

INTRA-FAMILY TRANSFERS OVER THE LIFECYCLE

Hugh Davies

Department of Economics, Birkbeck College,
7-15 Gresse St, London W1P 1PA

and

Heather Joshi

Social Statistics Research Unit, City University,
Northampton Sq, London EC1V OHB,
and
London School of Hygiene and Tropical Medicine,
99 Gower St, London WC1E 6AZ

NCDS WORKING PAPER 37

September 1993

Acknowledgements

This work is partly supported under the grant from the Joseph Rowntree Foundation, 'Livelihoods: dependence and independence in the 1958 cohort' to the Social Statistics Research Unit, City University. An earlier version of this paper was presented at the 7th Annual Meeting of the European Society for Population Economics, June 2-6 1993, Budapest.

1. INTRODUCTION

This paper reports on exploratory studies of how three main sources of women's income vary over the life-cycle in contemporary Britain. Two of these income sources are obvious, the labour market and the state. The third possible source is transactions within the family. If couples pool their incomes, and share the proceeds equally, the partner with the lower one will be compensated by half the original difference between them. As it is normally wives who receive less from the labour market plus the state, they would normally be the beneficiaries of income pooling, with husbands notionally paying out of their receipts from the outside world. Husbands' earnings may exceed their wives' for a number of reasons. Of particular interest here are the earnings wives tend to forgo to rear children, given prevailing divisions of labour in parenting. We have previously referred to this as "the earnings opportunity cost of children" (Joshi 1990, Joshi and Davies 1992d). In this paper, we allow for the impact of state transfers, and refer to the couple's "revenue cost of children". Thus the re-cycling of income within the family may not only vary from one part of a couple's life-cycle to another, but can be linked to the process of reproduction, part of the cycle of life from one generation to another.

Within the lifetime of an individual, the lack of earnings after retirement is, to some degree, redressed by transfers from the state and by pensions linked to earnings. We view the latter as a rescheduling of one's own labour market income. When a woman's earning phase is interrupted to rear children her earnings and earnings-related pensions are reduced as a result. This tends to widen gaps between spouses while rearing children and later on in old age. Transfers from spouses who pool incomes would be important during childrearing and also in old age. Widow's pension is another, posthumous, form of intra-couple payment.

In referring to the flows of purchasing power between spouses as transfers, we do not wish to imply that these are mere grants unrequited by an exchange of services. We do not, in practice, directly observe how much household production is being performed, nor do we make any attempt to model it here. Therefore we cannot estimate how much of the income gained in pooling is "earned" by unpaid work, but we do not mean to suggest that none of it is¹. Nor do we give a complete accounting of the (implicit) flows of purchasing power within the family: we neglect any such flows between other kin, such as the older generation, and to emphasise this point we sometimes use the term "spousal transfer".

Our exercise is to quantify how important these payments would be for hypothetical model couples at various stages of the life-cycle and at various different combinations of partners' earning power. The resulting picture of the potential role of the family alongside the State and the market should serve to inform policy debate on such issues as derived rights to social security as well as provide insight into gender relations (Joshi 1993, Ward, Joshi and Dale 1993, Arber and Ginn 1991).

We construct life-time income profiles for illustrative couples to address the following questions:

1. How does the income forgone by parents, the "revenue cost of children" compare with the "expenditure costs" of their consumption?
2. Who loses how much when mothers forgo earnings? How far is their 'sacrifice' shared with the state and their spouses?
3. How much of the gap in spouses's incomes is attributable to the revenue costs of children?
4. Is the intra family transfer greater while children are dependent than in old age?

We also investigate a further question, as a first step toward applying our models to simulated population rather than illustrative individuals. How far the earnings costs of motherhood and their incidence on woman, man and state vary across a distribution of degrees of female labour force attachment?

These questions all pick up hitherto unworked strands from our previous work simulating lifetime incomes and pensions² and blend them with the idea of the within-couple transfer which we made explicit in our exploration of the conventional assumption that couples always pool their incomes (Davies and Joshi 1992a). That work was based upon cross-sectional data on actual couples. When we compute the spousal transfer in this paper, we are not making the assumption that pooling always takes place, but reporting how much the transfer would be if the couple's income were completely pooled.

After a section (2) outlining the method by which our model couples are constructed and comparing our results with independent data from the 1958 birth cohort, NCDS, Section 3 presents our simulation results in order of the questions listed above, and Section 4 introduces our excursion into population simulation.

2. METHOD AND ASSUMPTIONS

We investigate these questions by means of a simulation model. We generate the lifetime earnings of illustrative people from econometric functions, and then apply tax, benefit and pension rules to these simulated gross earnings.

2.1 Participation and earnings

Female participation is modelled by a multinomial logit where the outcomes are "not employed", "employed part-time" and "employed full-time". For present purposes the key variables are age, marital status, numbers and ages of children, occupational grade and non-labour income. A woman is assumed to participate when her probability of doing so is greater than 0.5. Hours simulated for full-time employees are constants depending on occupational grade. For part-timers, hours are estimated by an ad hoc method depending on the ratio of the probabilities of full-time and part-time work. Earnings for participants are obtained from separate wage equations for full-time and part-time jobs estimated by Ermisch and Wright (1991). In the simulation of these equations the model uses dynamically generated work experience. Men are assumed to be employed continuously. The equation we used for male wages is a standard human-capital equation from Wright's and Ermisch's (1991) study of married men and women. No allowance is made for any dependence of men's earnings on their marital status, but Wright and Ermisch's equation is modified at younger ages, by splicing on parameters from Greenhalgh (1980). All the econometric equations were estimated on the assumption of exogenous fertility.

2.2 The individuals

Our model allows for three occupational levels, determined by educational attainment variables. In this exercise we concentrate on couples who have the same skill levels as each other, though we also include the case of a man in a high-level occupation married to a woman in a low-level occupation, a combination which is becoming less common as women's skill levels increase in successive cohorts. The men are given 12.5% more earnings than the mid-level men described in Davies and Joshi (1992b), which brings them closer to average earnings and gives the husband a hitherto typical educational lead within a married couple. Even in couples with the same skill level, men have an earnings lead over their wives due to hours differences, the premium on hourly wages from age differences and the educational lead, as well as the sex discrimination apparent in Wright and Ermisch's data from 1980. In general, we assume that there are no interruptions to earnings histories, apart from those due to childcare responsibilities, as we are focusing on the consequences of reproductive work. Random employment interruptions across the board might alter the

magnitudes involved in pension comparisons, but would be unlikely to change the ranking of the individual cases. Older married women are simulated to switch into part-time employment, but there is no allowance for sickness or unemployment. Our illustrative people are not average people, they are "typical" individuals from a world where uninterrupted male careers are the norm. There are four types of married women in the simulations: women with no, two and four children and a "career housewife" who has two children and does not take any paid work after her marriage. A woman marries at age 20, 22 or 24, depending (positively) on her occupational level. If she has two children these are born three years after marriage, and three years later than that. If she has four children, the first arrives two years after the marriage, and the others at two year intervals. In each case the men are assumed to be five years older than all the simulated women. We adopt this slightly anachronistic assumption so that both sexes retire at the same time. The marriages studied here are lifelong partnerships: even today, 63% of marriages in Britain are not expected to end in divorce. Men are assumed to live up to age 78, and women up to age 81.

Our examples show a somewhat restricted range of inequalities in underlying earning power between spouses. For example, this paper does not include any wife earning more than her husband, though such a situation obtains in about one in ten cases of two-earner couples (12% in our analysis of the 1990 FES). Another test of the realism of our few simulated couples is offered in Table 1. This draws on evidence collected at age 33 of a British birth cohort (NCDS) born in one week in March 1958³. For the women in that sample who were part of a couple with good income data, the share of the wife's income in the couple's joint net income was analyzed by whether or not there were children and the size of the wife's contribution. A summary of the distributions is shown in the top panel. Among both groups of wives, it was only a minority who contributed more than their husbands. Women with children clustered in the bottom third of the distribution, and childless wives in the 30-50% range.

Within these broad ranges we also find the net income shares of most of the simulated wives at age 33. These are shown in the lower half of Table 1. Childless wives' shares range from 31% to 42%, they are all simulated to be employed full-time. Mothers' shares range around 10%, apart from the highly qualified one with two children, who is employed fulltime and contributes 41%. The others draw their income almost entirely from Child Benefit, supplemented in a few cases by very low part-time earnings. It is on the whole plausible that these few cases in the lower panel on Table 1 could have been drawn from the empirical distributions reported in its upper panel. When further analysis of the NCDS data has been completed, it will become possible to compare the simulated histories with the employment trajectories of the cohort up to age 33. For the time being this comparison is encouraging, both because it validates the simulations and because they in turn can give us some idea of what the cohort's lifecycle might look like, projected into an unchanging economic environment.

2.3 Institutional Features

Income tax: the income tax system provides both a personal and a married couple's allowance, both of which are increased for people 65 or over (and increased again at 75). The married couple's allowance is assigned to the man (unless his income is too low to take advantage of it, in which case it is assigned to the woman). There are no tax allowances for having children (except for lone parents, whom we do not consider here). The basic rate of income tax is 25%.

National insurance contributions are paid only on earnings and only by people under National Insurance Pension age. They are levied on the band of earnings between the "lower earnings limit" (LEL) and the "upper earnings limit" (UEL). On our assumptions, employees are, mostly, charged 7% on all earnings⁴.

Child benefit is paid (usually, and always in our hypothetical families) to mothers of

dependent children (here children under 16). It is not taxable and is paid at a higher rate for the first child. For a woman with two children it amounts to £17.45 per week.

National Insurance Basic Pension is a taxable benefit paid to men aged 65 or over and women aged 60 or over. It is not earnings-related, but entitlement is related to the number of years during which earnings have been above the LEL. A married woman who has low entitlement on the basis of her own earnings history (such as our career housewife), has the right to a "Category B" pension based on her husband's earnings history. The category B pension is 60% of the full pension. When widowed, a "Category B" pensioner receives a full basic pension. In the following we count Basic pension as a state benefit. The full basic pension assumed is £54.15.

Earnings-linked pensions.

There is a state earnings-related pension scheme (SERPS). It is possible to "contract-out" of this scheme into a private pension scheme. Most of those who are contracted out are in Final Salary pension schemes. Contributions to final salary schemes are deductible from taxable income. We have assigned each person a default pension type. For men the default is a Final Salary Scheme, except that low-skilled men are assumed to be in SERPS. By default, women are assumed to be in SERPS except for the high-skilled who are assumed to be in a Final Salary scheme. Even for the high-skilled women, however, we assume that periods of part-time work are covered by SERPS, rather than the Final Salary Scheme. Those who are contracted out of SERPS pay a lower rate of national insurance contributions. The benefits payable under SERPS are related to (lifetime) earnings between the LEL and the UEL. In the following we count the contributions payable in respect of SERPS as pension contributions rather than as taxes, and SERPS benefits as pensions rather than state benefits.

Widowhood.

Under both SERPS and Final Salary scheme a survivor's benefit of one-half of the primary beneficiary's annual pension is paid to a surviving spouse.

2.4 Timing.

The simulations reported here take place in a timewarp. There is no inflation or economic growth: earnings levels are calibrated to 1992 levels. We assume that all relevant tax and benefit rates are fixed at their (April) 1992 levels⁵. Rules for tax, benefit and pension schemes are fixed to be those faced by someone entering the labour force in 1992. In particular, we assume that the current National Insurance pension ages for men (65) and women (60) apply in perpetuity.

2.5 Income components, sharing, and equivalising.

We classify income as follows:

- E = gross earnings
- L = labour market income
- U = earnings related pensions contributions (including SERPS)
- P = earnings related pension payment
- W = survivor's pension
- S = net state benefits
= child benefit + basic pension - income tax- (national insurance contributions, excluding SERPS contributions)
- F = family transfer
- N = "own" net income of a partner from external sources
- R = equivalent net income

The annual relationship between these quantities for one of the partners is:

$$\begin{aligned} L_{it}^k &= E_{it}^k - U_{it}^k + P_{it}^k \\ N_{it}^k &= L_{it}^k + S_{it}^k + W_{it}^k \end{aligned} \quad (1)$$

where:

- k = number of children ever born to the family
 - i = h (husband), w (wife)
 - t = year, running from date of marriage until death of longer living partner.
- Income components of a deceased spouse are defined to be zero.

If income pooling takes place, we assume that couples share their annual net incomes equally, and define the *inter-vivos* family transfer as :

$$F_t^k = \frac{(N_{wt}^k + N_{ht}^k)}{S_t} - N_{wt}^k \quad (2)$$

where s_t is the number of surviving members of the partnership.

Thus, in particular, the woman gets the benefit of the average net income of the couple.

$$A_{wt}^k = N_{wt}^k + F_t^k \quad (3)$$

To allow for possible expenditure costs of sharing, and the expenditure costs of children, we divide the average net income of the couple by the appropriate value of the equivalence scale to obtain R_{wt}^k , equivalent net income (which we also refer to as "pooled income"). Hence we define an "expenditure economies" term:

$$e_t^k = R_{wt}^k - A_{wt}^k \quad (4)$$

The expenditure economies term thus depends on both the average income of the couple and the equivalence scale. It will be positive for a couple without dependent children, but may be negative for a couple with children if the expenditure costs of children exceed the economies of sharing. Both the average and the equivalent net income are the same for each partner while both survive.

We make no attempt to estimate equivalence scales, but use administratively determined ones. The equivalent income scales we use here are based on those implicit in Supplementary Benefit, the safety net that applied up to 1988. The first adult in a family counts as 1, any second adult counts 0.59. Children under 5 count 0.22, those older but less than 11 count 0.27, those 11 and 12 count .35, those 13, 14 or 15 count 0.41, and those over 15 count 0.49.

In the following, we will frequently use undiscounted sums of these quantities over parts of the lifecycle. This is not to imply that for particular purposes a zero discount should always be used. As implied above, we define the "lifetime" to run from marriage until the death of the second partner.

3. RESULTS OF SIMULATING ILLUSTRATIVE INDIVIDUALS

The first step computes the lifetime incomes of various model couples, from the time of their marriage to the second death. From this we compute forgone earnings of the mothers as the difference in the lifetime earnings between the identical woman with the specified number of children and none. The result is compared with previous estimates.

3.0 An overview of lifetime incomes

Figure 1 shows the lifetime income profile for our two-child model couples in the cases where both partners have the same skill level. The figures show the net "own" income for both the husband and wife: these are the incomes which each would have under the "no sharing" assumption. Also shown are the average and pooled income per adult. In all the cases shown, the shape of the average income profile is dominated by the shape of the woman's own income profile, which is dominated by variations in her labour force participation and hours. These variations, in turn, are driven mainly by the number and ages of her children. The difference between the own and average lines represents the family transfer assumed to be paid under the pooling assumption. The difference between the average and pooled lines represents the consumption economies. For the high skilled couple, the economies of sharing and the woman's income are sufficiently large that the pooled (equivalent) income exceeds the man's at times when both are in full time employment and they do not have dependent children.

The man's income shows a very high replacement rate in retirement, especially in the mid-level skill case. This is due to a number of factors. At age 65, National Insurance contributions are no longer payable, tax allowances increase, and State basic pension is received. The simulated men's earning histories have no interruptions or job changes, thus producing the maximum possible earnings-linked pension: a level which few currently-retired men have achieved. In our timewarp, pension indexation policies are irrelevant, though we have demonstrated their importance elsewhere (Joshi and Davies 1992c). Proportionately, these effects have their maximum impact on the mid-level skill man, largely because of the ceiling on National Insurance contributions, and the flat rate character of the Basic pension.

When she is widowed, the woman's own income shows a sharp increase, particularly in the middle and high skill level cases. This is due to the survivor's pension she receives under her late husband's pension scheme. For the mid- and high-level skill illustrative cases, over half her income in widowhood comes from this source. While her husband is alive, the woman's standard of living depends on whether income is in fact pooled, but after his death she has a legal right to the survivor's pension. Another difference between this posthumous family transfer and that *inter vivos* is that a widow's pension is subject to income tax. This figure illustrates the importance of a widow's derived rights, whose continuation has been questioned in a draft EC directive (see Lister, 1992).

Table 2 shows undiscounted lifetime totals of the income measures graphed in Figure 1 (and for net State benefits) for the range of families we have looked at. The differences between men and women for the pooled and average measures reflect differences in their lifespan, and the age gap between them. The difference between the average and own net income for an individual is the spousal transfer *inter vivos*. Not surprisingly, the spousal transfer (if it is made) is highest in the cases where there is a large difference in the skill level of the two partners (he with high skills, she with low). Even absolutely, the spousal transfer in the couples where both have high-level skills is smaller than in the case where both have mid-level skills (except in the case of the career housewife). Generally speaking, mothers receive positive transfers from the state over their lifetime: high-skilled mothers whose earnings attract enough tax to outweigh their child benefit are the exception.

While both partners survive, under the pooling assumption both enjoy the same standard of living. For each partner, however, the source of this income appears differently. In what follows, we concentrate on looking at this income from the point of view of the wife. This is partly for economy of presentation, but also because we wish to highlight the effect of children on income and its composition. As Figure 1 illustrates, this is more transparent if we concentrate on income as seen from the woman's point of view. To put it another way: under the "no sharing" assumption, the man's income shows relatively little variation over the lifecycle, but the woman's shows considerable variation. Although we have not shown detailed tables from the point of view of the men in these simulations, it should be remembered that wherever a positive spousal transfer is received, during his lifetime, by his wife, there is a corresponding negative flow on his account.

3.1 Revenue and Consumption Costs of children

Joshi (1990, Table 5) and, among others, Joshi and Davies (1992d, Table 3) presented estimates of a woman's gross earnings cost of children. Table 3 below shows comparable estimates in this case. The absolute amount in pounds varies with the year's currency used, and the evolving details of the model; in Table 3 it is £192 thousand for a mother of two with mid-level skills married to a man at the same skill level. Table 3 also decomposes the gross earnings cost into components due to lost years, lost hours and lost pay. For this case, there is a roughly equal three-way decomposition of these costs into their components. For this particular woman in Table 3, lost earnings are 58% of potential earnings after motherhood, and the forgone total splits 35% lost years, 34% lost hours, while the two components of lost pay, lost experience and the negative part-time premium account for 27% and 4% respectively. In the original article (Joshi 1990), earnings lost amounted to 50% of potential after age 25, and the corresponding decomposition was 38%, 29%, 30% and 3%. The model, though elaborated, has not come too far adrift from its origins. What the present calculations are able to illustrate is that the three-fold decomposition does not apply generally across all types of woman. For the more qualified, and for the unqualified married to a high skilled husband, lost years are proportionally more important than lost hours, though the total loss is smaller for the former and larger for the latter. Lost years have greater salience for mothers of four than for those of two. The hypothetical career housewives have the largest forgone earnings compared to a childless wife who remains in the labour market.

The gross earnings cost of children measures the output (as accounted in the National Income) lost to the economy, approximately⁶, but it does not measure the income loss to the parents. We can now take a broader perspective on the question of the costs of children to take account of the effects of pensions, state taxes and benefits, and the direct costs of children⁷.

Under our assumptions, the revenue costs of children can be shown entirely on the woman's account, for neither the man's earnings nor his net state benefits depend on the number of children. These costs are independent of the amount of income pooling practised by the couple (on the, perhaps improbable, assumption that labour force participation is independent of pooling). We now investigate the extent to which the state tax/benefit system and the internal spousal transfer presumed to be paid under pooling, compensate a woman for these revenue losses.

Whether or not there is sharing *inter-vivos*, the loss in labour market income due to children can be expressed as:

$$\Delta L_{wt}^k = L_{wt}^0 - L_{wt}^k = \Delta N_{wt}^k - \Delta S_{wt}^k - \Delta W_{wt}^k \quad (5)$$

Where the last term on the RHS (the difference in widow's pensions) is identically zero in our cases, and the second term is the compensation which the state tax/benefit system makes to the gross income loss. For illustrative cases of couples with mid-level skills, Table 4, shows the steps involved in moving from the gross earnings cost of children to the net income cost, i.e. the quantities in this equation, together with the prior steps to get from earnings to gross labour market income.

Under the pooling assumption, we can set the revenue costs of children alongside the expenditure costs. In the following, we take no account of any utility which parents may gain from having children. Nor do we consider the utility of the children themselves. Under the conventional income pooling assumption, the costs of children may be measured by the in the equivalent net income enjoyed by a couple without children minus that enjoyed by a couple with children. This cost may be broken down into two components: the revenue cost and the expenditure cost. This cost may be expressed, in terms of equivalent net income, as follows (for the wife, similar for husband):

$$\Delta R_{wt}^k = R_{wt}^0 - R_{wt}^k = \{A_{wt}^0 - A_{wt}^k\} + \{e_t^0 - e_t^k\} \quad (6)$$

Where the first term in braces is the revenue cost and the second term in braces is the expenditure cost. Figure 2 presents lifetime estimates of these costs for our illustrative couples (husband plus wife, "career housewife" cases excluded here). Generally speaking, these estimates suggest that the revenue and expenditure costs of children are about equal, though for the couple who both enjoy high skill levels, the revenue costs are only about a third of the total costs⁸. Note that even under the conventional assumption where period-by-period income is pooled, the lifetime costs are not split equally between the two parents: this would only be the case if they died at the same time. For the illustrative couples reported here, the expenditure costs are borne equally under pooling, for they all happen to be incurred before the man's death.

Here we do not pursue the question of who bears the expenditure costs of children if couples do not pool their income, but turn to details of the revenue costs.

3.2 Who bears the earnings opportunity cost of children?

We have made no attempt before now to estimate who actually forgoes the income that would have resulted from mothers' forgone earnings. To investigate the incidence of the cost involved, we first decompose forgone labour market income into that which is forgone by the State in reduced taxes and increased (child) benefit on the one hand, and by the family on the other. Thus we have:

$$\Delta L_{wt}^k = L_{wt}^0 - L_{wt}^k = \Delta A_{wt}^k - \Delta S_{wt}^k - \Delta F_t^k - \Delta W_{wt}^k \quad (7)$$

Where, again, the last term will be zero on our assumptions. The net income loss would all be borne by the woman if the couple did not pool resources. If they do, we assume they do so completely so that half the gap between his net income and hers is said to be transferred. If these transfers occur, in a marriage which stays intact, the annual income costs (net of taxes and benefits) would be spread equally between wife and husband (while both survived). On this sharing assumption, Table 5 and Figure 3 decompose the lost labour market income of Table 4 into the portion borne by the State, the man and the woman. Generally speaking the division is into three roughly equal parts. Once the state's share is

determined, men and women almost split the difference. The State's share is dominated by the tax and national insurance revenues forgone. For years when both the mother and her childless counterpart are paying tax, this element of the State's share reflects the marginal rate of taxation in the system, set for most at 32%, so this accounts for the order of magnitude in most of the State entries (the exchequer costs of Child Benefit offsetting years of lower tax loss). The split between man and woman is not completely equal although pooling is assumed, and the shares are thereby equal in years when they are both alive. The extra cost borne by the woman occurs after his death, when he is no longer around to share it. If a pooling husband left the marriage while his wife were still alive, either by dying sooner or divorce, the sharing of the earnings cost would be less complete.

The general principle of roughly equal tripartite division of the cost does not apply across the social spectrum. Highly qualified mothers have a greater share of their (lower) forgone earnings borne by the state. The state forgoes more tax revenue because the childless counterpart does not work part-time. Career housewives shift less to the state, because the untaxed tranche of their counterparts' earnings is forgone as well.

Even with no help from their partners, mothers do not personally lose the full amount of their forgone earnings: up to 40% is shifted on the exchequer at these tax and benefit rates. Whether or not they bear the rest of the cost depends upon whether the couple pool their income and for how long. On the assumption of full pooling till his death, nearly half the net revenue cost is borne by the man. For all cases, except the highly qualified women, the woman's own part of the total cost is still the greatest.

3.3 Do the costs of children account for the gap in spouses' incomes?

Our third question relates to the proportion of the gap between spouses' incomes that could be directly attributed to women forgoing earnings forgone over motherhood. Table 6 shows the lifetime transfer from men to women in 12 hypothetical, income pooling, couples. It is half the gap between their net incomes plus widow's pension. The income which is forgone by mothers because of childrearing is the difference between their income and that of their childless counterpart. Therefore the part of the family transfer which arises out of mothers' reduced earnings can be read off as the difference between the two right hand columns of Table 6 and the column for the childless couple. The results are shown in the lower panel of Table 6. This shows that mothers' forgone earnings account for a minor part of the total family transfer. They range from one third to one sixth of the transfers that we assume occur even without childbearing. These are shown in column 1 of the top panel. Their relative magnitude reflects the size of the gender gap in pay, hours, and years of participation in generating income differences. Compared to the combined effects of these factors, differences between women's earnings are rather dwarfed (Joshi 1991 suggested that the effects of sex and motherhood on hourly pay were roughly equal). Although the presence of children intensifies the need for family transfer, any source of inequality between partners' net earnings would create scope for equalizing transactions.

3.4. Transfers between spouses over the lifecycle

The fourth issue we investigate concerns the phasing of income from various sources over the life-cycle. Given the assumption of greater female longevity and unequal partners' ages she faces a longer period in retirement (21 years) than he does (13 years). With a given period of widowhood, we can illustrate the sort of families for whom widow's pension is a particularly important source of income in old age. We also look at the relative importance of *inter-vivos* transfers, if made, while children are dependent compared to other times before retirement. Details of the family transfer, under the pooling assumption, and of how it varies over the life-cycle are shown in Table 7. (Fuller details of income components are in the Appendix) Under the "no sharing" assumption, the woman does not benefit from these transfers (except in widowhood), instead the amounts shown here represent half the gap

between the resources of the two partners. Here we treat a woman's survivor's pension as a "posthumous family transfer" and include it as part of the family transfer. Table 7 confirms the impression given by Figure 1 that this is indeed an important part of the family transfer. During the 8 years of widowhood, our sample women receive almost as much from this source as they would, under the pooling assumption, during their 13 years in a retired couple. For most women with children, the family transfer in old age is somewhat greater than that in the years while there are dependent children. The picture is very different for the low-skill couple, where only about 12% of the total family transfer is received in old age, as against nearly half while there are dependent children. This is because the low skilled man has a much lower pension than higher skilled men. This leads us to look in more detail at the effect of the type of pension provision on the family transfer.

Earning power and fertility are not the only determinants of lifetime income. Another of which we have taken account is the return on pension contributions. We saw above that a much smaller proportion of the lifetime family transfer accrued in old age in the cases of low-skill couples than in others. In the foregoing, we have assigned a default pension type to each person, depending on skill level and sex. In particular, low-skill men were assigned to the State Earnings Related scheme (SERPS), while others were assumed to be in a rather optimistically generous private occupational scheme, of a type to which women tend to have poorer access than men. We now investigate the sensitivity of our results to the assumed pension type. To do this, we now assume that everyone is in SERPS, the state earnings related pension scheme, and compare the time pattern of the putative family transfer under this assumption with that obtained under the default pension type assumptions. The bottom panel of Table 7 shows the results (it does not contain entries for the low skilled couple, both in SERPS under the default). This shows a dramatic change in the time pattern of the family transfer. The proportion of the transfer which accrues in old age for the couples containing more highly skilled members is now quite close to that for the couple with low skills. This is partly because the private pensions scheme we have modelled is more generous than SERPS, but also because the UEL on National Insurance is binding in the case of the more highly skilled, and does not permit them to defer as much of their labour market income into old age (and to their surviving spouses) as the private pensions system. The mid- and high-skill men pay about three times more in pension contributions under the assumed final salary scheme than they would under SERPS.

4. DISTRIBUTIONS OVER LABOUR FORCE ATTACHMENT

The results discussed above and in our earlier work have concerned a "typical" woman. Inevitably the question arises as to how typical she is, and what is the range of variation around her. (See Joshi 1990, Davies and Joshi 1992b). These questions arise particularly when one considers costing a policy change, such as subsidising childcare. Here we take a first shot at simulating the distribution of lifetime earnings and hence of lifetime income.

Our typical woman was assumed to be employed when her probability of doing so was over 50%. We now relax that assumption by generating a number of women who differ in their labour force attachment, but are otherwise identical. For example, in a year when the probability of full-time employment is estimated to be 0.4, and that of part-time is estimated at 0.3, 40% of this population are now simulated to be in full-time employment and 30% in part-time employment. In the simulations reported above, the typical woman would be assumed to be in full-time employment. As a first step, we assume that the level of labour force attachment of each simulated woman is constant over time. The model can be thought of as a "stayer" model.

In this section we confine ourselves to the case of women at the middle skill occupational level, married to men with the same level of skill, and we deal only with the cases of zero and two children. Figure 4 shows the lifetime income profile at quartiles of the distribution

of labour force attachment for women with two children. These show more years of part-time employment, especially in later years than those exhibited by the "typical" case above. The woman at the bottom quartile of attachment takes 14 years out of employment when the children are young and drops out of the labour force when she is 49.

Table 8 shows the revenue costs of children at the mid-points of deciles (and the median) of the distribution of labour force attachment. In calculating these costs each mother has been paired with the childless woman with the same level of labour force attachment. Thus we are setting labour force attachment (though not labour market participation) as independent of fertility. For convenience, a column showing corresponding figures for the "typical" case is included.

The child costs, and their components, peak around the median of the distribution. At high levels of attachment, the mother does not take much time out of the labour force. As compared with her childless counterpart the mother at the 85th percentile of attachment only takes three years out of labour force and a further eight years part-time while she has dependent children. At the other end of the distribution, the childless woman does not spend much time in the labour force: the childless woman at the 15th percentile is only employed for 12 years altogether, and only 5 of these are full-time. At that end of the distribution there is not much in the way of earnings to be forgone by having children. It seems likely that the "stayer" assumption leads to excessively thick tails in the distribution of years worked. Even the childless woman at the 5th percentile of attachment never enters employment at all. She is therefore a much more extreme case than the deliberately constructed extreme case of the "career housewife". Interestingly, the mother of two at the 15th percentile behaves rather like our career housewife: she only takes employment before having children, and after marriage all her employment is part-time.

The woman at the 75th percentile of attachment loses about 60% more gross earnings than the woman at the 25th percentile, but only about 36% more on either of the net income measures. This is a reflection of the importance of child benefit and tax allowances to women with low labour force attachment.

In this example, the "typical" woman experiences higher income losses than any woman in the simulated distribution. This is again because the procedure used for assigning labour force states in the "typical" case gives more years of full-time employment than the method used in simulating the distributions. The "typical" and median woman, however, take a similar number of years out of the labour force.

Table 8 also shows costs of children as percentage of gross earnings and net income in the childfree case. Once normalised in this way, both the gross earnings costs and the net income costs of two children for the "typical" woman are very close to the costs at the median of the attachment distribution. Whereas the absolute gross earnings costs peak in the middle of the distribution, in percentage terms they tend to rise as attachment falls, reflecting the low participation of their childless counterparts.

The earnings loss suffered by the "typical" mother is a bit of an exaggeration compared to average experience (see Joshi 1990, p49), and is still in some respects an exaggeration of cases towards the centre of the distribution.

5. CONCLUSIONS

This paper offers a synthesis of a number of themes upon which we have been working in the past and points us in the direction of further development, in which NCDS should be useful in providing more up to date evidence.

The experiences so far of the generation of women born in 1958 seem to have brought a number of them, at age 33, to around the point on an income trajectory simulated in our central cases. How far their histories to date also fit in with the simulations can be investigated. Their future patterns of earning and dependence on their partners will take longer to be seen. The simulations suggest that in an unchanging world the more highly qualified and those more continuously attached to the labour market (for example the "maternity leavers" identified by Waldfogel (1993)) will forgo rather less earnings (and pension) over their lifetime than some of their contemporaries. For those staying out of paid work to bring up their children, at least, the existence of a derived right in their partner's pension rights will remain important. Further work on NCDS work histories will help to indicate the size of this group.

The answers to our four questions, in brief, are:

1. How does the income forgone by parents, the "revenue cost of children" compare with the "expenditure costs" of their consumption?

Generally, the two are roughly equal, but for couples with high skills, the revenue costs are only about a third of the total costs.

2. Who loses how much when mothers forgo earnings? How far is their "sacrifice" shared with the state and their spouses?

The State pays roughly one third, and the couple split the rest about equally if they pool their income. But this answer varies by skill level: the State pays a bigger fraction for the better-off. Conversely, women are not the only beneficiaries of policies, such as subsidised childcare, which cut the earnings cost of children.

3. How much of the gap in spouses's incomes is attributable to the revenue costs of children?

Not a great deal for these cases. Various sources of inequality between the income of childless partners have been built into the model, and appear to be consistent with the latest evidence from NCDS

4. Is the intra family transfer greater while children are dependent than in old age?

Not with a generous pension system, but much greater with SERPS. The generosity of widows' pensions is particularly important to this conclusion.

Our experiment with estimating the distribution of child costs by labour force attachment revealed that there may be considerable variation in the gross earnings costs of children, but that this is somewhat attenuated by the tax/benefit system. It also suggested the desirability of experimenting with other methods and inspecting more longitudinal data to improve estimates of the tails of the distribution.

All these calculations assume an uninterrupted work history for men. One of the next steps is to relax this assumption. Another line of development would be to model household production, and explicitly recognise the extent to which it provides a quid-pro-quo for the "family transfer" (see Apps and Rees, 1993).

The couples modelled are essentially British. Mothers are less likely than their European counterparts to take paid work when their children are young and more likely to be

employed part-time while they have school-age children (Joshi and Davies, 1992d). The institutions built into the model are also British - tax, Child Benefit paid to the mother and the pension schemes. Nevertheless, the model could be adapted to mimic other countries' experience.

NOTES

1. We are grateful to Patricia Apps for pointing out this possible misconstruction of our terminology.
2. The method builds on the work of Joshi (1990) and has been applied to pensions and divorce (Joshi and Davies, 1991, 1992b), childcare (Joshi and Davies 1992d, 1993) and the interaction between pensions and motherhood (Joshi and Davies, 1992c). The model used here is an extended and updated version of that described in detail in Davies and Joshi (1992a).
3. Thanks to Clare Ward for producing the tabulation
4. We have counted the extra amount paid by employees not contracted-out of the State Earnings Related Pension Scheme as a pension contribution, see below.
5. See Joshi and Davies (1992c) for a discussion of indexation.
6. The lost output is actually greater than the earnings loss since it includes employer's National Insurance Contributions. Offsetting gains in home production have not been quantified either.
7. Joshi and Davies (1991, 1992b) considered pensions, while Joshi and Davies (1993) considered the effect of taxes and benefits. The assumptions used in those papers, however, differed somewhat from each other, and from those used here. We now present a unified set of estimates on a common set of assumptions.
8. This contrasts with an earlier estimate (Joshi 1990, p53) that the (gross) earnings costs of two children are about double the direct costs (based on scales recommended for Foster Care), but it still gives a greater relative weight to foregone income than the US estimates by Espenshade and Calhoun (1986) whose direct cost per child came out more than 3 times greater than the "indirect cost".

References

- Apps P F and Rees, R (1993) Labor Supply, Household Production and Intra-Family Welfare Distribution, paper presented at European Society for Population Economics Conference, Budapest, June 1993.
- Arber S and Ginn J (1991) **Gender and Later Life**, London:Sage
- Davies, H. and Joshi, H. (1992a) Sex, Sharing and the Distribution of Income. Birkbeck College Discussion Paper in Economics, 9/92. Provisionally accepted, **Journal of Social Policy**.
- Davies, H. and Joshi, H. (1992b) Constructing Pensions for Model Couples, in Hancock, R. and Sutherland, H. (eds) **Microsimulation Models for Public Policy Analysis: New Frontiers**. STICERD Occasional Paper 17. London: LSE, 67-96.
- Ermisch J F and Wright R E (1991) Welfare Benefits and Lone Parents' Employment in Great Britain, **Journal of Human Resources**, 26, Summer, 424-56.
- Espenshade T J and Calhoun C A (1986) The Dollars and Cents of Parenthood, **Journal of Policy Analysis and Management**, 5, 4, 813-871.
- Greenhalgh C (1980) Male-Female Wage Differentials in Great Britain: Is Marriage an Equal Opportunity? **Economic Journal**, 90, pp 751-775.
- Joshi H (1990) The cash opportunity cost of childbearing: an approach to estimation using British evidence, **Population Studies**, 44 pp 41-60
- Joshi H (1991) Sex and Motherhood as sources of Women's Economic Disadvantage, in D Groves and M Maclean (eds) **Women's Issues in Social Policy**, London: Routledge
- Joshi, H.E. (1993) Work, Lifecycle and Social Protection. **European Demographic Conference, Paris, October 1991, Conference volume II Invited Papers** Paris: John Libbey Eurotext (331-341)
- Joshi, H.E. and H. B. Davies (1991) Pension Splitting and Divorce, **Fiscal Studies**, Vol 12, no 4, pp 69-91.
- Joshi, H and H Davies (1992a), Child Care and Mothers' Lifetime Earnings: Some European Contrasts, CEPR Discussion Paper no. 600, London: Centre for Economic Policy Research.
- Joshi, H.E. and H.B. Davies (1992b) Pensions, Divorce, and Wives' Double Burden, **International Journal of Law and the Family**, 6, pp 289-320
- Joshi, H.E. and H.B. Davies (1992c) The Paid and Unpaid Roles of Women: How should Social Security adapt? in Baldwin S and Falkingham J (eds) **Social Security: New Challenges to the Beveridge Model**, Hemel Hempstead: Harvester Wheatsheaf (in press).
- Joshi, H.E. and H.B. Davies (1992d) Daycare in Europe and Mothers' Foregone Earnings. **International Labour Review**, 131, 6 (561-579).
- Joshi, H E and Davies H B (1993) Mothers' Human Capital and Childcare in Britain. Birkbeck Discussion paper in Economics 3/93.

- Lister R (1992) **Women's Economic Dependency and Social Security**. Manchester: Equal Opportunities Commission.
- Walfoegel J (1993) Women Working for Less: A Longitudinal Analysis of the Family Penalty, Welfare State Programme Discussion Paper WSP/93, STICERD, LSE.
- Ward C, Joshi H and Dale A (1993) Income Dependency Within Couples. NCDS Discussion Paper no 36, SSRU, City University, London.
- Wright R E and Ermisch J F (1991) Gender Discrimination in the British Labour Market: A Reassessment, **Economic Journal**, Vol 101, pp 508-522.

TABLE 1

Wife's Contribution to joint net income among 33 year olds

Empirical data for 1991
(National Child Development Survey)

Share of wife in couple's joint net income	childless couples	Percent of couples with children
0	3	2
> 0 < 15%	5	32
> 15% < 30%	8	27
> 30% < 50%	50	25
> 50% < 100%	30	12
100%	4	2
N	582	2750

Wife's contribution to joint net
income as simulated at age 33
Percent

Occupations of Partners	Number of children		
	None	Two	Four
Low Low	38	13	17
Mid Mid	37	12	11
High High	42	41	10
High Low	31	5	10

TABLE 2

Lifetime Income Totals (thousands of pounds)
Couples with:

	No children		Two children		Two children (housewife)		Four children	
	WOMAN	MAN	WOMAN	MAN	WOMAN	MAN	WOMAN	MAN
Skill level: both low								
Pooled	533	496	424	390	359	326	388	355
Average	431	394	375	340	320	287	367	334
Own net	290	536	179	536	71	536	166	536
State	15	-98	64	-98	59	-98	75	-98
Skill level: both middle								
Pooled	714	642	583	514	485	419	534	467
Average	582	510	514	445	431	365	500	432
Own net	401	691	267	691	105	691	240	691
State	-24	-155	41	-155	50	-155	66	-155
Skill level: both high								
Pooled	919	829	798	710	549	474	714	627
Average	749	659	710	623	490	415	674	588
Own net	618	791	542	791	115	791	472	791
State	-124	-203	-74	-203	47	-203	-29	-203
Skill level: his high, hers low								
Pooled	749	672	627	552	584	510	587	512
Average	611	534	553	477	517	442	548	474
Own net	299	846	184	846	112	846	176	846
State	10	-221	47	-221	47	-221	58	-221

Notes

Lifetime: years from marriage while either survive

Pooled: net equivalized income

Average: net income averaged over surviving members

Own net: net income of this partner, including widow's pension, and net State Benefits.

State: net State benefits.

TABLE 3

Gross Earnings Cost of Motherhood
Totals and Decomposition

	Number of children		
	Two	Two (housewife)	Four
Gross earnings loss Thousands of pounds (1992)			
Skill level:			
Both low	153	233	176
Both middle	192	329	240
Both high	127	617	242
Low (husband high)	146	196	165
As percent of childless earnings after age of first birth			
Both low	66	100	73
Both middle	58	100	71
Both high	21	100	38
Low (husband high)	75	100	81
Source of earnings loss (as percent of total)			
Skill level: both low			
Lost years	36	68	41
Lost hours	41	0	33
Lost experience	23	32	26
Part-time penalty	0	0	-0
Skill level: both middle			
Lost years	35	64	39
Lost hours	34	0	29
Lost experience	27	36	29
Part-time penalty	4	0	3
Skill level: both high			
Lost years	44	54	48
Lost hours	11	0	5
Lost experience	43	46	47
Part-time penalty	2	0	-0
Skill level: his high, hers low			
Lost years	53	70	56
Lost hours	25	0	19
Lost experience	23	30	25
Part-time penalty	-0	0	-0

TABLE 4

Gross and Net Revenue Costs of Children
Thousands of pounds (1992)

	Woman with:	
	Two Children	Four Children
Gross earnings	191.61	239.62
Subtract		
Pension contributions To get	3.25	4.03
Earnings net of pension cont	188.36	235.59
Add		
Earnings-linked pension To get	10.82	15.98
Gross private income	199.18	251.57
Add		
Net state benefits To get	-65.11	-90.48
Net income	134.07	161.09

Notes: elements in table are values for woman with no children, less those for woman with 2,4 children respectively.

Both partners have middle-level skills

TABLE 5

Who Pays the Revenue Cost of Children?
Percentages of Gross Labour Market Income Loss

	WOMAN	MAN	STATE
Skill level: both low			
Two children	36	34	31
Two children (housewife)	43	41	17
Four children	35	33	32
Skill level: both middle			
Two children	34	33	33
Two children (housewife)	41	39	20
Four children	33	31	36
Skill level: both high			
Two children	31	29	40
Two children (housewife)	38	36	25
Four children	31	30	39
Skill level: his high, hers low			
Two children	39	37	24
Two children (housewife)	42	41	17
Four children	37	35	28

TABLE 6

Transfer from Husband over Lifetime
Thousands of pounds (1992)

	Woman with:		
	No Children	Two Children	Four Children
Total transfer			
Skill level:			
Both low	151	205	211
Both middle	232	298	311
Both high	195	231	266
Low (husband high)	376	432	436
Amount attributable to revenue cost of children			
Both low		54	61
Both middle		65	78
Both high		37	71
Low (husband high)		57	60

Note: transfer includes widow's pension

TABLE 7

Family Transfer by Stage of Lifecycle
As Percent of Lifetime Total

	No Children	Woman with: Two Children	Two Children (housewife)	Four Children
Skill level: both low				
While dependent children	0	45	40	49
Rest of "working life"	86	43	48	38
While retired, both alive	8	7	9	9
While widowed	6	5	4	4
Skill level: both middle				
While dependent children	0	35	32	38
Rest of "working life"	52	26	34	24
While retired, both alive	26	21	20	21
While widowed	22	17	14	17
Skill level: both high				
While dependent children	0	19	32	26
Rest of "working life"	34	10	30	8
While retired, both alive	34	19	19	17
While widowed	33	18	14	16
Skill level: his high, hers low				
While dependent children	0	31	31	35
Rest of "working life"	62	34	37	30
While retired, both alive	21	20	19	20
While widowed	17	15	14	15
IF IN SERPS				
Skill level: both middle				
While dependent children	0	50	42	54
Rest of "working life"	84	38	45	34
While retired, both alive	8	7	9	7
While widowed	8	5	4	5
Skill level: both high				
While dependent children	0	55	45	65
Rest of "working life"	78	28	43	21
While retired, both alive	7	6	8	6
While widowed	15	10	4	8
Skill level: his high, hers low				
While dependent children	0	42	40	47
Rest of "working life"	89	46	49	41
While retired, both alive	7	7	7	8
While widowed	5	4	3	4

Notes: the family transfer is here defined to include its posthumous component (widow's pension)

TABLE 8

Distribution of Income Costs of Two Children
Couple with middle level skills

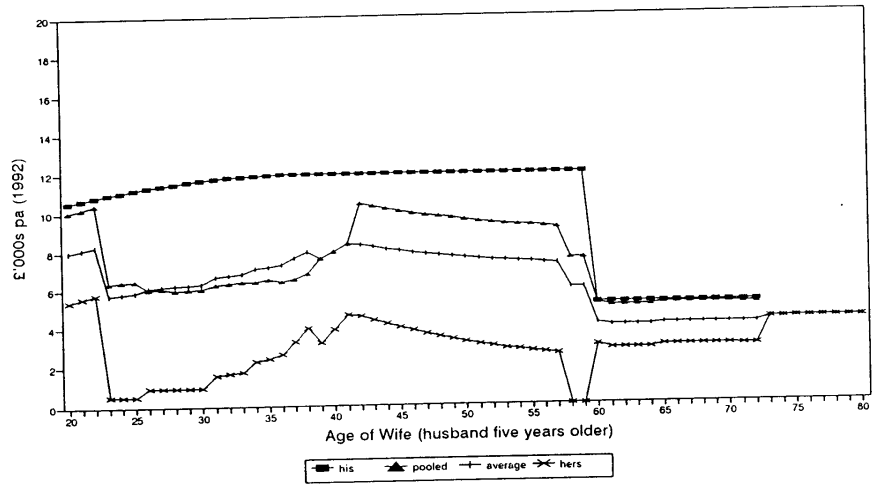
	Attachment percentile (most attached to least attached)											
	Typical	95	85	75	65	55	50	45	35	25	15	5
Thousands of pounds												
Gross earnings	192	32	117	157	179	180	169	158	122	99	22	0
Net,if no pooling	134	9	73	104	123	125	118	111	86	76	3	-15
Net,if pooling	69	5	37	53	63	64	60	57	44	39	2	-7
As percentage of childless												
Gross earnings	58	8	30	42	52	59	59	60	61	72	100	0
Net,if no pooling	35	2	17	25	31	34	34	34	31	34	3	-17
Net,if pooling	12	1	6	9	11	12	11	11	9	8	0	-2

Notes: A woman in the 95th attachment percentile will take employment when her probability of doing so exceeds .05

FIGURE 1

Income Profiles for Couples with Two Children

Skill Level: Both Low



Skill Level: Both Mid

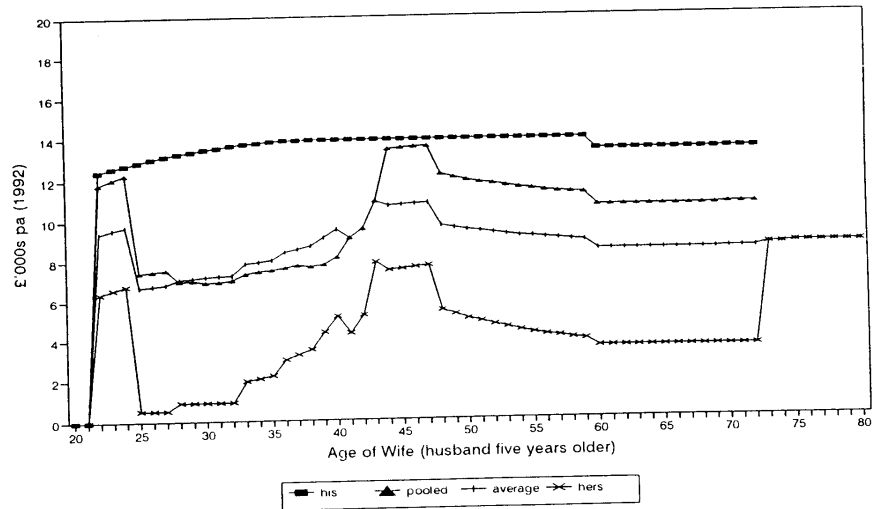


FIGURE 1 (continued)
 Income Profiles for Couples with Two Children

Skill Level: Both High

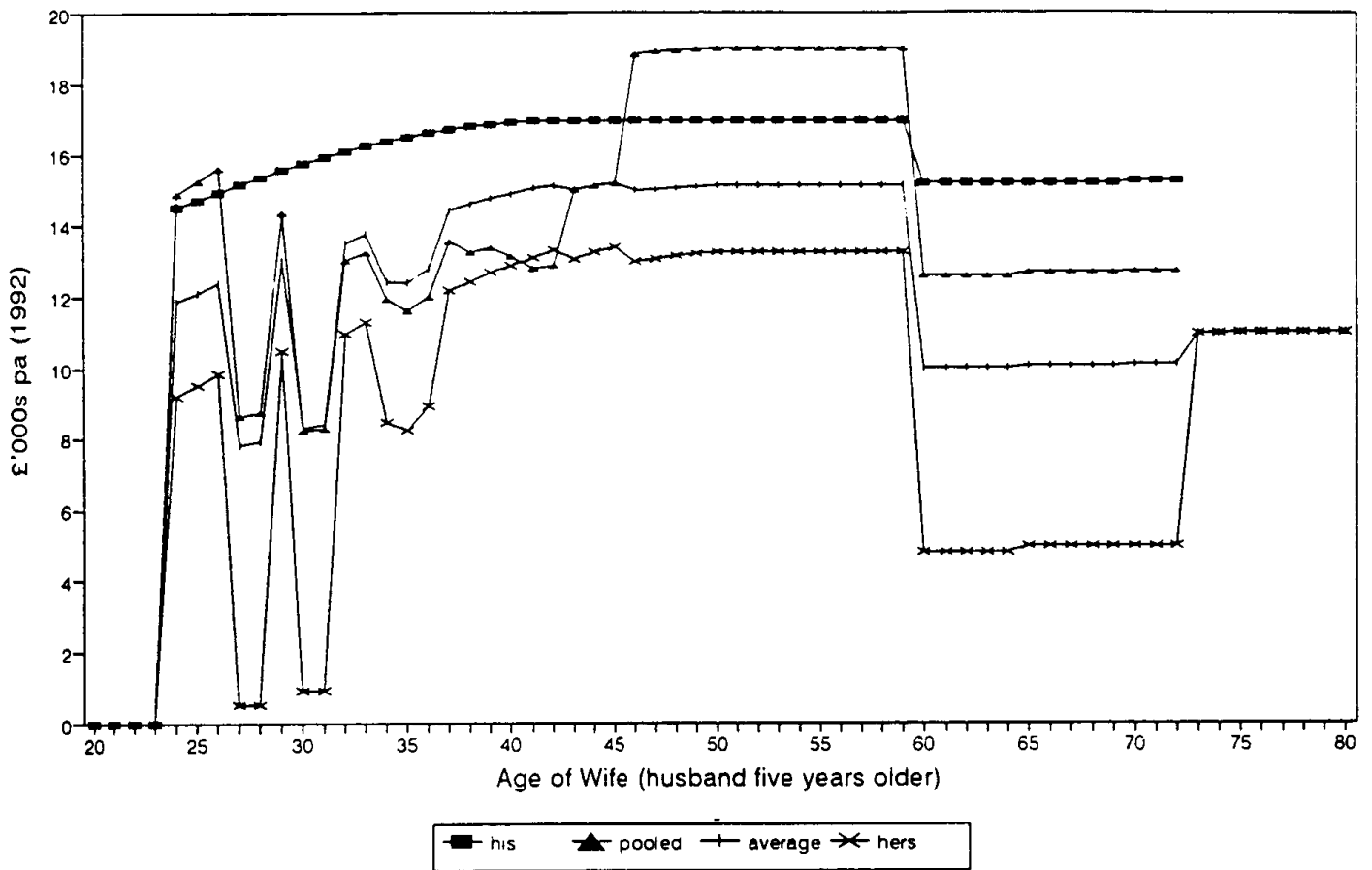


FIGURE 2
Revenue and Expenditure Costs of Children

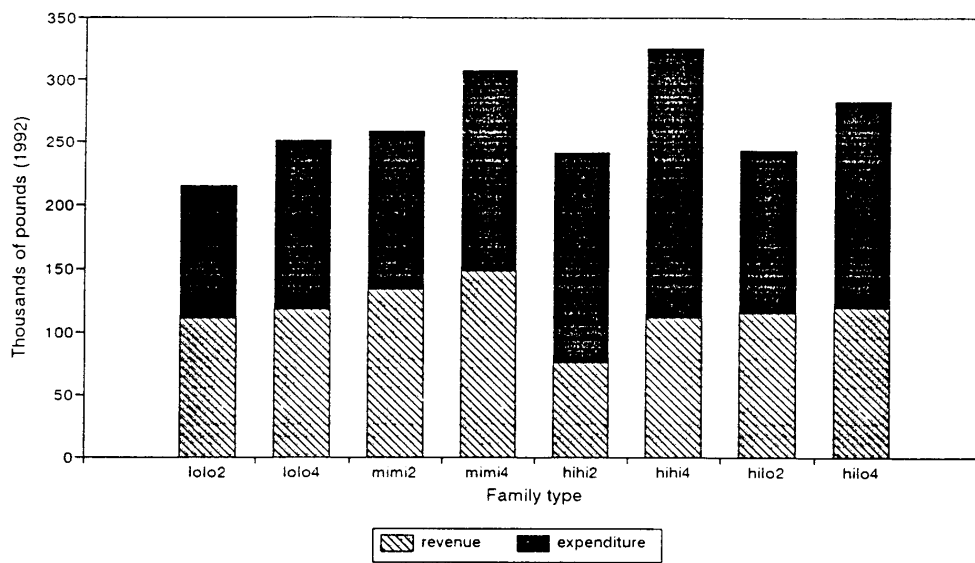


FIGURE 3
Who Pays the Revenue Cost of Two Children?

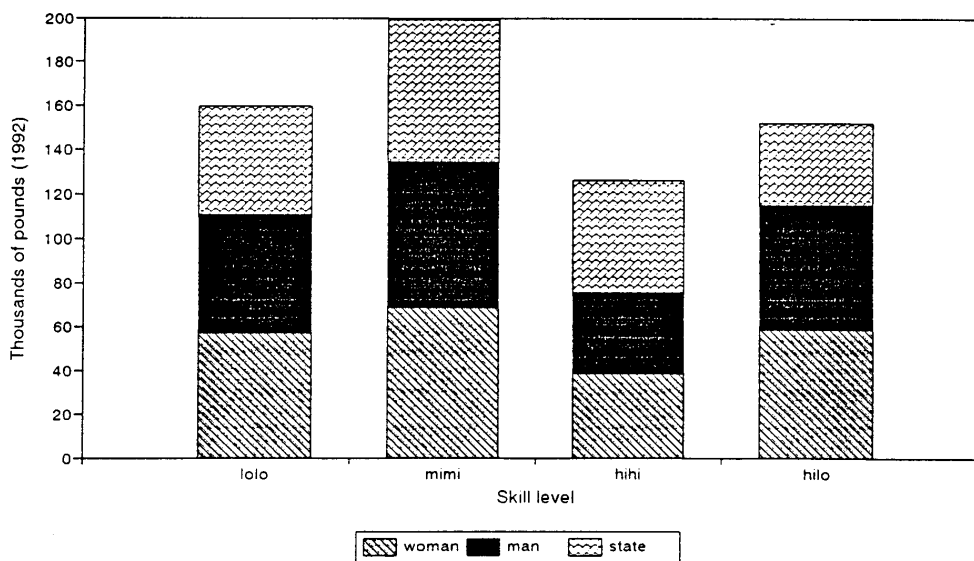
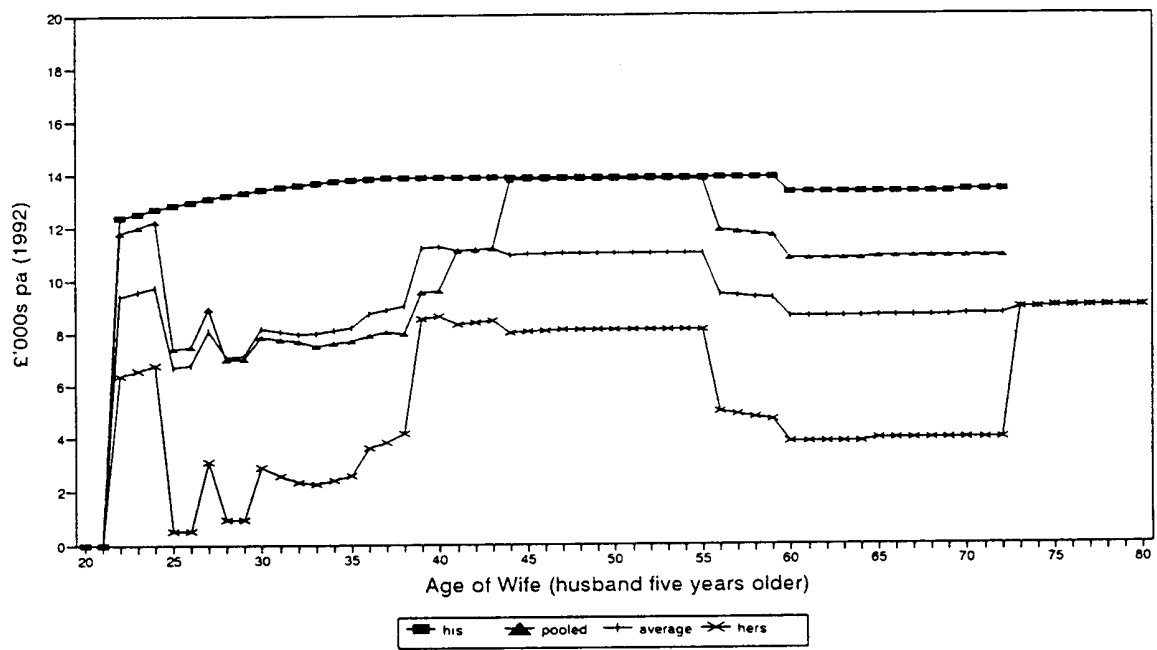


FIGURE 4
 Income Profiles for Couples at Quartiles of attachment
 Most Attached Quartile



Median Attachment

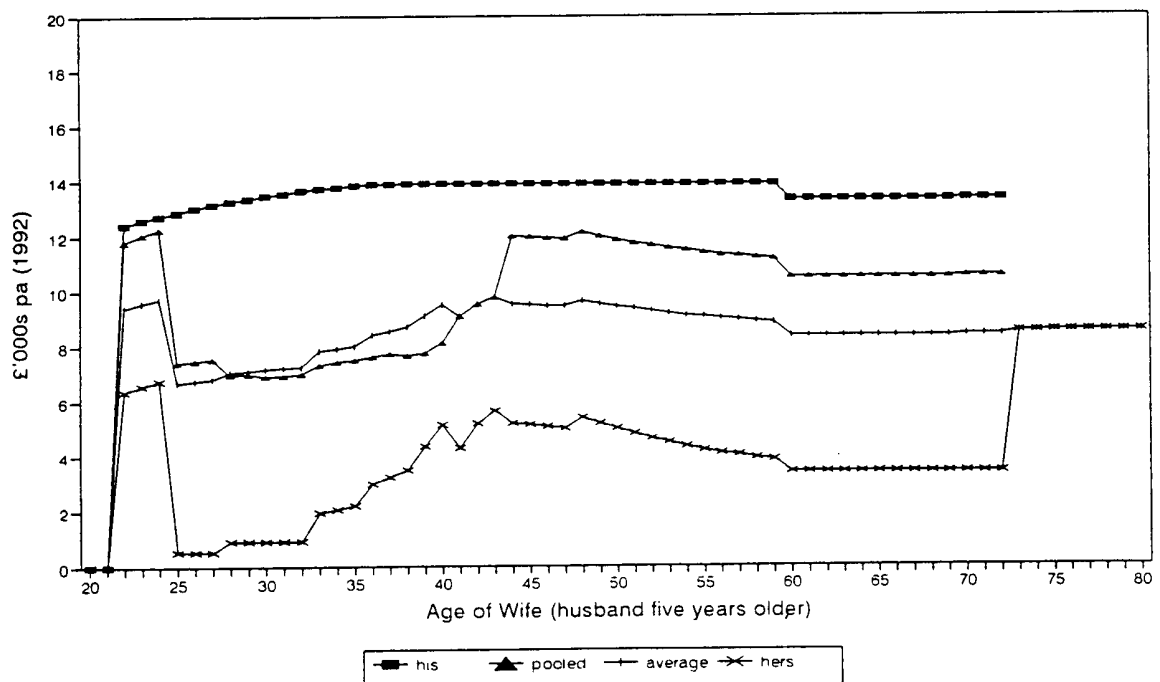
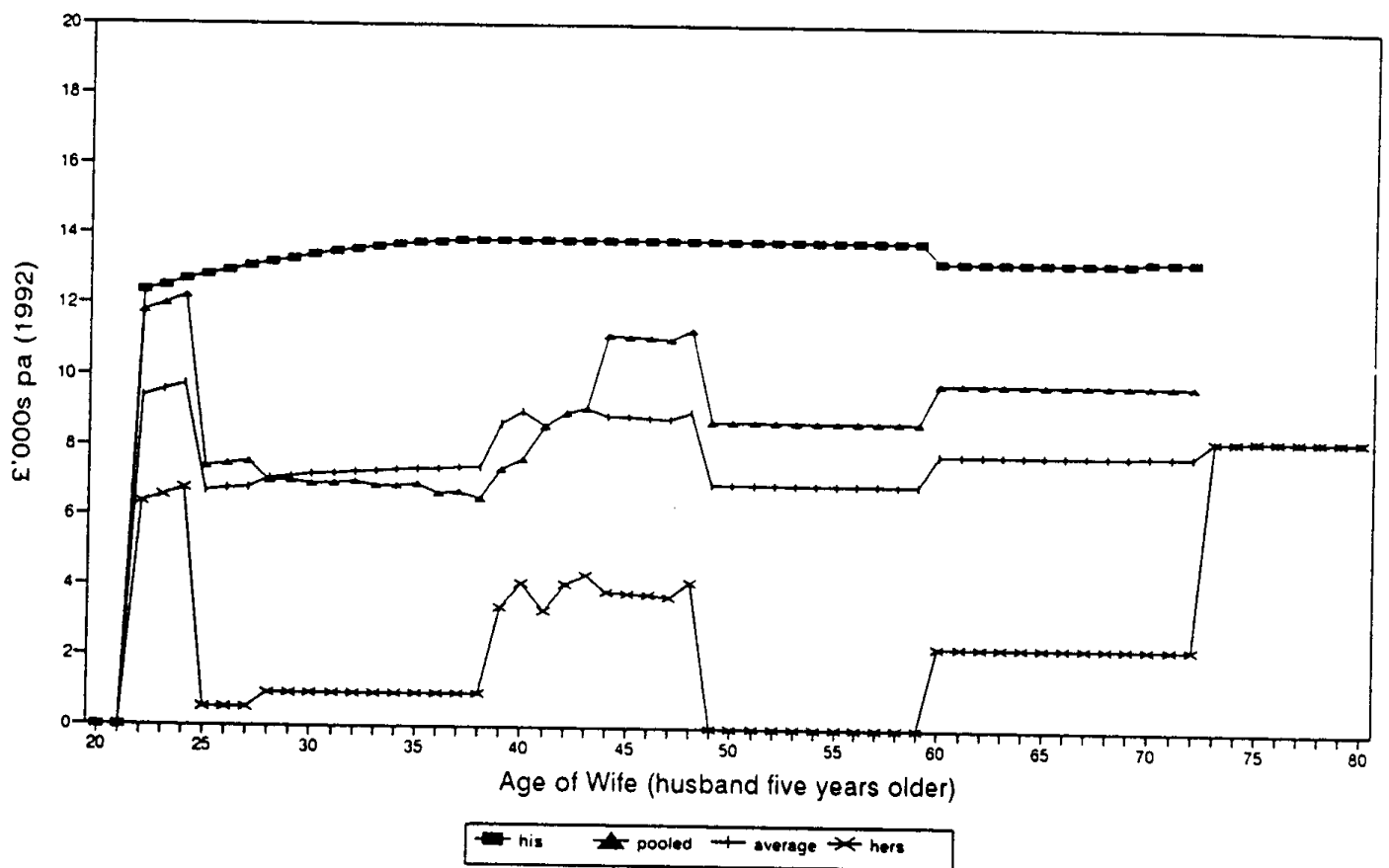


FIGURE 4 (continued)
 Income Profiles for Couples at Quartiles of attachment
 Least Attached Quartile



APPENDIX

SOURCES OF INCOME BY STAGES OF LIFECYCLE Thousands of pounds (1992)

	Woman with:			
	No Children	Two Children	Two Children (housewife)	Four Children
Skill level: both low				
While dependent children				
Labour market	0	23	0	23
State	0	14	15	28
Family Transfer	0	92	103	103
Total (averaged)	0	129	118	154
Rest of "working life"				
Labour market	250	77	0	54
State	-40	-6	0	-3
Family Transfer	129	88	124	81
Total (averaged)	339	159	124	132
While retired, husband alive				
Labour market	9	4	1	3
State	34	34	22	27
Family Transfer	12	15	22	19
Total (averaged)	55	52	45	49
While widowed				
Labour market	6	2	1	2
State	22	23	23	23
Family Transfer	9	9	9	9
Total (averaged)	37	34	33	34
Skill level: both middle				
While dependent children				
Labour market	0	37	0	36
State	0	11	15	26
Family Transfer	0	105	122	119
Total (averaged)	0	154	137	180
Rest of "working life"				
Labour market	349	123	0	78
State	-71	-19	0	-9
Family Transfer	120	78	130	75
Total (averaged)	398	182	130	144
While retired, husband alive				
Labour market	16	9	2	6
State	36	37	22	37
Family Transfer	61	64	75	65
Total (averaged)	113	109	99	108
While widowed				
Labour market	10	6	1	4
State	11	12	13	13
Family Transfer	51	51	51	51
Total (averaged)	72	69	66	68

APPENDIX

SOURCES OF INCOME BY STAGES OF LIFECYCLE (continued)
Thousands of pounds (1992)

Skill level: both high

While dependent children				
Labour market	0	216	0	169
State	0	-39	15	-12
Family Transfer	0	67	148	102
Total (averaged)	0	244	163	259
Rest of "working life"				
Labour market	623	288	0	225
State	-162	-74	0	-57
Family Transfer	66	34	141	33
Total (averaged)	527	247	141	200
While retired, husband alive				
Labour market	34	30	3	27
State	33	33	22	34
Family Transfer	65	67	86	68
Total (averaged)	132	131	111	129
While widowed				
Labour market	21	19	2	17
State	5	6	10	6
Family Transfer	63	63	63	63
Total (averaged)	90	88	75	86

Skill level: his high, hers low

While dependent children				
Labour market	0	16	0	15
State	0	15	15	28
Family Transfer	0	136	144	153
Total (averaged)	0	166	158	197
Rest of "working life"				
Labour market	213	53	0	35
State	-33	-4	0	-2
Family Transfer	234	149	173	133
Total (averaged)	414	198	173	166
While retired, husband alive				
Labour market	8	3	1	2
State	34	26	22	22
Family Transfer	78	84	87	87
Total (averaged)	120	113	110	111
While widowed				
Labour market	5	2	1	1
State	9	10	10	10
Family Transfer	63	63	63	63
Total (averaged)	77	75	74	75

Notes:

Total (averaged) is the total, for the relevant period, of the average net income of the surviving members of the couple.

The family transfer is here defined to include widow's pension.