This is because women are more likely to experience lower earnings and so qualify for a repayment 'holiday' under the 85 per cent rule.

For the income-contingent scheme (Figure 2B), repayment duration for women again appears to be roughly uniformly distributed, although with a higher mean than the government scheme. For men, there is a heavy clustering of repayments between 25 and 30 years. The few individuals who complete repayment in under 20 years have less than three years of loans and/or earnings at or above the national insurance upper earnings limit.

Who are the fast and slow repayers? Tables 3 and 4 show some selected socio-demographic characteristics for the fast and slow repayers. Fast repaying men are defined as those who complete repayment within two-thirds of the mean duration; slow repayers are defined as those with part of the loan still outstanding after one-and-a-third times the average duration.

Table 3 shows that men who repay within two-thirds of the mean duration are likely to have higher life expectancies (77 years) than all graduates (71), and graduates in turn are likely to live longer than their non-graduate cohort counterparts (71). Although male graduates in general spend an average of 33 years in full-time employment compared with 36 years for non-graduates, the rapid repayers have on average 41 years in the labour force. They also experience significantly lower rates of unemployment. Even so, the rapid repayers can still expect to spend 3.8 years out of work.

The main cause of slow repayment by men is the duration of unemployment: slow repayers experience 8½ years of unemployment; those who never repay are unemployed for 9 years, nearly twice the cohort average. Slow and never repayers also spend much longer out of the labour market altogether. Slow repayers include individuals with postgraduate qualifications, who have longer out of the labour force, are older when they enter, and have higher loans.

Amongst women there were no rapid repayers when defined as 2/3 of the mean duration. Table 4 shows the characteristics of (a) women who had repaid their loan within one and a third of the mean duration i.e. non-slow repayers and (b) the rest. The most striking characteristic here is not unemployment but the impact of child bearing. Fewer faster repaying women have ever had children than their slower paying counterparts; and they also experienced fewer years with a child under age 16. The experience of lone parenthood was significantly higher amongst slow payers than faster payers. Of all the women in the LIFEMOD cohort, 37 per cent experience lone parenthood, the average duration being 3.4 years. Amongst slow repaying women both proportions are slightly higher. Slow repayers also experience fewer years of full-time employment (17.8). Women in the cohort in general spent an average of 20 years in full-time work and a further 9 years in part-time work.

Illustrative individual cases. Figure 3 presents the loan liability profiles for eight LIFEMOD men and women. It should be stressed that these are eight *actual* individuals. They illustrate the variety of repayment patterns underlying the averages presented above.

Both man 1 and man 2 are examples of rapid repayers. They both repay an income-contingent loan within 20 years of leaving full-time education. Man 1 attended a state secondary school, leaving at 18 with one 'A' level. He worked full-time or two years before attending a college of further education to study for an HND at age 20. Upon leaving college he re-entered the labour force. He marries at 24 and has three children (when he is 26, 27 and 30). By his late 20s his gross pay was around £200 per week (1985 prices). When he is 33 he divorces, and he remains single until he is 39 (the year after he makes his final loan repayment).

Man 2 is the son of a university lecturer and a primary school teacher. He went to private school and left at 18 after passing 'A' levels. He went straight to university, taking out a loan of £1000 when he was 18, 19 and 20. He left full-time education with a £3000 debt and immediately entered full-time employment. At age 25 he got married, and by his

mid 20s was earning above the national insurance upper earnings limit. For most of the repayment period he was making the maximum repayment possible, and had repaid the loan in full by age 42.

The common factor amongst male rapid repayers is continuous full-time employment in an above average waged job. Conversely, it is interruptions to employment through unemployment or low paid part-time or temporary work which are the common denominator amongst the slow repayers. This is illustrated by men 3 and 4. Man 3 is in parental social class 4. He left school at 19 and went to university. At age 22 he entered the work-force with a reasonable salary. Initially he followed a repayment path similar to that of man 2, until repayments were interrupted by a spell of unemployment at the age of 31. Over the next ten years he managed to obtain only 23 weeks of work (the longest spell in any year being 10 weeks). At age 41, he got married and re-entered the work force on a full-time permanent basis. After this point he resumed the repayment schedule of man 1 or 2.

Man 4 is also a slow repayer. His repayment schedule is still more uneven. Like man 2, he had parents in socioeconomic group 1. Unlike man 2, however, he went to a state school, leaving at 16, going to a college of further education for one year, and taking 'O' levels. Thereafter, he worked full-time in low waged work (£50 per week). At age 20 went back to college for 2 years. Upon leaving he got a well-paid job (£180 per week), but was made redundant after a year. Over the next two years he found temporary casual employment for a total of 28 weeks. At age 25, he once again found full-time employment, and for the next 2 years worked continuously. At age 27 he again became unemployed, a spell which lasted until he was 33. Thereafter employment was intermittent until another long spell out of the labour force between ages 41 and 46. He re-entered employment through yet another temporary job, but then spent 15 years in the same job until 'retiring' at age 63. It was during this last spell of continuous work that he was finally able to pay off the outstanding part of the loan, making the last repayment in his last year of employment. He never married or had children.

Whereas for men it is unemployment or periods of low pay which result in slow repayment, for women it is often child care responsibilities. Interestingly, as shown in Table 4, it is not the presence of children *per se* which appears to be the dominant factor but rather the number of parents present.

Woman 1 had parents in socioeconomic group 4. She left school at 16 and spent two years at a further education college, where she took 'A' levels. She then continued in

education at a further education college, obtaining an HND at age 20. Woman 2 attended state school until 18, and then went to university. She never married or had children. She has a repayment profile very similar to man 2, the only difference being that she takes one year longer due to a temporary gap in earnings when she changed jobs at age 33. Woman 3 has an educational history similar to woman 2. She marries at 26 and gives birth to her only child at age 29. She divorces at 35, when the child is six. The then experiences a period out of the labour market, re-entering at age 40. She is employed full-time for 2 years and then part-time until age 54, when her child reaches 16. She then recommences full-time work and repays rapidly, making her last loan payment when she is 58.

Woman 4 comes from socioeconomic group 6. She marries when at university and has her first child just after graduating, and a second three years later. She divorces at age 27 and spends 15 years as a lone parent. During this time she works part-time, and for most of the period her earnings are below the NIC lower earnings limit, so that she makes few repayments. At age 42 she begins full-time work again and from then on resumes continuous repayments, paying off the loan in full by age 58.

3.3 Students in Further Education

Table 5 shows the situation for full-time and part-time students in non-advanced further education. The assumptions are the same as for Table 2. Take-up is 100 per cent for full-time students and 50 per cent for part-time students; since part-time students in this case are the majority, the average take-up rate is closer to 50 per cent than to 100 per cent. The assumptions about default rates, are also identical to those in earlier tables. There are two major differences in comparison with advanced further and higher education shown in Table 2: (a) the average loan, £1541, is about £1000 smaller, i.e. there is a mix of one- and two-year students, and (b) the relevant earnings profiles are much more heterogeneous.

The pattern of repayments in Table 5A is strikingly different from that for higher education.[14] First, a much lower proportion repay in full, despite the fact that the loan is smaller -- 42 per cent of borrowers repay under a hypothetical extension of the government scheme to this group, and 62.4 per cent under the income-contingent scheme. Second, a much lower proportion of total borrowing is repaid under the government scheme (52.5 per cent, compared with 77 per cent for advanced further and higher education).[15] Third, however, a *larger* fraction is repaid under the income-contingent scheme (85.5 per cent, compared with 81 per cent for advanced further and higher education). Again, the income-contingent arrangements perform significantly better because they collect at least some

repayment from people with earnings between the national insurance lower earnings limit and 85 per cent of average earnings.

The difference is even more dramatic if we look at the figures for men, who repay 72 per cent of total borrowing under the government scheme and nearly *96 per cent* under the income-contingent scheme (Table 5B, column (2)). Women repay 38 per cent of total lending under the government scheme and 78 per cent with income-contingent repayments.

The effect of earnings growth further improves the performance of income-contingent schemes. With three per cent earnings growth and a zero real interest rate, men repay 97.4 per cent of total borrowing (72.4 per cent under the government scheme) and women 91.7 per cent (38.5 per cent under the government scheme). With three per cent earnings growth, men could pay a real interest rate of 2 per cent and still repay 95 per cent of total borrowing. Figure 1 showed the cumulative repayment stream of students in higher and advanced further education, the main lesson being the effectiveness of the income-contingent mechanism in faciliting repayment from people with lower incomes. The lesson is reinforced by Figure 4, which gives the analogous results for students in non-advanced further education, again assuming 3 per cent earnings growth and a zero real interest rate. Two results from Figure 4 are very striking: the extent to which students in non-advanced further education repay their loans; and the superiority of the income-contingent scheme over a hypothetical extension of the government higher-education loan scheme to this group of students.

Figure 5 shows the variation in the duration of repayment. Under the government scheme, repayment is protracted for both men and women: most men repay within 30 years; for women there is still a significant tail repaying up to 40 years. Given the relatively lower earnings of this group, the fact that the income-contingent scheme can collect repayments on earnings above the national insurance lower earnings limit but below the threshold at which repayments are due under the government scheme means, as Figure 5B shows, that repayments come in somewhat *faster* with the income-contingent scheme, particularly for men.

4 RESULTS 2: GRADUATE TAXES AND EMPLOYER USER CHARGES

We have analysed loans in order to compare income-contingent arrangements with the existing scheme. This section briefly discusses two additional, but separate, options.

Graduate taxes could be used *instead* of a loan scheme; employer user charges could be used *in addition* to either a loan scheme or a graduate tax.

Advanced further and higher education is illustrated by Table 6 (full-time students) and Table 7 (full-time and part-time students). Again, comparison between the two tables is revealing.

A graduate tax of one per cent would repay 103 per cent of total borrowing in the case of full-time students (Table 6), compared with 79 per cent if repayment ceased once the loan was repaid (Table 1A). Thus with a graduate tax, assuming zero earnings growth, richer graduates repay 25 per cent more than they would under a loan. The yield increases to over 140 per cent of the cohort's borrowing with earnings growth of 1½ per cent, and to nearly twice total lending with 3 per cent earnings growth.

Table 7 includes part-time students, with significant effects. Part-time students borrow less than full-time students but have broadly similar earnings profiles. Thus their inclusion raises the return to a graduate tax to 133 per cent of the equivalent loan at zero earnings growth, and to 250 per cent with 3 per cent earnings growth.

Employer user charges, in the case of full-time and part-time students yield over 1½ times as much as an equivalent loan at zero earnings growth, rising to 3 times total lending if real earnings grow at 3 per cent. A possible implication is a user charge at a lower rate, say ½ per cent.

Non-advanced further education. In comparison with students in advanced further and higher education, loans for this group are smaller and working life generally longer. Thus graduate taxes and employer user charges have a much higher return than for higher education. A graduate tax repays over 200 per cent of an equivalent loan (Table 8), compared with 133 per cent for higher education (Table 7). The yield of an employer user charge is 221 per cent, compared with 156 per cent for higher education. Again, a possible implication is that investment in non-advanced further education could be recouped through a graduate tax/employer user charge of ½ per cent.

5 RESULTS 3: THE POTENTIAL AGGREGATE IMPACT

5.1 Additional Resources

This part of the paper is intended only to illustrate in the broadest terms what could be done with the additional resources which the previous analysis suggests might be released. The

major purpose is not to make policy recommendations, but to illustrate why the previous discussion is important. We discuss only the case of advanced further and higher education.

The results below can be interpreted in two ways. If students borrow public funds, the savings in public spending will accrue only slowly; thus the figures which follow illustrate the *eventual* annual savings, once the loan scheme is mature. A more optimistic interpretation is that students borrow from private-sector sources (e.g. banks), who receive a partial guarantee from the government. In this case, the public expenditure savings are *immediate*.

Method. The potential annual revenue from loans, *R*, can be calculated as the fraction of total borrowing which is repaid, *r*, times the average amount borrowed by each student for each year of study, *L*, times the number of students in higher education, *N*. Thus:

$$R = r*L*N \qquad (1)$$

1) Suppose that there are 1¼ million students, and that each student borrows £1000 each year he/she is in higher education. Suppose also that 80 per cent of total borrowing is repaid. This is roughly the case for students in advanced further and higher education under the government scheme and the income-contingent scheme in Tables 1A (full-time students) and 2A (full-time and part time). Thus, N = 1¼ million, L = £1000, and r = 0.8. Total potential additional revenue is £1 billion *per year* in steady state, or immediately if students borrow from the private sector.

2) If earnings growth were 3 per cent and borrowers (full-time and part-time) paid a real interest rate of 2 per cent, revenues (Table 2A, column (2)) would be £984 million.[16]

With a graduate tax and employer user charges matters are somewhat different, in the sense that it is unlikely that either of those revenue sources could be privatised in the way suggested for student loans. Thus the numbers below apply only in steady state, i.e. only once the system is fully mature.

3) From Table 7, a graduate tax yields 133 per cent of total lending. Thus the total additional revenue from a graduate tax in steady state would be £1.7 billion per year,[17] and with 1½ per cent real earnings growth, about £2.3 billion per year.[18]

4) The same logic applies to employer user charges. With zero earnings growth the annual yield of an employer user charge in steady state would be about £2 billion (Table 7),[19] and with 1½ per cent earnings growth, £2.7 billion.[20]

In all these cases, if the number of students in higher education expands and/or if loans are extended to broader classes of student, the potential revenues are commensurately higher, and similarly if the user charge were extended to more workers.

Total additional revenue. The low-case scenario is the government scheme. From (1), above, additional revenue would be £1 billion once the scheme was mature. That, however will be a long time. On the government's own figures (*Hansard* (Written Answers), 24 July 1989, col. 441), it will take 25 years to work off the cumulative deficit of earlier years; and even that figure is an understimate, in that it ignores the interest charge on the deficit years and assumes 3 per cent real earnings growth. Alternatively, if the same scheme were financed from private sources, there would be an immediate public expenditure saving of £1 billion per year in 1985 prices. Since the retail price index rose by 47.3 per cent between January 1985 and January 1993, the low-case yield is therefore about £1.5 billion in 1993 prices.

A middle scenario would be to assume 3 per cent earnings growth; a 2 per cent real interest rate on loans; borrowing of £2000 per year (i.e. doubling the size of the loan); and an increase in the numbers entering advanced further and higher education to 1.5 million. Using the figures in Table 2A, the yield would be about £2.4 billion[21] at 1985 prices, or about £3.5 billion in 1993 prices.

A high-case scenario would be to make the same loan assumption as in the previous paragraph, and to superimpose a 1 per cent employer user charge. From Table 7, with 3 per cent real earnings growth, the yield of a user charge would be £4.5 billion[22] in 1985 prices, or £6.7 billion in 1993 prices. Thus the combined yield in the long run would be over £10 billion.

5.2 What Those Resources Might Buy

We discuss the implications only of the middle-case scenario, assuming that teaching costs in higher education (other than in science or medicine) are £3000 per student per year, and that typical costs in further education are £1800 per year at the cheaper end of the range, about £3000 in the modal case, and around £4500 at the higher end of the spectrum.

Additional resources of £3.5 billion would then *fully* fund the tuition costs of:

- 1.2 million places in higher education for arts or social science subjects, or a similar number of places on an average further education course; or
- nearly 2 million places on a cheaper further education course; or
- nearly 780,000 places on a more expensive further education course.

The money could be disbursed in the form of education and training vouchers. Suppose that students from poorer backgrounds received a voucher for the full cost of fees, and students from better-off backgrounds received less. If the average voucher were for 50 per cent of fees, the number of vouchers would be twice as high as the numbers in the previous paragraph.

If part-time courses cost half as much as full-time courses, and if the average voucher, again, was for half of the cost, then £3.5 billion would pay for:

- 4.7 million 50 per cent vouchers for part-time places in higher education or average further education; or
- 3.1 million 50 per cent vouchers for part-time places in the more expensive range of further education; or
- nearly 7.8 million 50 per cent vouchers for part-time places on the cheaper range of further education courses.

If the typical cost of part-time in-house training is £1000 per year, £3.5 billion would fund 3.5 million such courses, or 7 million 50 per cent training vouchers.

In all these cases, the additional resouces could instead be used to increase quality rather than quantity; or they could be used for a mixture of expansion and the maintenance of quality.

To reiterate, the point of these figures is not to suggest them as specific policy, but to illustrate the scale of activity which could be financed by a fairly modest system of student loans and employer user charges. A major purpose of the results is to offer a toolkit, whereby readers can use the results in the tables to calculate for themselves what the revenues would be under their chosen assumptions about the level of loans and numbers of students, about rates of earnings growth, and about the level and coverage of any employer user charge.

6 SUMMARY

Loans for advanced further and higher education.

- Assuming no earnings growth, the government loan scheme imposes heavy front-end costs, but collects no more in total repayments than the income-contingent loan scheme.

- If loans are offered to full-time and part-time students (Table 2A), 77 per cent of total lending is repaid under the government scheme, and 81 per cent under the income-contingent scheme. This is the result assuming zero earnings growth, which is the least favourable to the income-contingent scheme. Thus the government scheme could operate with a guarantee of just over 20 per cent and the income contingent scheme of just under 20 per cent. If individual earnings grew by 3 per cent annually, the income-contingent scheme could operate with a 10 per cent guarantee.

- Alternatively, with 3 per cent real earnings growth, income-contingent loans could repay somewhat more than the government scheme and, in addition, pay a 2 per cent real interest rate (Table 2A).

- The average repayment period for the income-contingent scheme is 26 years, in comparison with 18 years for the government scheme; the longer repayment period is efficient.

- Women have much lower earnings. Under the government scheme this means that many do not repay. With the income-contingent scheme, lower-earning women can repay at least something: assuming a zero real interest rate (commensurate with the government scheme), though only 27 of women repay in full, they repay two thirds of what they have borrowed (Table 2C). With 3 per cent earnings growth, women repay 84 per cent of borrowings.

- Low or never repaying men experience much higher levels of lifetime unemployment than rapid repayers. In the case of women, the main cause of slow repayment is time spent as a lone parent.

- Income-contingent loans perform much better for part-time students.

- A 1 per cent employer user charge would, in the long run, repay over 150 per cent of an equivalent loan (Table 7).

Loans for non-advanced further education.

- In comparison with students in advanced further and higher education, repayments fall from just over three-quarters of total borrowing to just over half under the government scheme. With income-contingent arrangements, the fact that loans are smaller and the repayment period generally longer means that repayments *rise* from 81 to 85 per cent of total borrowing (Table 5A).

- With income-contingent repayments, men repay 96 per cent of total borrowing and women 78 per cent (Tables 5B and C). With three per cent earnings growth and a zero real interest rate, men repay 97 per cent of total borrowing (72 per cent under the government scheme) and women 92 per cent (39 per cent under the government scheme).

The scope for expansion.

- If students were able to borrow from the private sector, the public-expenditure savings from loans would be immediate, and would not have to wait for many years until the scheme was mature.

- The estimated revenue from a plausible loan regime is £3.5 billion per year (1993 prices).

- These resources could be spent in an infinite number of ways. They would fully fund up to 1.2 million new places in higher education, or 2 million places on a cheaper further education course, and twice the number of vouchers paying, on average, 50 per cent of the costs of education/training.

- If part-time courses cost half as much as full-time courses, the revenue could pay for 4.7 million 50 per cent vouchers for higher education or an average further education course, or nearly 7.8 million 50 per cent vouchers for part-time cheaper courses in further education.

- Alternatively, some or all of the additional resources could be used to improve quality.

Conclusion. Bennett, Glennerster and Nevison (1992a, b) suggested that the *average* rate of return to education for middle-class children has been fairly low. Is it desirable in those circumstances to follow the policies suggested in this paper, namely to introduce a significant element of loan finance into education and training (particularly if the loans pay a positive real rate of interest)? There are several reasons why the present policies are not in conflict with the earlier findings. First, Bennett, Glennerster and Nevison (1992b) found that the rate of return is higher for children from non-professional backgrounds, i.e. the very people for whom access is most important. Second, we know that if entry gates are narrow, middle-class applicants 'crowd out' other students; supply-side expansion of the sort suggested in section 4 widens the gates, to the particular benefit of applicants from poorer backgrounds. Third, figures for the later 1980s suggest an upward trend in rates of return to at least some types of education and training.

The point, however, highlights the need to design policy with considerable care, precisely to avoid deterring both potential applicants and their subsequent employers. The main conclusion is the effectiveness of the income-contingent mechanism in achieving this, through (a) its high repayment yield, despite (b) the low burden it places on individuals. The mechanism makes it possible to achieve a number of desirable objectives simultaneously.

- It raises substantial additional resources for education and training without major reliance on additional tax funding (a desirable result if only because major public expenditure increases on education and training are clearly not on offer).

- It minimises the deterrent to young people to pursue education or training. Moreover, the introduction of loans raises resources which can be used *inter alia* to give the greatest help to those who need it most, e.g. by giving 100 per cent vouchers to groups whom one wants particularly to help.

- It offers employers a way of increasing the supply of trained people without running the risk of paying for training which ends up benefiting a competitor.

APPENDIX: The LIFEMOD Microsimulation Model

This kind of model produces a population which differs in important respects from the actual population, shaped by an amalgam of varying conditions. Figure A1 contrasts the actual age pyramid of the British population in 1985 with the numbers of the 'LIFEMOD 4000' who are 'alive' at each age. The actual age structure reflected the fluctuating pattern of fertility and mortality in earlier parts of the century. By contrast, the LIFEMOD population pyramid is much smoother, and its average age at death is higher. This is because the life expectancy of individuals in LIFEMOD is based on mortality rates as they were in 1985 for each gender, age (up to 96, at which all survivors are assumed to die) and parental social class. A greater proportion of the LIFEMOD sample thus survives to, say, age 85, than of the actual cohort born in 1900, who experienced very different conditions, and higher mortality at each earlier age than was the case in 1985. Throughout the model it should be appreciated that this is a *hypothetical* population; the model shows what the population *would* look like if age-gender specific mortality rates remained at 1985 levels until the year 2080 (i.e. for 95 years) rather that what the population *did* look like in 1985.

The construction of the model is described in detail in Falkingham and Lessof (1991; 1992) and Hills and Lessof (1992). Each individual is followed from birth through to death, experiencing major life events such as schooling, tertiary education, marriage, childbirth, employment and retirement. Ageing of the cohort is achieved through explicit modelling of the demographic and socio-economic process. Because the attributes of each person at time *t+1* are determined using the attributes at time *t*, the cohort is aged 'dynamically' rather than 'statically'. This ageing is based on the probabilities of the various demographic and other transitions occurring. These probabilities are estimated from official statistics, sample surveys and other data sources. Transitions between various states are then simulated by using the relevant probabilities allied with Monte Carlo selection processes.

A randomly generated number ranging from 0 to 1, drawn from a uniform distribution, is assigned to the record of each individual for every year (up to and including year 95). Taking mortality experience as an illustration, if the randomly generated number attached to an individual is less than the probability of dying in that year, given the age and sex of the person, then the individual dies and their records are terminated. For example, the death rate for males aged 20 in 1985 was 0.93 per 1000. Since the random numbers are exactly uniformly distributed, two of the cohort males will be selected to die at age 20. However, where the random number exceeds or equals the mortality probability, the person survives to the next year of life. In this way, they become part of the pool 'at risk of death'

in the following year where they are subject to the same procedure (with a new probability of death and different random numbers).

A similar approach is adopted, for example, for entry into the labour-force. The transition probability for any woman is dependent on her age, the age of her youngest child, her previous labour market status, education level and so on. In this instance, once an individual has been selected to be employed via the Monte Carlo process, additional characteristics such as wage or unearned income are subsequently generated using a regression equation.

As discussed earlier, the LIFEMOD cohort is 'born' into, and subsequently lives in, a world that looks like 1985. Although the steady-state assumption results in a highly stylized 'population' it nevertheless provides a useful benchmark against which current government policies, and changes to those policies, can be evaluated. As Summers (1956) noted, the instability of the size of the distribution of income makes data about the lifetime income distribution in the past of little help in analysing lifetime income distribution today, while the future distribution of income is unknown. Summers saw great potential in the construction of steady-state or 'latent' income distributions which would allow answers to questions about lifetime income distribution given *existing* economic conditions.

It is important to note that one effect of this steady state assumption is that the model results are affected by the considerable age, cohort and period effects which are inherent in the transition probabilities applied. Several classic examples of these effects exist. One is that model projections of marriage and fertility may underestimate lifetime rates because of the current trend to delay the age of first marriage. Similarly lifetime education experience may be overestimated, combining the higher rate of entry into tertiary education for 18 year olds in 1985, with those of mature students who did not have the opportunity when they were 18 but are 'returning' to education in the 1980s.

Figure A2 illustrates how the age-specific average full-time male earnings of the LIFEMOD cohort compare with those of the actual 1985 cross-section drawn from the New Earnings Survey (NES). The age-earnings profiles are very similar, although earnings at older ages in the LIFEMOD cross-section are consistently above those in the NES. This reflects the higher educational achievement of the LIFEMOD population compared with the actual UK working population in 1985. Both sets of earnings data show a decline from age 50, and so exhibit the hump-shaped pattern typical of cross-section age-earnings profiles. Note that both these profiles refer to full-time employment.

Figure A3 shows how these earnings profiles vary with educational experience for both men and women in the LIFEMOD cohort. The graph serves to demonstrate the private return to higher education in the form of higher earnings, thus showing the scope for introducing some form of cost sharing. However, it is important to note that these are profiles of full-time earnings and that not all people are fully employed for all of their working lives.

Notes

1. Though the principle is clear, its implementation is far from easy. Neutrality is the appropriate policy only where the different pathways are equally effective in terms, for example, of increasing the individual's productivity. The difficulty of assessing the effectiveness of different courses need not be stressed.

2. Again, this assumes that all relevant alternatives are equally effective.

3. For further discussion of loan regimes, see Barr (1989, 1991) and Barden, Barr and Higginson (1991). On funding issues, more broadly, see Barr (1993).

4. For further discussion, see Barnes and Barr (1988, Ch. 6); Glennerster (1991); Le Grand (1989).

5. Examples include the Medical Research Council 'Douglas cohort', the National Child Development Survey, the OPCS Longitudinal Survey and the Michigan Panel Study of Income Dynamics. For more detailed description, see Duncan (1984), Elder (1985).

6. Harding (1990) discusses the distinction between 'static' and 'dynamic population' models which do achieve these two aims, and 'dynamic cohort' models of the kind described here.

7. The real interest rate is the excess of the rate of interest over the rate of inflation. A zero interest rate therefore implies that the loan is indexed to changes in the price level, but that no interest is charged (an equivalent formulation is that loans attract an interest rate equal to the inflation rate).

8. The repayment is 1 per cent of taxable income below the upper earnings limit for national insurance contributions (NICUEL), for individuals whose earnings exceed the lower earnings limit for national insurance contributions (NICLEL) i.e.:

$$\text{if } E > \text{NICLEL then } R = 0.01*\text{Min}(\text{EARN},\text{NICUEL}).$$

9. The proposal is to make us of the *tax base* for NIC, and to collect the loan repayment *alongside* NICs. There is no presumption that the national insurance authorities would process the individual student loan accounts, which could be handled by some other agency better-equipped to cumulate repayments across large numbers of years. For fuller discussion of the collection mechanism and its relation to the national insurance system, see Barr and Glennerster (1993).

10. Looking at the lifetime earnings profiles of the LIFEMOD cohort presented in Figure A.3, repayments to the mortgage type loan are made predominantly whilst the cohort individuals are at some point on the incline of the earnings profile, before they reach their peak.

11. Each individual student, for each period of continuous study (for instance a degree) is assigned at random to either the 'yes' or the 'no' category. A student in the 'yes' category is assumed to take out a loan each year during his/her course of study; a student in the 'no' category is assumed not to take out a loan during that course. If he/she subsequently embarks on another course, the process is repeated.

12. For comparability with the government scheme, Figure 1 also assumes a zero real interest rate.

13. Thus Figure 2 omits all individuals who do not repay in full.

14. Tables 5A - C were estimated separately for full-time and part-time students. There was little difference in the results, so we show only the tables for full- and part-time students together.

15. As well as modelling a cut off at 85 per cent of *annual* average male earnings, we also modelled the cutoff on a weekly basis. On the annual basis if someone spends six months in work at the national average wage and six months unemployed they would make no repayments; on the weekly basis they would make repayments for half the year. Qualitatively, this would improve the performance of the government scheme. Quantitatively the effect was small: on the annual basis, 52.5 per cent of borrowing was repaid (Table 5A, column (2)); on the weekly basis, repayment rose to 53.9 per cent.

16. I.e. from Table 2A, ICL (2%i) = 78.7 per cent. Thus N = 1.25 million, L = £1000, and r = 0.787.

17. I.e. from Table 7, graduate tax = 132.5 per cent. Thus N = 1.25 million, L = £1000, and r = 1.325.

18.I.e. from Table 7, graduate tax = 181.4 per cent. Thus N = 1.25 million, L = £1000, and r = 1.814.

19. I.e. from Table 7, the employer user charge = 156.4 per cent. Thus N = 1.25 million, L = £1000, and r = 1.564.

20. I.e. from Table 7, the employer user charge = 156.4 per cent. Thus N = 1.25 million, L = £1000, and r = 2.154.

21. I.e. from Table 2A, with 3 per cent real earnings growth, ICL (2%i) = 78.7 per cent. Thus N = 1.5, L = £2000, and r= 0.787.

22. I.e. from Table 7, with 3 per cent real earnings growth, the yield of an employer user charge is 302 per cent of an equivalent £1000 loan. Thus N = 1.5, L = £1000, and r = 3.02.

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Table 1A:

LOANS: ADVANCED FURTHER AND HIGHER EDUCATION: FULL TIME: MEN AND WOMEN

	Proportion who repay in full	Proportion of loan repaid	Mean repayment period (years)	Repayment as per cent of annual earnings
Zero earnings growth				
Pure mortgage	89.3	89.2	10.1	5.9
Government scheme	70.9	78.8	17.3	2.3
ICL[a] scheme	53.4	79.1	28.3	0.91
ICL scheme (1%i)	37.8	69.3	30.9	0.91
ICL scheme (2%i)	22.2	56.3	33.7	0.91
ICL scheme (3%i)	7.4	41.7	34.2	0.91
1½ per cent earnings growth				
Pure mortgage	89.3	89.3	10.1	5.4
Government scheme	70.9	78.6	17.3	1.9
ICL scheme	67.9	84.8	25.3	0.91
ICL scheme (1%i)	59.2	77.9	27.2	0.91
ICL scheme (2%i)	46.2	68.2	29.6	0.91
ICL scheme (3%i)	30.3	55.7	32.3	0.91
3 per cent earnings growth				
Pure mortgage	89.3	89.4	10.1	4.9
Government scheme	70.9	78.4	17.3	1.7
ICL scheme	79.4	88.6	23.2	0.91
ICL scheme (1%i)	71.8	83.7	24.6	0.91
ICL scheme (2%i)	63.7	76.4	26.3	0.91
ICL scheme (3%i)	53.6	66.8	28.3	0.91

SOURCE: LIFEMOD

[a] ICL = income contingent loan

Table 1B:

LOANS: ADVANCED FURTHER AND HIGHER EDUCATION: FULL TIME: MEN

	Proportion who repay in full	Proportion of loan repaid	Mean repayment period (years)	Repayment as per cent of annual earnings
Zero earnings growth				
Pure mortgage	89.0	89.1	10.1	6.2
Government scheme	85.2	87.1	15.0	2.1
ICL scheme	78.4	90.3	27.7	0.87
ICL scheme (1%)	60.0	85.0	31.0	0.87
ICL scheme (2%i)	35.7	74.2	33.7	0.87
ICL (3%i)	11.8	57.4	34.3	0.87
1½ per cent earnings growth				
Pure mortgage	89.0	89.2	10.1	5.6
Government scheme	85.2	87.1	15.0	1.9
ICL scheme	85.8	92.6	23.6	0.87
ICL scheme (1%)	81.8	89.9	26.2	0.87
ICL scheme (2%i)	70.6	85.4	29.4	0.87
ICL (3%i)	49.3	76.0	32.5	0.87
3 per cent earnings growth				
Pure mortgage	89.0	89.3	10.1	5.1
Government scheme	85.2	87.2	15.0	1.6
ICL scheme	90.7	94.0	20.8	0.87
ICL scheme (1%)	87.5	92.2	22.5	0.87
ICL scheme (2%i)	83.7	89.3	24.9	0.87
ICL (3%i)	78.4	85.1	27.7	0.87

SOURCE: LIFEMOD

[a] ICL = income contingent loan

Table 1C:

LOANS: ADVANCED FURTHER AND HIGHER EDUCATION: FULL TIME: WOMEN

	Proportion who repay in full	Proportion of loan repaid	Mean repayment period (years)	Repayment as per cent of annual earnings
Zero earnings growth				
Pure mortgage	89.7	89.3	10.1	5.6
Government scheme	52.9	68.2	22.1	2.5
ICL scheme	22.5	64.8	30.7	0.96
ICL scheme (1%i)	10.1	50.9	30.7	0.96
ICL scheme (2%i)	5.3	37.1	32.9	0.96
ICL (3%i)	1.9	25.6	33.7	0.96
1½ per cent earnings growth				
Pure mortgage	89.7	89.4	10.1	5.1
Government scheme	52.9	67.6	22.1	2.0
ICL scheme	45.5	74.9	29.0	0.96
ICL scheme (1%i)	30.9	63.6	30.5	0.96
ICL scheme (2%i)	15.6	49.7	30.8	0.96
ICL (3%i)	6.6	35.8	30.3	0.96
3 per cent earnings growth				
Pure mortgage	89.7	89.5	10.1	4.6
Government scheme	52.9	67.0	22.1	1.7
ICL scheme	65.3	81.5	27.5	0.96
ICL scheme (1%i)	52.1	73.5	28.5	0.96
ICL scheme (2%i)	38.9	62.4	30.0	0.96
ICL (3%i)	22.2	49.0	30.7	0.96

SOURCE: LIFEMOD

[a] ICL = income contingent loan

Table 2A:

LOANS: ADVANCED FURTHER AND HIGHER EDUCATION: FULL TIME AND PART TIME: MEN AND WOMEN

	Proportion who repay in full	Proportion of loan repaid	Mean repayment period (years)	Repayment as per cent of annual earnings
Zero earnings growth				
Pure mortgage	88.2	89.3	10.6	5.2
Government scheme	66.6	77.3	17.8	2.0
ICL[a] scheme	52.6	81.0	25.5	0.92
ICL scheme (1%i)	40.0	71.1	26.4	0.91
ICL scheme (2%i)	28.1	58.0	26.3	0.91
ICL scheme (3%i)	17.3	43.3	23.4	0.91
1½ per cent earnings growth				
Pure mortgage	88.2	89.3	10.6	4.75
Government scheme	66.7	77.0	17.9	1.70
ICL[a] scheme	64.0	86.8	23.4	0.92
ICL scheme (1%i)	57.0	79.9	24.7	0.91
ICL scheme (2%i)	46.5	70.1	25.9	0.91
ICL scheme (3%i)	34.1	57.3	26.5	0.91
3 per cent earnings growth				
Pure mortgage	88.2	89.2	10.6	4.34
Government scheme	66.7	76.7	17.9	1.46
ICL[a] scheme	73.5	90.3	21.8	0.92
ICL scheme (1%i)	67.6	85.8	22.9	0.91
ICL scheme (2%i)	60.3	78.7	24.0	0.91
ICL scheme (3%i)	52.6	68.9	25.5	0.91

SOURCE: LIFEMOD

[a] ICL = income contingent loan

Table 2B:

LOANS: ADVANCED FURTHER AND HIGHER EDUCATION: FULL TIME AND PART TIME: MEN

	Proportion who repay in full	Proportion of loan repaid	Mean repayment period (years)	Repayment as per cent of annual earnings
Zero earnings growth				
Pure mortgage	88.9	89.9	10.7	5.4
Government scheme	83.9	87.2	16.0	1.9
ICL scheme	73.1	91.5	25.7	0.88
ICL scheme (1%)	57.4	85.8	27.1	0.88
ICL scheme (2%i)	39.7	74.6	27.3	0.88
ICL (3%i)	22.6	58.1	23.4	0.88
1½ per cent earnings growth				
Pure mortgage	88.9	89.8	10.7	4.95
Government scheme	83.9	87.1	16.0	1.64
ICL scheme	78.9	94.0	22.3	0.88
ICL scheme (1%)	75.3	91.3	24.3	0.88
ICL scheme (2%i)	65.9	86.6	26.5	0.88
ICL (3%i)	49.1	76.5	27.5	0.88
3 per cent earnings growth				
Pure mortgage	88.9	89.8	10.7	4.52
Government scheme	83.9	87.1	16.0	1.44
ICL scheme	82.9	95.3	19.8	0.88
ICL scheme (1%)	80.5	93.7	21.4	0.88
ICL scheme (2%i)	76.9	91.0	23.3	0.88
ICL (3%i)	73.1	86.7	26.0	

SOURCE: LIFEMOD

[a] ICL = income contingent loan

Table 2C:

LOANS: ADVANCED FURTHER AND HIGHER EDUCATION: FULL TIME AND PART TIME: WOMEN

	Proportion who repay in full	Proportion of loan repaid	Mean repayment period (years)	Repayment as per cent of annual earnings
Zero earnings growth				
Pure mortgage	87.4	88.6	10.5	4.9
Government scheme	44.9	64.3	22.2	2.2
ICL scheme	27.2	67.3	24.8	0.96
ICL scheme (1%i)	18.5	53.4	23.6	0.96
ICL scheme (2%i)	13.6	39.5	22.5	0.96
ICL (3%i)	10.6	27.8	23.4	0.96
1½ per cent earnings growth				
Pure mortgage	87.4	88.5	10.6	4.45
Government scheme	45.1	63.7	22.2	1.80
ICL scheme	45.5	77.4	25.8	0.96
ICL scheme (1%i)	34.3	66.1	25.9	0.96
ICL scheme (2%i)	22.3	51.9	24.0	0.96
ICL (3%i)	15.3	38.0	22.5	0.96
3 per cent earnings growth				
Pure mortgage	87.4	88.5	10.6	4.07
Government scheme	45.1	63.0	22.2	1.50
ICL scheme	61.9	83.9	25.1	0.96
ICL scheme (1%i)	51.7	76.2	25.8	0.96
ICL scheme (2%i)	39.8	65.0	25.9	0.96
ICL (3%i)	27.0	51.1	24.7	0.96

SOURCE: LIFEMOD

[a] ICL = income contingent loan

Table 3:

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RAPID, SLOW AND NEVER REPAYERS: MEN[a]

	Rapid	Slow	Never
Age of death	77.1	76.8	76.0
Ever married (%)	92.3	75.0	71.1
Age at first marriage	26	22.1	19.4
Ever divorced (%)	53.8	27.5	28.9
Years full-time employment	41	26.0	25.9
Years out of labour force	6.0	12.6	12.5
Years unemployment	3.8	8.5	9.1

SOURCE: LIFEMOD

[a] Respectively, individuals who repay within 2/3 of the mean duration under the income-contingent scheme, within 1 1/3 of the mean duration, or never.

Table 4:

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF SLOW AND NOT SLOW REPAYERS: WOMEN[a]

	Not Slow	Slow & Never
Age of death	70.3	80.1
Ever married (%)	88.7	94.0
Age at first marriage	22.6	24
Ever divorced (%)	35.0	37.2
Ever lone parent (%)	31.8	42.6
Years as lone parent	2.7	4.1
Years with child under 16	14.8	17.2
Years part-time employment	8.0	7.2
Years full-time employment	19.4	17.8
Years out of labour force	10.4	14.5
Years unemployment	1.8	2.4

SOURCE: LIFEMOD

[a] Respectively, individuals who do or do not repay within 1 1/3 of mean duration.

Table 5A:

LOANS: NON-ADVANCED FURTHER EDUCATION: FULL TIME AND PART TIME: MEN AND WOMEN

	Proportion who repay in full	Proportion of loan repaid	Mean repayment period (years)	Repayment as per cent of annual earnings
Zero earnings growth				
Pure mortgage	87.9	89.0	11.3	4.1
Government scheme	42.0	52.5	24.0	1.1
ICL[a] scheme	62.4	85.5	22.3	0.98
ICL scheme (1%i)	55.0	75.7	23.0	0.98
ICL scheme (2%i)	47.1	62.6	23.5	0.98
ICL scheme (3%i)	38.8	47.9	23.5	0.98
1½ per cent earnings growth				
Pure mortgage	87.9	89.0	11.3	3.75
Government scheme	42.0	52.7	24.0	0.87
ICL[a] scheme	73.0	90.8	21.5	0.98
ICL scheme (1%i)	66.3	84.2	22.2	0.98
ICL scheme (2%i)	59.0	73.7	22.8	0.98
ICL scheme (3%i)	51.3	60.2	23.2	0.98
3 per cent earnings growth				
Pure mortgage	87.9	88.9	11.3	3.45
Government scheme	42.0	52.8	24.0	0.70
ICL[a] scheme	78.4	94.1	19.9	0.98
ICL scheme (1%i)	74.5	89.7	20.9	0.98
ICL scheme (2%i)	69.7	82.7	21.9	0.98
ICL scheme (3%i)	62.2	71.8	22.3	0.98

SOURCE: LIFEMOD

[a] ICL = income contingent loan

Table 5B:

LOANS: NON-ADVANCED FURTHER EDUCATION: FULL TIME AND PART TIME: MEN

	Proportion who repay in full	Proportion of loan repaid	Mean repayment period (years)	Repayment as per cent of annual earnings
Zero earnings growth				
Pure mortgage	86.7	87.8	11.6	4.6
Government scheme	62.2	72.4	23.6	1.15
ICL scheme	80.4	95.8	21.0	0.96
ICL scheme (1%)	75.7	92.7	22.5	0.97
ICL scheme (2%i)	68.1	85.6	23.6	0.97
ICL (3%i)	58.0	72.8	24.1	0.97
1½ per cent earnings growth				
Pure mortgage	86.7	87.8	11.6	4.21
Government scheme	62.2	72.4	23.6	0.82
ICL scheme	83.8	96.9	19.0	0.96
ICL scheme (1%)	82.3	95.6	20.4	0.97
ICL scheme (2%i)	79.3	92.7	22.0	0.97
ICL (3%i)	72.8	86.1	23.1	0.97
3 per cent earnings growth				
Pure mortgage	86.7	87.7	11.6	3.89
Government scheme	62.2	72.4	23.6	0.67
ICL scheme	84.6	97.4	17.0	0.96
ICL scheme (1%)	84.0	96.5	18.3	0.97
ICL scheme (2%i)	82.7	95.2	19.5	0.97
ICL (3%i)	80.3	92.2	21.0	0.97

SOURCE: LIFEMOD

[a] ICL = income contingent loan

Table 5C:

LOANS: NON-ADVANCED FURTHER EDUCATION: FULL TIME AND PART TIME: WOMEN

	Proportion who repay in full	Proportion of loan repaid	Mean repayment period (years)	Repayment as per cent of annual earnings
Zero earnings growth				
Pure mortgage	88.8	89.9	11.1	3.6
Government scheme	26.2	38.3	24.9	1.22
ICL scheme	48.4	78.1	24.0	0.98
ICL scheme (1%i)	38.8	64.6	23.7	0.99
ICL scheme (2%i)	30.8	49.2	23.3	0.99
ICL (3%i)	23.9	34.8	22.3	0.99
1½ per cent earnings growth				
Pure mortgage	88.8	89.8	11.1	3.33
Government scheme	26.2	38.4	24.9	0.95
ICL scheme	64.6	86.3	24.1	0.98
ICL scheme (1%i)	53.9	76.6	24.4	0.99
ICL scheme (2%i)	43.3	62.6	23.8	0.99
ICL (3%i)	34.6	46.8	23.4	0.99
3 per cent earnings growth				
Pure mortgage	88.8	89.8	11.1	3.33
Government scheme	26.2	38.5	24.9	0.95
ICL scheme	73.6	91.7	22.5	0.98
ICL scheme (1%i)	67.2	85.0	23.4	0.99
ICL scheme (2%i)	59.7	75.1	24.3	0.99
ICL (3%i)	48.0	60.9	23.9	0.99

SOURCE: LIFEMOD

[a] ICL = income contingent loan

Table 6:

GRADUATE TAX AND EMPLOYER USER CHARGE: ADVANCED FURTHER AND HIGHER EDUCATION: FULL TIME: (as percentage of total loan liability)

	Graduate tax	Employer user charge
MEN AND WOMEN		
Zero earnings growth	103.2	127.3
1½ per cent earnings growth	141.7	176.0
3 per cent earnings growth	198.2	247.3
MEN		
Zero earnings growth	128.9	165.6
1½ per cent earnings growth	178.6	231.0
3 per cent earnings growth	252.2	327.4
WOMEN		
Zero earnings growth	70.3	78.3
1½ per cent earnings growth	94.0	104.9
3 per cent earnings growth	127.7	143.0

SOURCE: LIFEMOD

Table 7:

GRADUATE TAX AND EMPLOYER USER CHARGE: ADVANCED FURTHER AND HIGHER EDUCATION: FULL TIME AND PART TIME: (as percentage of total loan liability)

	Graduate tax	Employer user charge
MEN AND WOMEN		
Zero earnings growth	132.5	156.4
1½ per cent earnings growth	181.4	215.4
3 per cent earnings growth	253.3	302.0
MEN		
Zero earnings growth	167.1	204.0
1½ per cent earnings growth	231.2	283.7
3 per cent earnings growth	326.4	401.7
WOMEN		
Zero earnings growth	87.3	94.5
1½ per cent earnings growth	116.1	125.9
3 per cent earnings growth	157.0	170.7

SOURCE: LIFEMOD

Table 8:

GRADUATE TAX AND EMPLOYER USER CHARGE: NON-ADVANCED FURTHER EDUCATION: FULL TIME AND PART TIME: (as percentage of total loan liability)

	Graduate tax	Employer user charge
MEN AND WOMEN		
Zero earnings growth	208.1	220.8
1½ per cent earnings growth	297.6	316.3
3 per cent earnings growth	436.9	464.9
MEN		
Zero earnings growth	303.6	324.0
1½ per cent earnings growth	442.0	472.9
3 per cent earnings growth	660.7	707.8
WOMEN		
Zero earnings growth	139.4	146.5
1½ per cent earnings growth	193.2	203.1
3 per cent earnings growth	274.3	288.5

SOURCE: LIFEMOD