INCOME DISTRIBUTION AND REDISTRIBUTION ACROSS THE LIFECYCLE: EVIDENCE FROM AUSTRALIA

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Editorial Note

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Abstract

Annual net fiscal incidence studies, which examine the redistributive impact of government taxes and expenditures at a single point in time, have almost universally concluded that such government activities successfully redistribute income from the rich to the poor. However, because there are such strong lifecycle influences on income, there have always been doubts about the extent to which cash transfers and taxes simply redistribute income across the lifecycle of individuals, rather than redistributing income from those with high to those with low lifetime incomes.

Analysis of the extent to which the income redistribution achieved by the tax-transfer system is intra-personal rather than inter-personal has been difficult in the past, because of the lack of sufficient data about lifetime and lifecycle incomes. The paper reports the results achieved when using a new dynamic cohort microsimulation model.

When cash transfers were compared *with the amount of income taxes required to finance them*, the results suggested that on average about 45 per cent of such income taxes paid by males were returned to them as cash transfers during another point in their lifecycle, while the remaining 55 per cent were devoted to inter-personal redistribution. While this was the average picture for all males, there were major differences amongst males, with those with lower lifetime incomes recouping a much more substantial proportion of their income taxes. For women, on average all income taxes levied were repaid to them as cash transfers at some other period in their lifecycle although, once again, the average picture disguised major variation amongst different types of women.

1. Introduction

Numerous studies of the *income redistribution* achieved by various government taxes and expenditures, based upon cross-section data, have generally concluded that the net effect of such programs is to successfully redistribute income from rich to poor (Saunders, 1984). While the studies range from those which simply allocate personal income taxes and cash transfers,[1] to those which also embrace other taxes and other types of government expenditure,[2] the findings are strikingly similar. Thus, annual net fiscal incidence studies typically conclude that taxes are broadly proportional to income or slightly progressive (with the progressive effect of income taxes being offset by other regressive taxes); that cash transfers, and to a lesser extent other government expenditures, are progressive; and that the combined effect of both taxes and outlays is to transfer income from the rich to the poor.

But do these conclusions still hold when a much longer time period, such as an entire lifetime, is considered? For example, at any single point in time, a large proportion of those with low incomes are retirees, who might have enjoyed high incomes in the past while in the labour force, or students or teenagers, who will probably earn much higher incomes in the future. It thus seems likely that, if one could somehow measure the past and future incomes of all of those captured in a cross-section survey,

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1 For example, see Kakwani (1983), Saunders (1982) and Collins and Drane (1981, 1982) for Australia.

2 For example, see CSO (1990), O'Higgins and Ruggles (1981), Webb and Sieve (1971), Peacock and Browning (1954), Barna (1945) and Cartter (1955) for the UK; ABS (1987b) and Harding (1984, 1982) for Australia; Reynolds and Smolensky (1977) and Gillespie (1965) for the USA; and Dodge (1975) and Ross (1980) for Canada.

their *lifetime* incomes would be much more equally distributed than their incomes during the single year or weeks embraced by the survey. But how much more equal ? Similarly, while income taxes appear progressive in net fiscal incidence studies, taking a greater slice of the income of the rich than of the poor, and income-tested cash transfers appear even more effective in directing resources to the poorest in society, it is likely that many of the cash transfer recipients of today were the high income taxpayers of yesterday.

Thus, when a longer time period is considered, it is conceivable that the wide-ranging programs of government taxation and expenditure common to all industrialised countries simply redistribute resources across *the lifecycle of individuals*, funding the cash transfers and services received by each individual while they are studying or retired from the taxes collected from that same individual during their peak working years. It is therefore possible that government programs do not redistribute income from rich to poor at all, as annual net fiscal incidence studies suggest, but merely enforce the reallocation of income during the lifecycle - in other words, that all of the redistribution achieved by taxation and expenditure programs is *intra-personal*, rather than *inter-personal*.

Such doubts have been raised before. Many have suggested that the cross-section studies of the redistributive impact of government activity may be flawed. As Layard points out, the annual approach first "exaggerates the basic inequality of incomes and then it exaggerates the amount of redistribution" (1977,46). The same concern is echoed by Reynolds and Smolensky, who argue that "a single year accounting period

exaggerates the size of government redistribution by almost any definition of redistribution" (1977:24).

Answering such questions requires lifetime information and, as Atkinson observes, the "immediate problem with the lifetime approach is that of obtaining the required data" (1983:45). Some overseas countries possess either longitudinal administrative or panel data (in which the same individuals are surveyed for a number of years) but, even in these cases, the data rarely embrace entire lifetimes, so that simulation techniques are still required to produce lifetime profiles. Australia does not possess any comprehensive longitudinal data, so that there is no alternative to using simulation techniques to derive realistic lifetime profiles.

Economists have frequently attempted to estimate lifetime profiles or functions, using a range of econometric and simulation techniques (eg. Blomquist, 1976; Blinder, 1974; Davies, 1979; 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 lifetime earnings profile of married men fails to take into account that very few men stay constantly married and constantly in the labour force for their entire working lives. Ignoring the degree of change in personal circumstances when attempting to provide a picture of lifetime welfare is a critical ommission, as perhaps the major lesson from the longitudinal data which has been collected overseas is the astonishing degree of change from year to year in family and labour force status, earnings and income (Duncan, 1984; Elder, 1985).

An alternative modelling option which attempts to incorporate the diversity and constant change in the circumstances of individuals over time lies in dynamic microsimulation models. Microsimulation models (sometimes also called microanalytic simulation models) were pioneered in economics by Guy Orcutt in the United States in the late 50s and 60s (Orcutt, 1957; Orcutt et al, 1961, 1976, 1986), but their use in routine policy making and economic analysis in Australia has only recently become feasible with improvements in computer hardware and the availability of unit record tapes from the Australian Bureau of Statistics. The defining characteristic of such models is that they deal with the attributes and behaviour of micro-units, such as individuals, families or households. In contrast to the better-known macroeconomic simulation models, which examine relationships between national economic sectors and agreggated variables, microsimulation models examine the effects of policy and economic changes at the micro level (Merz, 1988).

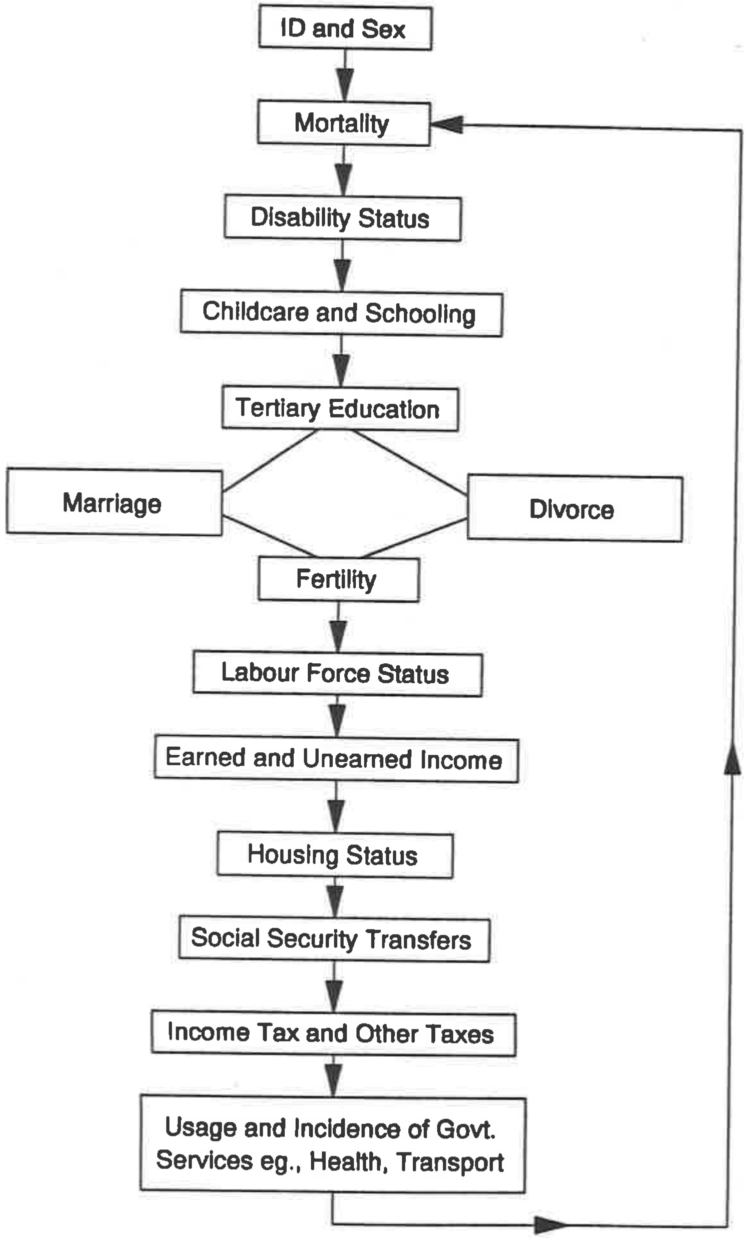
Dynamic cohort microsimulation models attempt to project a single cohort of individuals born in the same or adjacent years forward through time. The micro-units are 'aged' one year at a time, through the simulation of demographic and other events such as death, marriage, divorce, birth, children leaving home, labour force entry and exit, etc. The cohort are generally aged from birth to death, so that the entire lifecycle of one cohort is simulated. This ageing is based on the probabilities of various demographic and other transitions occurring and these probabilities are estimated from official statistics, sample surveys and other data sources within a country. Transitions between various states are then simulated, by using these probabilities allied with Monte Carlo selection processes.

The types of processses which are modelled are shown in Figure 1. These processes are gone through every year, so that the characteristics of every individual in the sample are updated every year. For example, the first question is whether or not the individual dies that year, based upon the probability of death for someone of their age, marital status, education etc. If the person 'lives' then all of the later modules are run through and the characteristics of the person are changed in accord with the probabilities of change occurring. For example, depending upon their age, sex and other characteristics, the individual might start or leave tertiary education, switch between different schooling or tertiary sectors, get married or divorced, have a child, enter or leave the labour force, change the number of hours they work or their wage rate, become disabled, change their housing status, and become eligible or ineligible for various cash transfers.

2. Structure of the Harding Dynamic Cohort Model

The model consists of a pseudo-cohort of 2000 males and 2000 females, who are tracked from birth to death and experience major life events such as schooling, marriage and unemployment (Harding, 1990a, 1990b). The cohort are 'born' in 1986 and live for up to 95 years in a world which remains exactly as it was in their birth year. Given the uncertainty surrounding future changes in marriage and birth rates, labour force participation rates, education rates and so on, this means that a *steady-state* world has been assumed in the initial version of the model. Thus, the first version of the model does *not* attempt to estimate what the actual experience of the cohort born in Australia in 1986 will be. Instead it seeks to answer the following question: *If the demographic, labour force, income and other characteristics of the population and all government policies existing in 1986 remained unchanged for 95 years, what would the distribution of income be like*

Figure 1
Typical Structure of a Dynamic Cohort Microsimulation Model



and what income redistribution would be achieved by government programs ? The model is thus currently not 'dynamic' in the sense of allowing behavioural change in response to exogenous shocks or in incorporating anticipated changes in parameters such as unemployment rates (although it is possible to include such changes if agreement can be reached about the magnitude of behavioural change or about the likely shape of the world in the future).

Although the steady-state assumption might appear unrealistic at first glance, it is probably the most useful benchmark against which to evaluate current government policies and changes to those policies. As Summers pointed out in 1956, the instability of the size distribution of income makes data about the the lifetime income distribution in the past of little help in analysing the lifetime income distribution of today, while the future distribution of lifetime income is unknown. Summers saw great potential in the construction of steady-state or 'latent' income distributions, which would allow one to answer questions about lifetime income distribution given *existing* economic conditions and government policies (1956:4). Similarly, both the Canadian DEMOGEN and West German SFB3 dynamic cohort models assume a steady-state world when evaluating the impact of both existing and possible government policies (Wolfson, 1988:233; Hain and Helberger, 1986:63).

The processes simulated in the model include:

- **death** - probability dependent upon age and sex (from ABS death rate statistics- ABS 1987d);
- **disability** - entries to and exits from various disabled states dependent upon age and sex (from ABS 1988 Disabled and

Aged Persons Survey - Australian Bureau of Statistics (ABS), 1989);

- **schooling** - preschool usage by age and sex; attendance at government, Catholic and other independent schools dependent upon age, sex and parental socio-economic status; shifts between the sectors modelled; probabilities of leaving school from age 15 onwards dependent upon age, sex, parental SES and schooling sector (probabilities derived from numerous education surveys, including ABS, 1987a);
- **tertiary education** - attendance at full or part time university or TAFE modelled, dependent at various ages upon age, sex, parental SES, secondary qualifications and study status in preceding year (from wide range of education data, including ABS, 1987c; Anderson and Vervoon, 1983);
- **marriage, remarriage and divorce** - re/marriage dependent upon age, sex and previous marital status, and divorce upon age and sex (from ABS, 1988a, 1988b);
- **fertility** - dependent upon age, marital status and parity (number of children already born) (from ABS, 1987e, 1988c);
- **labour force participation** - probability of entering or leaving the labour force and of number of hours worked dependent upon age, sex, education, study or disability status, labour force status in the preceding year and, additionally, marital status and age of youngest child for women; self- employment status assigned based upon age, education, self-employment status in the preceding year (and husband's self-employment status for women); probability of various lengths of unemployment dependent upon age, sex, lifetime unemployment propensity and unemployment status in preceding year (probabilities

derived from 1986 Australian Income Distribution Survey - IDS);

- **earnings** - dependent upon age, sex, education, invalidity status, 'ability', hours worked, whether wage and salary earner or self-employed and a stochastic term to capture fluctuations in earnings from year to year; all income figures in model expressed in constant 1986 dollars (earnings functions estimated from 1986 IDS);
- **other private income** - income from investments, interest, rent and superannuation modelled, based on such characteristics as age, sex, education, earnings, labour force status, marital status and disability status; maintenance also included (from 1986 IDS);
- **social security and education cash transfers** - receipt of age, invalid, wife's, carer's and sole parents pension; unemployment, sickness and special benefits; family allowance and family allowance supplement, multiple birth payments, additional pension/benefit, mothers/guardians allowance, SAS and TEAS (now called AUSTUDY) and postgraduate study awards all included (June 1986 system and rates imputed in accord with rules for eligibility);[3]
- **income tax and Medicare levy**, including the dependent spouse, sole parent, pensioner and beneficiary rebates (1985-86 income tax schedules imputed in accord with rules for liability or eligibility).

This means that by the time one of the 4000 individuals in the model 'dies', an enormous amount is known about their lives.

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3 The Australian social security system is very different to the social insurance systems prevailing in Europe. The various payments are income-tested, so that receipt is based upon current income rather than past contributions.

For example, in each year of life we know whether they were studying and at what type of institution, their marital status and the age and number of any children, their labour force status and their earnings, their receipt of other private income or cash transfers and the amount of income tax they paid.

Housing status has unfortunately not been included in the first version of the model, principally because there were no adequate housing data on the 1986 Australian Income Distribution Survey micro-data tape which could be used for the simulation of housing, and longitudinal data on housing were also not available. In addition, although it is hoped to include indirect taxes and other government expenditures in the model in the near future, at the moment assessment of the impact of government is limited to the major cash transfers, education outlays and income tax administered by the Federal Government. The results outlined in this paper therefore only deal with the lifetime redistribution of *cash income* directly generated by the federal tax-transfer system. If the analysis embraced indirect taxes or other government expenditures, it is possible that quite different conclusions might be reached about the redistributive impact of all government activity or about the distribution of a lifetime income measure which included the imputed value of various government services. Inclusion of state and local government taxes and expenditures might also affect the conclusions.

A second issue is that in assessing the impact of government upon income redistribution, the distribution of income *before* specified government actions necessarily has to be compared to the distribution of income *after* such actions. This immediately raises the question of what the most appropriate 'before' benchmark -

or counterfactual - is. Although heavily criticised (Reynolds and Smolensky, 1977), the most commonly used reference point is the 'zero government counterfactual', which measures the redistributive effect of government against the original distribution of pre-tax and pre-transfer income. While it is clearly invalid to assume that the distribution of factor income would remain the same if there was no government, such an assumption has been implicitly adopted in this study, because there are no data available suggesting how the lifetime distribution of factor income in Australia would change if government miraculously disappeared.

A third issue is the assumed incidence of cash transfers and income taxes. The benefit of cash transfers is assumed to be fully incident upon those to whom they are paid, while the burden of income taxes is assumed to be fully incident upon those legally liable to pay them. Equally importantly, those with legal liabilities to pay tax are assumed to meet them and no account is taken of the underground economy and possible tax evasion. In addition, in the initial version of the model the burden of income tax is assumed to equal the amount of tax collected, even through income taxes may distort consumer choice and generate excess burdens (Musgrave and Musgrave, 1984:307; Ballard et al, 1985).

A fourth issue is that the discount rate and the rate of economic growth are assumed to cancel each other out. In other words, the amounts of various types of income received by individuals each year are simply summed to derive the applicable lifetime totals. This means that a dollar of income received late in life is given the same value as a dollar of income received early in life, contrary to the practice of many lifetime income studies which give a higher weighting to income received early in the lifecyle via use of a discount rate (Lillard, 1977; Fase, 1971; Richardson and Hancock, 1981). This discount rate is used to reflect not only individual preferences for receiving money now rather than in the future, but also to capture the economic advantage bestowed by money received early in the lifecycle due to the interest which can be earned on it if invested.

However, use of a discount rate in a study such as this, which also abstracts from economic growth, is problematic. Because cross-section data are used to set the various earnings and income parameters, the yearly increases in real incomes which could be expected to occur in the real world with economic growth have been abstracted from. While it is easy to model increases in wage rates etc due to economic growth, it is not clear how the various other parameters in the model would then have to be changed. For example, if real increases in wages and other income are modelled, then the various social security income tests would presumably require amendment every year, otherwise an ever-declining proportion of the pseudo-cohort would be eligible for income-tested cash transfers. The tax scales would presumably also require amendment, otherwise the proportion of income paid in tax would increase markedly over the lifetime.

The imputation of economic growth is thus very complex, and a steady state world seemed easier to simulate and more clearly understandable, at least for the first round of the model. This is also the practice of the Canadian and West German dynamic cohort models, both of which assume that the rates of economic growth and of discounting cancel each other out (Wolfson, 1988:233; Hain and Helberger, 1986:63). However, analysing the difference that other assumptions about discount rates would

make to the results remains an interesting area for future development of the model.

A fifth issue is that while the *total lifetime income* of individuals is of great interest, it can distort perceptions of inequality and income distribution. Some of the pseudo-cohort have low lifetime incomes simply because they died at an early age, rather than because they received low earnings. Further, despite their apparently low lifetime incomes, this group would also appear to have received minimal social security transfers, having died long before age pension age, thereby creating a misleading impression of the lifetime progressivity of cash transfers.

Some other lifetime microsimulation models have dodged this problem, by making all individuals in the model die at the same age. For example, in the Davies model each household consists of a husband and wife who start economic life together at age 20 and die together at age 75 (Davies et al, 1984:636). Similarly, all individuals in the Blinder model start economic life at age 18 and die 54.7 years later at about age 73 (1974). While the West German SFB3 dynamic cohort model contains the option of using age-sex-family status specific death rates or of terminating all cohort records at the same age, published work comparing the lifetime incomes of individuals has fixed a uniform age of death, thereby again avoiding the issue (Hain and Helberger, 1986:63).

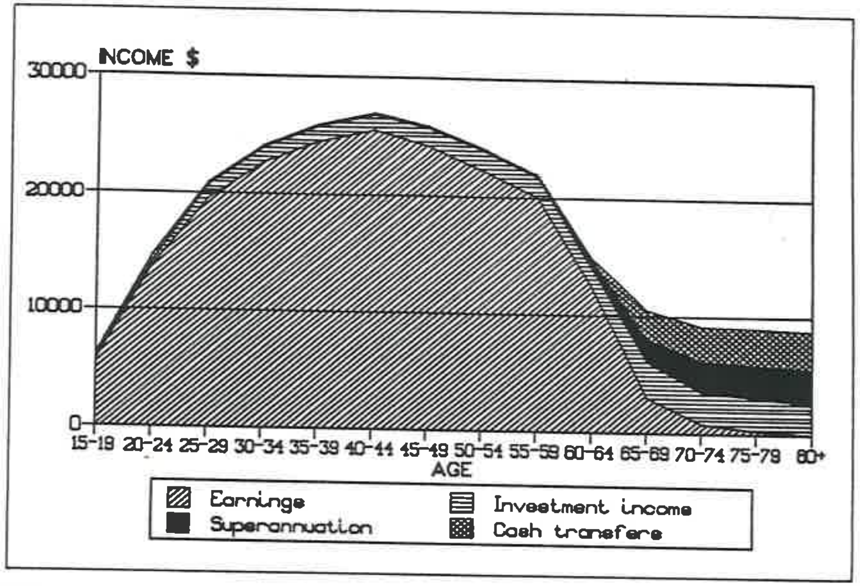
However, as the aim of this study was to directly compare lifetime incomes, this approach was deemed inadequate, and *annualised* lifetime measures were developed. First, all of those who died before the age of 20 were excluded, as many of this group would not have entered the workforce, and would thus have zero annualised income. Second, for those remaining, total lifetime income was then divided by their number of years of life minus 15. (It would be equally easy to divide lifetime income by total years of life, but because the cohort typically enter the labour force between the ages of 15 and 20, such a procedure would result in annualised lifetime incomes which appear quite low at first glance.) Dividing by years of life minus 15 thus gives a more accurate 'eyeball' impression of living standards, and the annualised lifetime income measures can be readily interpreted as the average amount of income received *during each year of adult life*.

3. Income Distribution and Redistribution over the Lifecycle for Males

As many studies of earnings profiles have found, the earnings of males increase sharply during their twenties and early thirties, with the accumulation of human capital and increasing age and experience (Blanchflower and Oswald, 1990). The rate of increase slows during the thirties and forties and, as Figure 2 shows, the annual earnings and income of males in the simulation peak at ages 40 to 44. During the fifties and early sixties, average annual income declines, due not only to the declining hourly wage rates traced in Table 1,[4] but also to reductions in hours worked and to voluntary or involuntary withdrawal from the labour force.

4 Some longitudinal studies have found that the earnings of males increase constantly until retirement, due to the effect of economic growth each year upon real earnings (Ruggles and Ruggles, 1977). However, the earnings of younger cohorts increase at a faster rate and the *relative* wages of older workers therefore decline. As discussed earlier, the model abstracts from economic growth, and it is this relative decline which is therefore picked up in the simulation.

Figure 2
Average Amounts of Income Received Each Year by Age by Males



While some males are still working in their late sixties, with earnings averaging about one-quarter of the average annual income of males aged 65 to 69, earnings are negligible during the seventies. Income during retirement drops steeply, with average income being about one-third of that achieved during peak working years. Sources of income also show dramatic change, with income from age 70 onwards being fairly equally split between investment income, private occupational superannuation, and cash transfers from the state in the form of age pension.

The average picture for men, however, disguises major variations in lifecycle income by those who achieve different standards of living during their lifetimes. It is possible to isolate those whose lifetime income placed them in the bottom 10 per cent of males, after taking full account of variations in family circumstances,

Table 1
Income and Other Characteristics of Males by Age

Measure	Age													
	15-20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80+
Earnings	5660	13775	22780	22780	24600	25600	24320	22300	20150	12360	3065	810	305	20
Investment income	185	425	1265	1265	1315	1325	1535	1760	1745	1625	3020	2800	2850	2630
Superannuation	0	0	0	0	0	0	0	0	15	730	1940	2555	2735	2910
TOTAL ORIGINAL	*5845*	*14200*	*24040*	*24040*	*25915*	*26920*	*25850*	*24060*	*21910*	*14715*	*8025*	*6165*	*5890*	*5555*
Pension	10	5	10	5	5	15	10	35	35	115	2495	2960	3090	3230
Benefit	205	400	195	140	105	110	120	95	95	95	0	0	0	0
Education transfers	115	95	20	10	15	15	20	15	5	5	0	0	0	0
*TOTAL TRANSFERS***	*330*	*505*	*220*	*160*	*125*	*135*	*155*	*150*	*135*	*215*	*2495*	*2960*	*3090*	*3230*
GROSS INCOME	6175	14705	21035	24200	26040	27060	26005	24210	22045	14925	10520	9125	8980	8790
Income tax	1060	3254	5790	7225	8190	8760	8540	7850	6990	4415	2265	1735	1620	1445
DISPOSABLE INC	*5115*	*11450*	*15245*	*16975*	*17850*	*18295*	*17465*	*16360*	*15050*	*10510*	*8255*	*7390*	*7360*	*7345*
EQUIVALENT INC	8384	17775	21405	21385	22300	24570	25470	26120	24620	18105	14950	13690	13155	12540
% married	2.1	22.1	51.4	67.7	72.3	73.2	73.0	71.6	69.9	68.1	65.1	60.9	53.0	37.8
Av no children	0.018	0.226	0.662	1.218	1.386	1.115	0.648	0.230	0.061	0.015	0	0	0	0
% in labour force	68.0	95.4	98.0	98.5	99.2	99.0	95.7	92.8	89.8	60.9	24.1	6.2	2.9	0.4
% work F.T.*	70.0	89.4	94.7	95.5	95.8	96.1	95.4	90.8	85.4	80.9	72.6	58.6	53.1	62.5
% exp any unemp#	25.1	22.0	10.5	6.6	5.9	6.4	7.1	6.1	5.7	6.1	0	0	0	0
Hourly wage rate*	6.75	8.75	9.90	11.15	11.95	12.45	12.65	12.80	13.05	13.00	10.65	12.45	10.10	5.60
Av hrs worked pa*	1366	1711	2063	2116	2118	2131	2125	2045	1979	1912	1278	1142	1128	1053
% with degree	0	8.1	15.1	17.1	18.3	19.0	19.0	19.0	19.1	19.0	19.0	19.8	20.5	24.0
% sec sch only	42.5	39.3	24.8	16.9	11.8	9.1	8.9	8.9	8.8	9.0	8.9	9.4	9.6	9.0

Notes:
- * denotes average for those in the labour force (not average for whole age group).
- \# percent unemployed is the percentage experiencing any unemployment during a year, and thus looks higher than standard cross-section unemployment rates during a single point in time.
- ** includes small amount of child transfers for male sole parents.

and then go back and identify what happened to those males during each year of life. To do this, a decision has to be made about which of the various income measures available in the model should be used to rank and compare males, so that they can then be divided into deciles of lifetime income.

While any of the various lifetime income and tax measures available in the model could be used to rank individuals, *equivalent income* has been selected as the measure which best encapsulates lifetime welfare. If equivalent lifetime income was not used to rank individuals then, for example, a never married male with a lifetime income of half a million dollars would be regarded as having achieved the same lifetime standard of living as another male with the same total lifetime income who for 20 years supported a non-working spouse and four children. Thus, the use of equivalent income to try to improve comparisons of welfare is now widely accepted and, for example, is endorsed by the British Central Statistical Office, who now rank all households by equivalent income in their yearly analyses of fiscal incidence in the UK (CSO,1990).

It should be appreciated, however, that no equivalence scale can capture fully the differences in the needs of various types of income units due to their differing circumstances. Most equivalence scales do not, for example, allow for the possible differences in income required by families with severely disabled members. There is also extensive debate about whether equivalence scales applicable to low income families are equally applicable to high income families and about how to measure accurately the differences in income required by those in different circumstances (Whiteford,1985). Despite these problems, equivalent income is now widely used in

cross-sectional income distribution studies to rank different types of income units (eg. Kakwani, 1986; O'Higgins et al, 1981, 1988). The alternative of assuming that those with the same monetary income but very different needs have the same standard of living is seen as even more unacceptable.

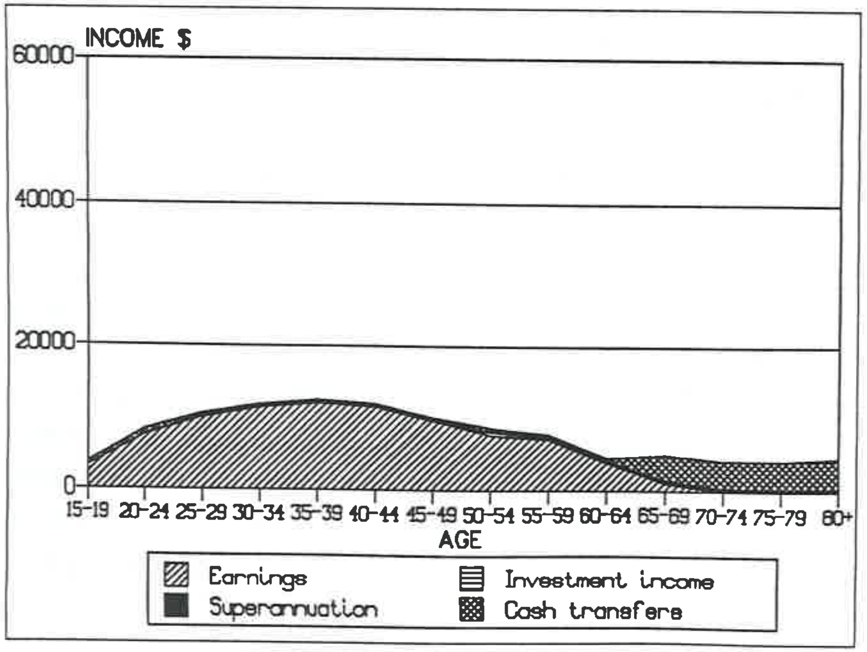
As discussed earlier, it is also not immediately obvious how to make sense of lifetime income measures. If the income received by an individual in every year of life is summed, and the population is then divided into deciles of total lifetime income, many of those in the lowest income decile will simply be those who died at a younger age. Their lower lifetime incomes will thus reflect the reduced number of years in which they earned income, rather than necessarily pointing to a low lifetime standard of living. Measures of tax and transfer incidence will be similarly distorted as, for example, those who died early will have received no age pension, and the transfer system might therefore falsely appear to be regressive. To circumvent these problems, the incomes received by the cohort in every year of life were summed and then *annualised* lifetime income measures were derived, by dividing the various lifetime totals by years of life minus 15. The annualised income measures can thus be viewed as the average amount of income received during each year of adult life.

Consequently, for the following analysis males and females have been ranked by their *annualised lifetime equivalent family disposable income* and then divided into deciles. This income measure thus standardises for both differential length of life and the additional demands placed upon income by dependent spouses and children (with the equivalence scale used being that implicit in the Australian social security cash transfer system at January

1990). Figure 3 takes those in the lowest decile of males, ranked by annualised lifetime equivalent income, and shows the amount of income they received by source of income during their lifetimes.

For those in the *bottom decile,* earnings and income peak somewhat earlier than for males on average, at ages 35 to 39, reflecting their lower educational achievement. Although the vertical axis in Figure 3 is scaled differently to that in Figure 2, the peak income of around $12,500 of the bottom decile is about half that of all males on average. Further, while cash transfers were such an insignificant source of income for males on average that they could not even be identified in Figure 2 for those below

Figure 3
Average Amounts of Income Received Each Year by Age by Males Placed in the Lowest Decile of Annualised Lifetime Male Equivalent Income



retirement age, for males in the bottom decile cash transfers made a minor contribution to income even during the prime working years, reflecting the greater incidence of unemployment and sickness.

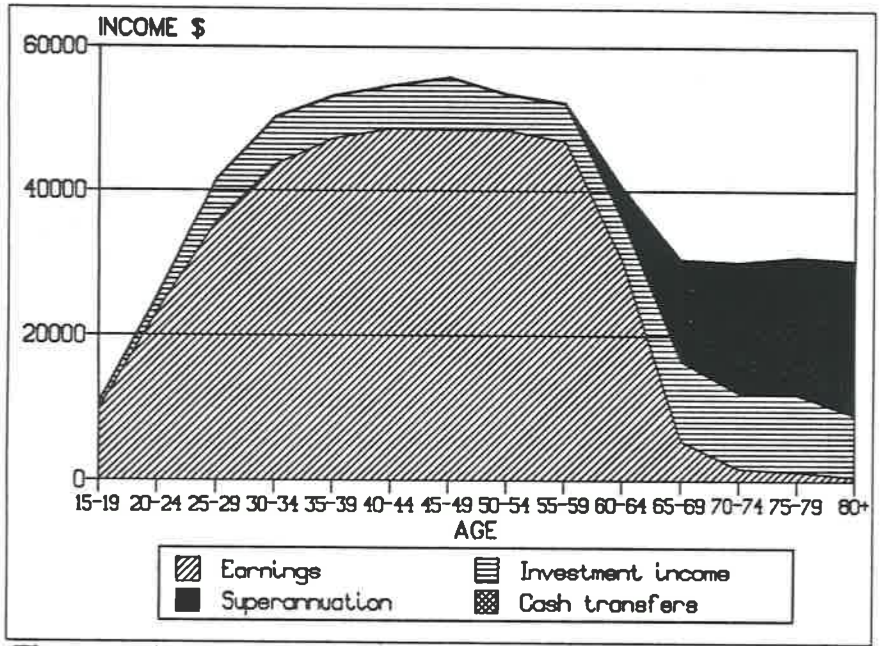
The disadvantage experienced by the bottom decile continued into retirement, where occupational superannuation was non-existent and investment income minimal. They thus relied on age pension after retiring from the workforce, which provided an average income of around $4,500 - about half of the average retirement income enjoyed by males on average.

This lifecycle profile stands in stark contrast to that of males in the *top decile* of annualised lifetime equivalent income, whose income peaked later at ages 45 to 49 and who benefited from high incomes during their thirties, forties and fifties (Figure 4). The peak income received by the top decile was more than twice that received by males on average and more than four times that received by the bottom decile. Investment income formed a more significant source of income during their entire lives and contributed about a third of total income during retirement, with the balance coming from occupational superannuation.

The standard of living achieved by the top decile during retirement was also far higher, with the average gross income after age 65 of around $30,000 being more than three times as much as that achieved by males on average. The relative drop in standard of living in retirement was also less, due to the cushioning impact of superannuation, with average retirement incomes being well over half the income achieved during the peak working years.

Figure 4

Average Amounts of Income Received Each Year by Age by Males Placed in the Highest Decile of Annualised Lifetime Male Equivalent Income



The preceding figures simply trace *gross* income received during the lifecycle, thereby taking account of transfers but not taxes. One would expect the relative advantage enjoyed by the affluent during their lifecycles to be reduced once income taxes were deducted from income. In addition, one of the interesting questions which can be analysed using the simulation is the extent to which the state redistributes income across the lifecycle of individuals, taxing individuals during the relatively affluent peak working years and redistributing this income via cash transfers to the leaner years of retirement.

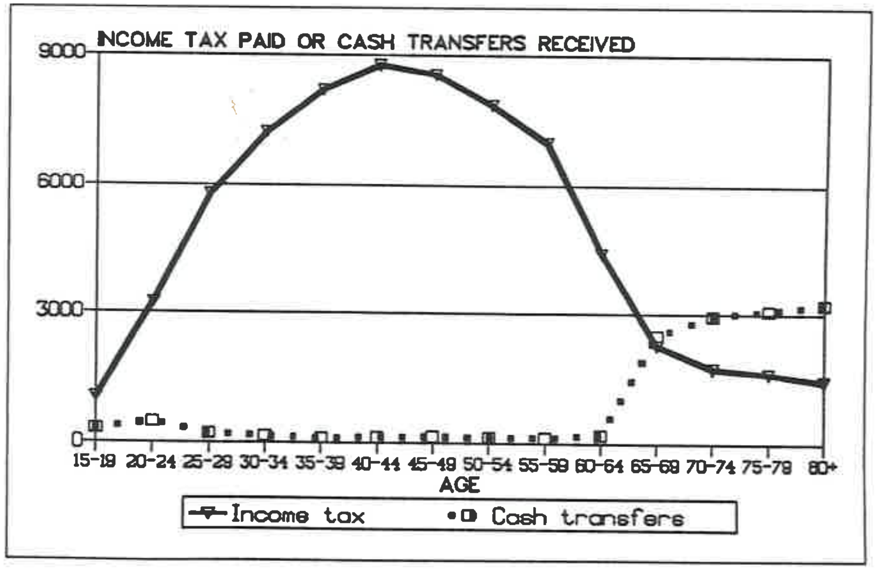
The average picture for all males is shown in Figure 5, where income taxes from labour force entry until retirement massively

exceed transfers, but transfers exceed taxes from age 65 onwards. It must be emphasised that although average taxes are far greater than average cash transfers received during the lifetimes of men, this does not mean that the welfare state is 'failing': income taxes are used to finance a very wide range of other services, such as education, health, housing, transport and defence, and many of these services provide a direct benefit to individuals which a broader incidence study would incorporate. The graph merely shows how *cash income* is redistributed across the lifecycle and, as a result, taxes necessarily exceed transfers because they finance so many other services.

Once again, the picture for those with varied lifetime standards of living is markedly different. Even for those in the decile with the *lowest lifetime standard of living*, average income taxes paid each year exceed average cash transfers received, until age 65 is

Figure 5

Average Income Tax Paid or Cash Transfers Received by Age by Males



reached (Figure 6). For those in the *bottom decile*, the income tax paid out during the working years is, however, almost fully recouped during retirement, as cash transfers average $985 during each year of adult life while income taxes average $1,100 a year. While Figure 6 initially appears to suggest that total transfers received during retirement by those in the lowest decile of annualised lifetime equivalent income are actually *greater* than taxes paid in earlier years, this is not the case. The average age of death for men in this decile is 71.6 years and thus, in practice, many of them do not live long enough to more than recoup their income tax.

The lifecycle pattern of taxes and transfers for those in the *top decile* of annualised lifetime equivalent income is plotted in

Figure 6

Average Income Tax Paid or Cash Transfers Received by Age by Males Placed in the Lowest Decile of Annualised Lifetime Male Equivalent Income

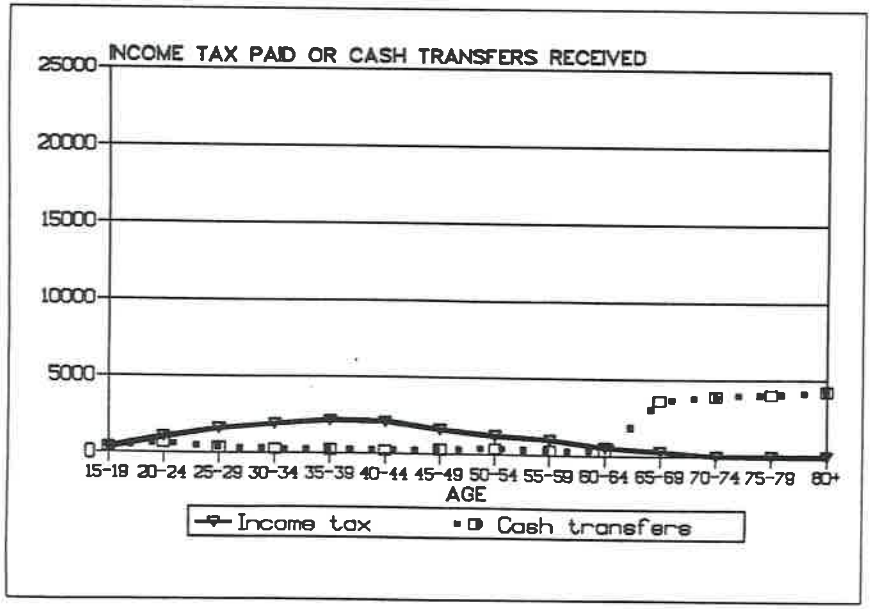
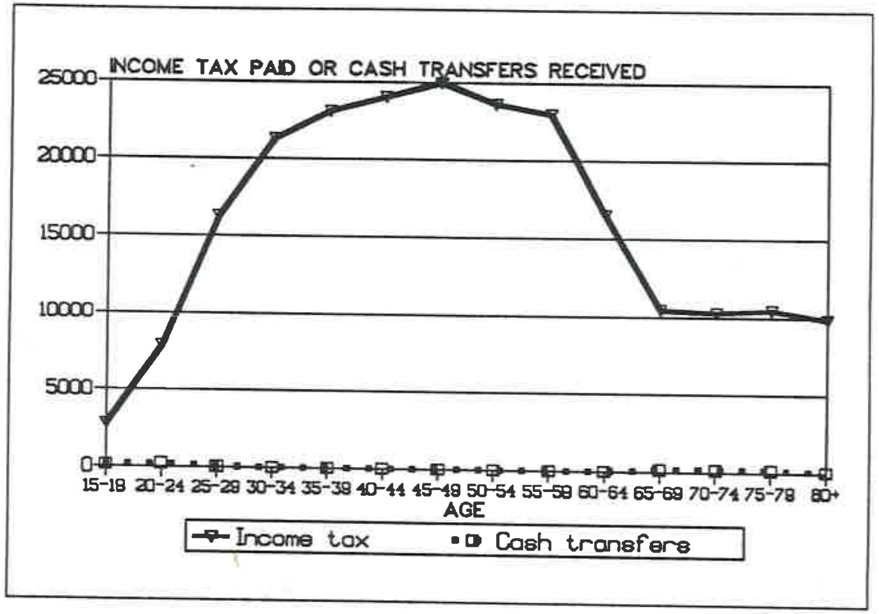


Figure 7. Cash transfers are negligible throughout the entire lifecycle, while average income taxes peak at around $25,000 a year while the top decile are in their late forties, and decline to an average $10,000 a year when they retire.

Figure 7

Average Income Tax Paid or Cash Transfers Received by Age by Males Placed in the Highest Decile of Annualised Lifetime Male Equivalent Income



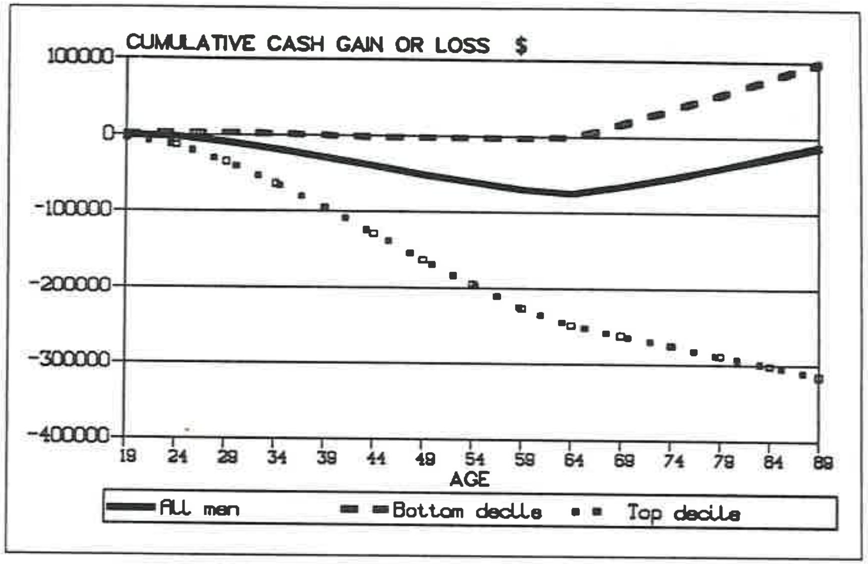
It is difficult to measure accurately the degree of intra- and inter-personal income distribution achieved by all income taxes and transfers because, as discussed above, income taxes so greatly exceed transfers. In an attempt to identify the direction and magnitude of redistribution more clearly, 27.6 per cent of the amount of tax paid by all taxpayers has been calculated for every year (termed *adjusted income tax*). At this level, the absolute amount of all income tax paid by all men and women in the simulation *exactly equals* the amount of all cash transfers received by all men and women.

It is then possible to calculate the cumulative amount of adjusted income tax paid by particular groups and deduct the cumulative amount of cash transfers received, thereby showing the net cumulative gain or loss at different stages of the lifecycle. As Figure 8 demonstrates, for men as a whole, cumulative adjusted income tax exceeds cumulative cash transfers, unless such men live beyond the age of 90. As the average age of death for all men is about 74 years of age, on average men make a net loss of around $50,000 during their lifetimes. In other words, at death men have on average paid out just under $90,000 in adjusted income tax and received just under $40,000 in cash transfers. For all males, therefore, about 45 per cent of their adjusted income tax payments are devoted to *intra-personal redistribution*, or the transfer of income from one part of their life to another; the remaining 55 per cent represents *inter-personal redistribution*, from men to women.

Although this represents the average picture for males, there are significant differences among males. (It should also be remembered that this only represents the average picture for survivors: those males who die before retirement age experience a net loss.) Figure 8 also shows the average profiles for those in the top and bottom deciles of annualised lifetime equivalent income. Males in the *bottom decile* essentially break even during the working years, moving ahead only in retirement. As the average age of death for men with the lowest lifetime standard of living is about 72 years, men in this decile on average receive about $38,000 more in cash transfers during their lifetimes than they pay out in adjusted income tax.

Figure 8

Cumulative Gain or Loss From Taxes and Transfers During the Lifecycle for Males



Note: The average age of death is 73.7 years for all males, 71.6 years for males in the lowest decile and 72.5 years for men in the top decile.

The graph shows cumulative annualised cash transfers received by a given age minus cumulative adjusted annualised income taxes paid by the same age.

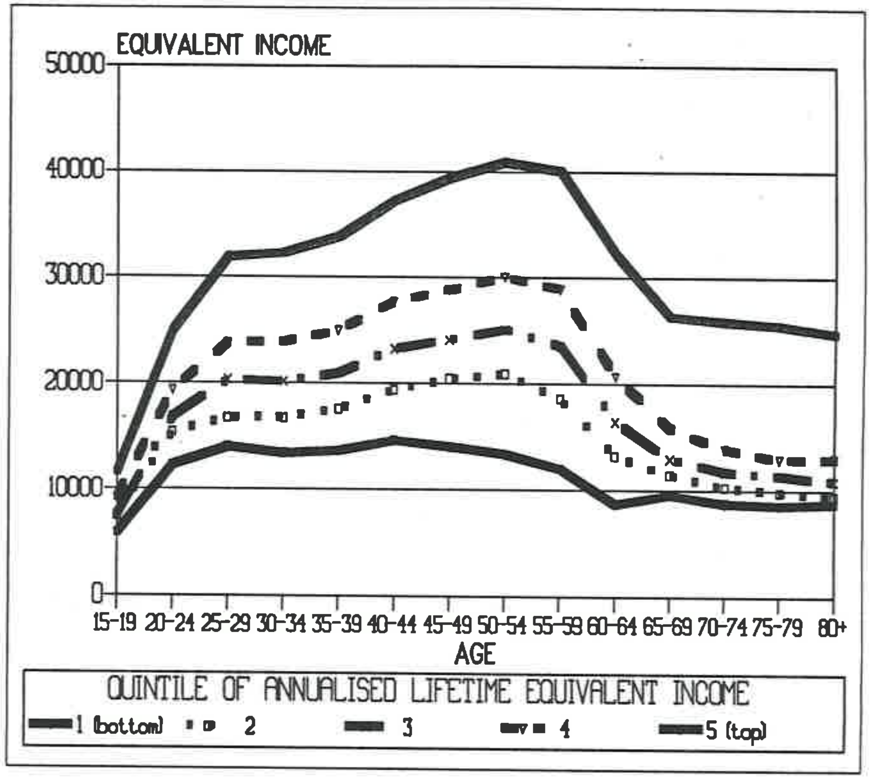
In contrast, men in the *top decile*, who die at the average age of about 72.5 years, have on average paid out about $260,000 more in adjusted income tax during their lifetimes than they have received in cash transfers. For men in this decile, only about two per cent of the adjusted income tax which they pay during their lifetimes is received back in the form of cash transfers, so that intra-personal redistribution for those in this decile is minimal.

Despite these apparently very major transfers of income from men with high lifetime standards of living, the distribution of income remains very unequal over the lifecycle. A clearer picture of the extent to which *living standards* across the lifecycle are being equalised is provided in Figure 9, which traces the equivalent income per year of males ranked into quintiles on the basis of their annualised lifetime equivalent disposable family income. In other words, the total amount of equivalent income received by all males during their lifetimes was first calculated; second, this was divided by years of life minus 15 to derive annualised equivalent income, and third, all males were then ranked by ascending amount of annualised lifetime equivalent family income and divided into five equal groups. After all males were assigned to one of these groups, it was then possible to go back and re-examine the income received by those in each group during each year of life, taking full account of transfers received in that year, income taxes paid in that year and the number of adults and children being supported by the family's income in that particular year.[5]

Once account was taken of needs, the disparity between living standards before and after retirement was somewhat reduced, thereby indicating that, during the peak working years, the advantage of higher income was partly offset by the need to support more people with that income. Equivalent income during retirement amounted to about 52 per cent of peak equivalent income received during the working years for males on average; for those in the top and bottom fifth of the lifetime distribution of equivalent income, equivalent income amounted to about 63 and 60 per cent respectively to the highest equivalent income achieved while in work.

5 As discussed earlier, it is the equivalent income of the income unit which is calculated and attributed to all adults within the income unit. This means that during the years when a male is part of a married couple, any income of the wife is included in the calculation of equivalent income. During the years when the sale is single, his equivalent income is simply his own income after application of the relevant equivalence scale.

Figure 9
Annual Equivalent Income by Age For Males, Ranked by Quintile of Annualised Lifetime Male Equivalent Income



It should be noted that this result is, of course, dependent upon the equivalence scale used. The scale used was the government-endorsed scale implicit in social security payment rates in January 1990 and, because the social security system does not assumed that needs decrease with age (and thus pays a single invalid pensioner aged 40 the same rate as a single age pensioner age 70), the equivalence scale derived from it does not differentiate by age. Some overseas research has suggested that the aged require less income to achieve comparable standards of living to those of workforce age (Whiteford, 1985), so it is possible that the above results overstate the relative decline in income which occurs in retirement.

Living standards were most unequal during the late forties and early fifties, when those in the top quintile benefited from an annual equivalent income which was about three times greater than that of the bottom quintile. In retirement, the differences in living standards narrowed, with the bottom eighty per cent of the population having a relatively comparable standard of living, but the gap between the top 20 per cent and the rest of the population widening.

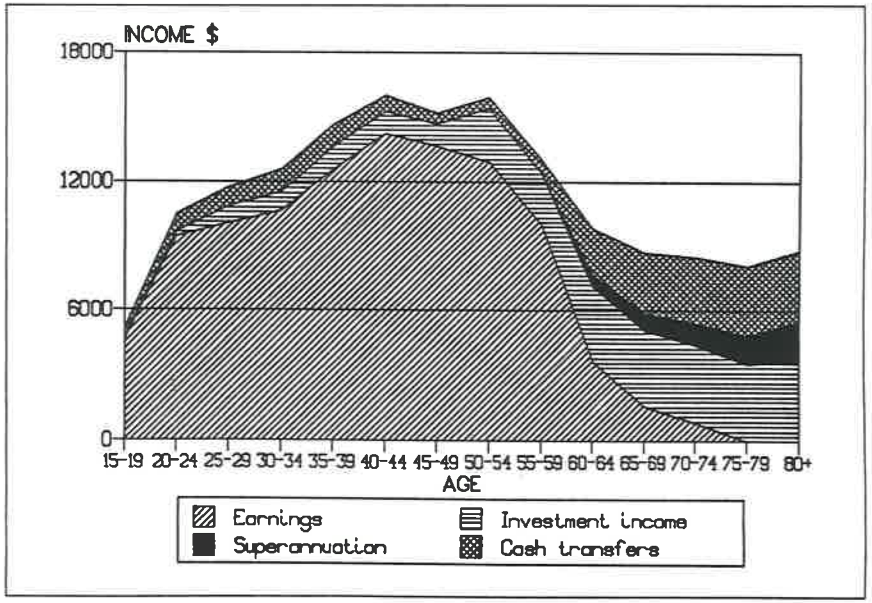
4. Income Distribution and Redistribution over the Lifecycle for Females

As with males, the average earnings of females increase sharply during their twenties and thirties, peaking at ages 40 to 44 (Figure 10). However, even though the average hourly wage rate of females rises steadily during their twenties and thirties (Table 2), average annual earnings dip during the early thirties, in response to the declines in labour force participation during the peak child bearing and raising years. Investment income increases during the early fifties, as the family responsibilities of women decrease and more income is available for investment, remaining at about the same level until retirement from age 60 onwards, when both the absolute level of investment income and its relative contribution to total income increase again.

Cash transfers remain a more significant source of income during the entire lifecycle for women than for men, due principally to the payment of child-related cash transfers to mothers rather than fathers and to sole parents pension. During the peak working years, women's personal incomes are much lower than men's:

while Figures 2 and 10 are drawn to different scales on the vertical axis, at their height the average incomes of women are about 60 per cent of those of men. In retirement, however, the average gross incomes of men and women are much more equal, at about $9,000 a year. While males surviving past the age of 70 receive higher superannuation payments than women, the absolute amount of investment income received by women is slightly higher, as they inherit income-producing assets from their husbands.

Figure 10
Average Amounts of Income Received Each Year by Age by Females



Once again, the aggregate picture glosses over the enormous differences in income during the lifecycle for women at different ends of the income spectrum. Figure 11 shows the lifecycle pattern for women whose lifetime income and family circumstances placed them among the *bottom 10 per cent* of all

Table 2

Income and Other Characteristics of Females by Age

Measure	Age													
	15-20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80+
Earnings	4605	9420	10025	10575	12450	14115	13550	12865	10005	3675	1600	860	0	0
Investment income	135	255	815	875	1055	1045	1015	2515	2390	3455	3495	3550	3565	1765
Superannuation	0	0	0	0	0	0	0	0	0	550	790	1005	1290	3720
*TOTAL ORIGINAL***	*4745*	*9685*	*10885*	*11540*	*13635*	*15275*	*14675*	*15420*	*12410*	*7680*	*5880*	*5420*	*4850*	*5490*
Pension	95	355	410	430	430	330	290	425	595	2165	2835	3075	3230	3315
Benefit	160	225	75	30	20	20	40	10	10	0	0	0	0	0
Education transfers	110	75	20	20	40	50	45	25	5	5	0	0	0	0
Child transfers	25	140	350	540	525	350	145	40	10	0	0	0	0	0
TOTAL TRANSFERS	*390*	*800*	*850*	*1020*	*1015*	*750*	*515*	*500*	*620*	*2165*	*2835*	*3075*	*3230*	*3315*
GROSS INCOME	5135	10485	11735	12560	14650	16025	15190	15920	13030	9850	8715	8490	8085	8805
Income tax	690	1875	2420	2780	3520	4100	3915	4295	3300	1865	1530	1380	1150	1365
DISPOSABLE INC	*4440*	*8610*	*9315*	*9780*	*11130*	*11920*	*11275*	*11625*	*9730*	*7985*	*7185*	*7110*	*6935*	*7440*
EQUIVALENT INC	7880	16365	18750	19295	21010	23225	23825	24565	21200	15660	13310	12810	12460	12860
% married	7.4	34.2	58.9	69.2	71.5	71.9	69.9	68.2	64.5	59.7	52.3	42.6	29.8	12.0
Av no children	0.087	0.438	1.008	1.519	1.521	1.109	0.538	0.166	0.041	0.007	0.001	0	0	0
% in labour force	62.0	84.8	75.3	72.5	77.0	81.2	77.7	70.2	59.3	27.3	9.9	5.5	0	0
% work F.T.*	49.2	79.5	73.1	70.3	74.0	77.8	78.4	88.5	88.7	87.7	83.5	85.9	0	0
% exp any unemp#	20.2	21.0	14.9	11.8	10.4	10.1	10.6	5.9	6.7	0	0	0	0	0
Hourly wage rate*	6.75	8.30	9.40	10.20	10.60	10.95	10.80	10.30	9.50	8.15	10.65	10.35	0	0
Av hrs worked pa*	1182	1433	1513	1511	1617	1684	1704	1849	1849	1758	1786	1858	0	0
% with degree	0	9.1	15.1	16.7	18.0	18.7	18.7	18.7	18.9	19.3	19.6	19.7	19.9	22.0
% sec sch only	37.6	42.8	32.0	23.9	17.5	13.4	12.5	12.5	12.4	12.6	12.7	12.7	12.6	11.5

Notes:

* denotes average for those in the labour force .

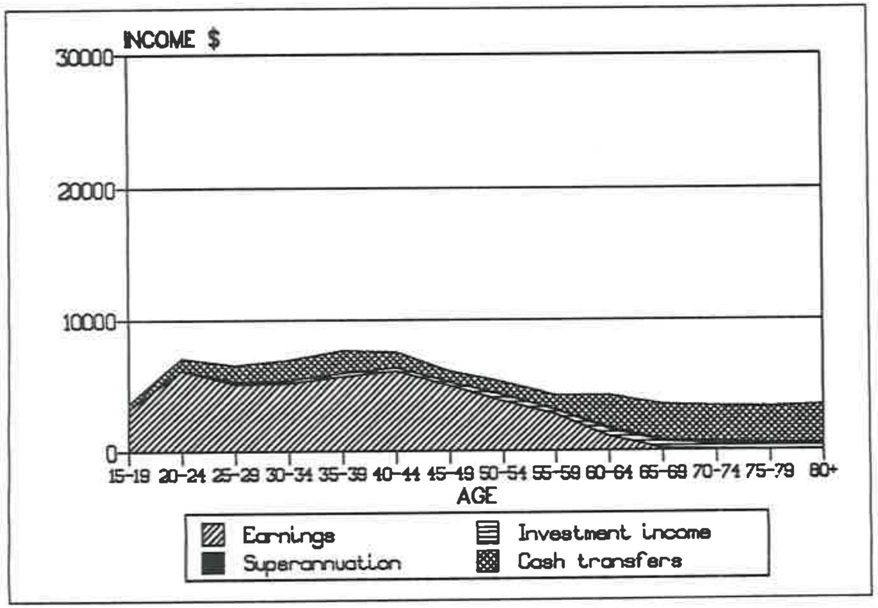
** includes maintenance. All income figures rounded to nearest $5. Totals may not sum due to rounding.

% unemployed is % experiencing any unemployment during year.

women, ranked by annualised lifetime equivalent income. Such women receive very low earned incomes, peaking at only $6,000 a year, with average earnings slumping during their late twenties and thirties as they remain at home with children.

Figure 11

Average Amounts of Income Received Each Year by Age by Females Placed in the Lowest Decile of Annualised Lifetime Female Equivalent Income

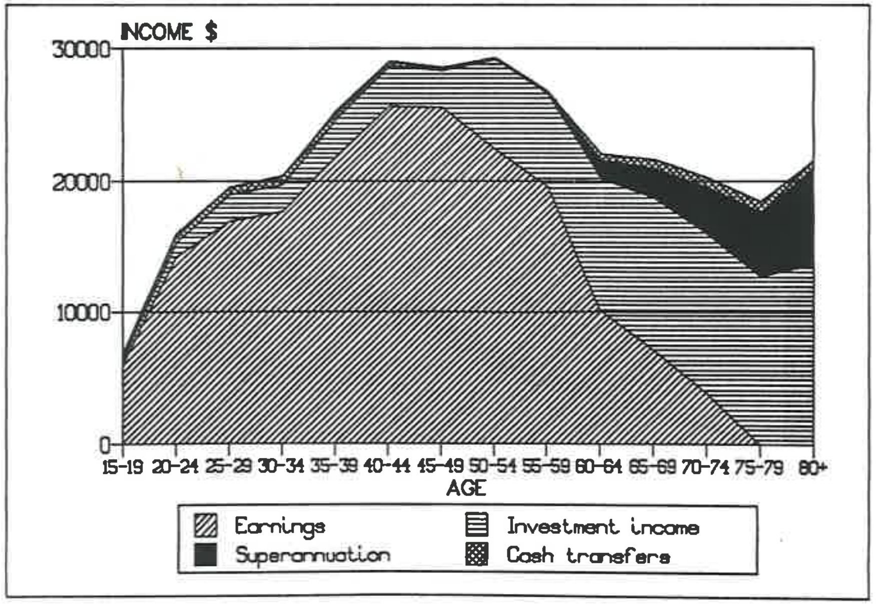


Average yearly investment income is also negligible, at a few hundred dollars a year, and superannuation in retirement almost non-existent. Cash transfers remain an important source of income during their lifetimes, rising in the late twenties and thirties with child transfers and sole parents pension, declining in the fifties as children leave home, and rising again in retirement, when they form by far the most significant component of post-retirement income.

For those women in the *top decile* of annualised lifetime equivalent income, cash transfers are an insignificant source of income during both pre and post-retirement (Figure 12). Their earnings profile is much more similar to that of all males where, despite the slight dip caused by family responsibilities in the early thirties, earnings continue to rise to peak at just over $25,000 in the forties, roughly the same absolute level as is achieved by males on average (Figure 2). Although the average investment income for women in the top decile is lower than that for men in the top decile, it is a very important source of income, with both investment income and superannuation rising in the eighties as spouses die and the surviving wives inherit assets and occupational pension entitlements. Women in the top decile are also more likely than other women to remain in the labour force

Figure 12

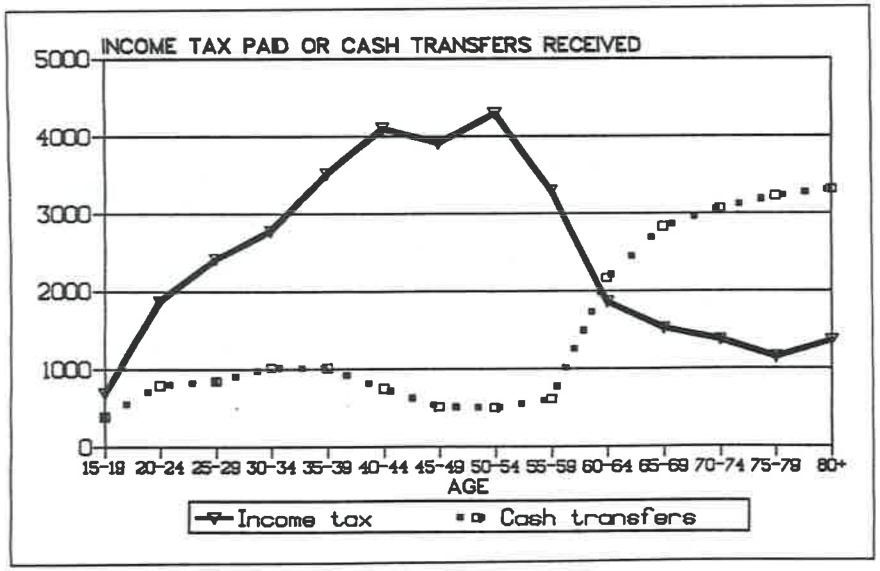
Average Amounts of Income Received Each Year by Age by Females Placed in the Highest Decile of Annualised Lifetime Female Equivalent Income



after the statutory retirement age is reached, with some 21 per cent still working on a full or part time basis in their late sixties.

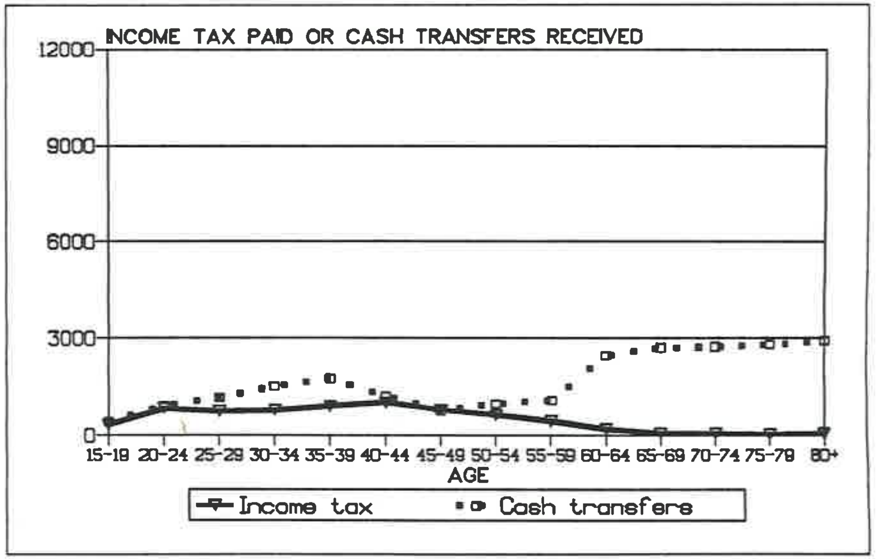
The tax-transfer system generates a significant amount of lifecycle income redistribution for women, providing transfers during the twenties and thirties, when family responsibilities are at their height, and after retirement in the early sixties. As a comparison of Figures 5 and 13 demonstrates, cash transfers are more important for women than for men during working years, although in retirement the average value of cash transfers is similar. The amount of income tax paid during the lifecycle is much lower, reflecting the reduced taxable incomes of women compared to men, and peaks at only around $4,000, less than half of the peak for men.

Figure 13
Average Income Tax Paid or Cash Transfers Received by Age by Females



The lifecycle pattern of taxes and transfers for those with the highest and lowest levels of lifetime standard of living is strikingly at odds with the picture on average. As Figure 14 illustrates, women in the *lowest decile* of lifetime equivalent income receive much more in transfers during their lifetimes than they pay in taxes and, with the exception of the 45 to 49 years age range, receive more in transfers than they pay in income tax during every year of their life.

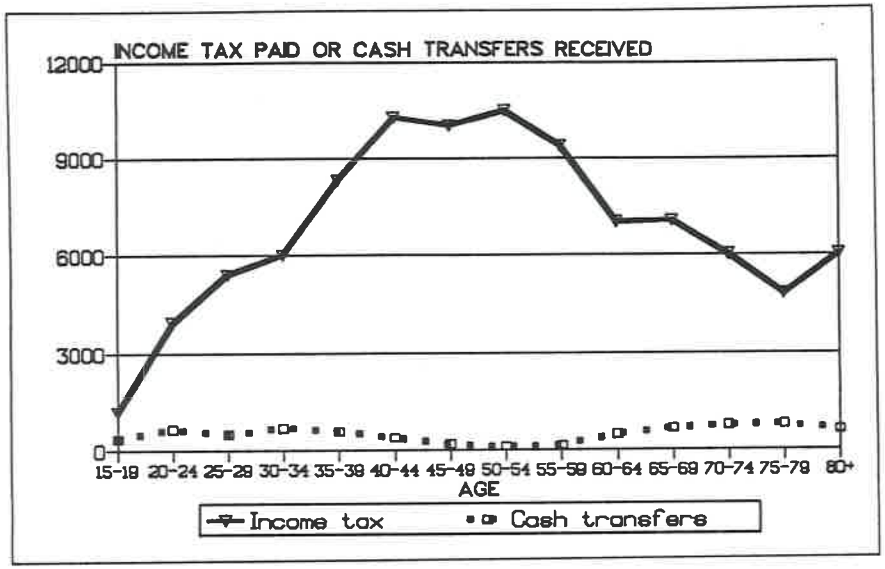
Figure 14
Average Income Tax Paid or Cash Transfers Received by Age by Females in the Lowest Decile of Annualised Lifetime Female Equivalent Income



The profile for women in the *top decile* is again more similar to that of males in the top decile, with income tax rising steeply during the twenties and thirties and declining in retirement. The characteristic twin-humped pattern of cash transfers for women is again evident, although cash transfers remain very low, never exceeding $1,000 (Figure 15).

Figure 15

Average Income Tax Paid or Cash Transfers Received by Age by Females in the Highest Decile of Annualised Lifetime Female Equivalent Income



As with men, it is possible to compare cumulative *adjusted income tax* with cumulative cash transfers received - ie. to compare the amount of cash transfers received against the amount of income tax devoted to the provision of cash transfers (27.6 per cent of all income tax paid by all men and women). Interestingly, the picture for all women is similar to that of men in the bottom decile of annualised lifetime equivalent income, in that cumulative adjusted taxes paid essentially equal cumulative transfers received during the working years, but net gain increases sharply in retirement, when transfers outpace adjusted taxes.

The average age of death for all women is around 79 years, so on average women make a net gain of about $40,000. (This is lower

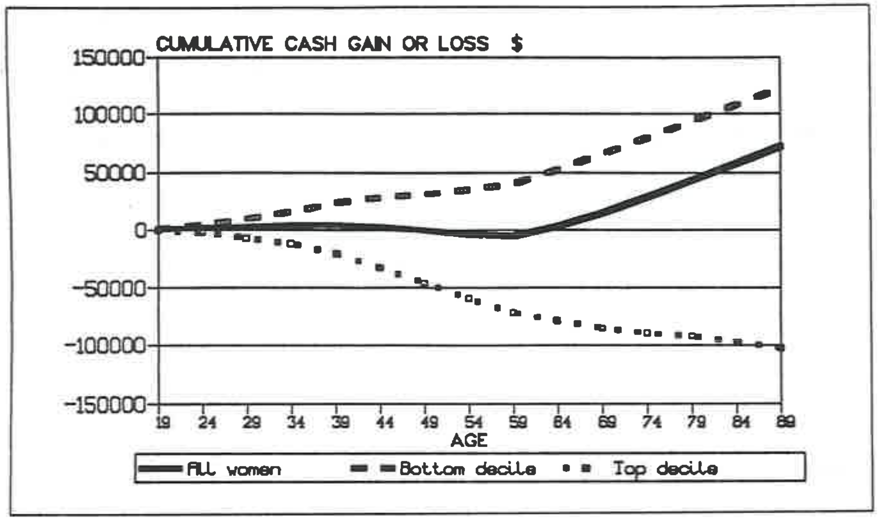
than the male average loss of $50,000 which finances the $40,000 gain of women; because women live on average for five years longer than men, the net loss of men has to be shared between more women). This means that, for women in general, *all* adjusted income tax payments contribute to intra-personal income redistribution; looked at from a lifecycle perspective, all taxes collected during the peak working years are redistributed backwards to the years of child rearing and, far more importantly, forwards to the years of retirement.

For women belonging to the *bottom decile* of annualised lifetime equivalent income, cash transfers exceed adjusted income tax throughout the lifecycle. At the average age of death of 81.6 years, women in this decile have received about $100,000 more in cash transfers than they have paid in income tax. As Figure 16 shows, there is no point in the lifecycle when women with the highest lifetime standards of living have received more in cash transfers than they have paid in adjusted income tax. Thus, there is not only redistribution from men to women, but also from rich women to poor women, ranked by lifetime standard of living.

While the above analysis has examined the personal income distribution of women, and the extent to which this income is modified during the lifecycle by income taxes and transfers, this does not take account of income sharing within families. For example, while women in the lowest lifetime equivalent income decile have very low personal incomes which never exceed $8,000 a year during their entire lifetimes, the low earned incomes of many such women might be offset by the income of a male breadwinner.

Figure 16

Cumulative Gain or Loss From Taxes and Transfers During the Lifecycle for Females

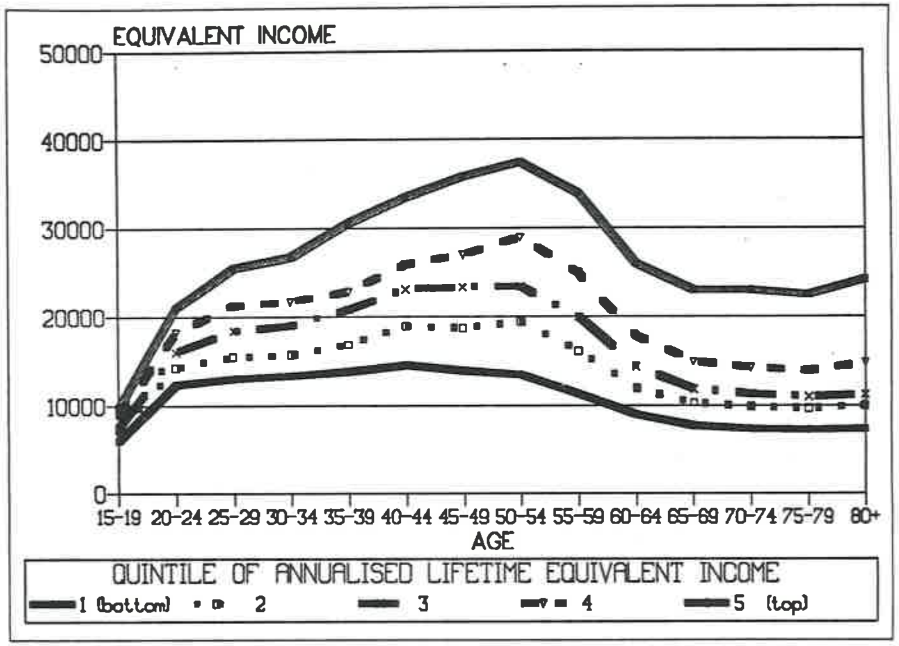


Note: The average age of death is 78.8 years for all females, 81.6 years for women in the lowest decile and 76.5 years for females in the top decile.

To compare the *standard of living* achieved by different women during their lifecycles, rather than to just compare their income, equivalent income must be used. In Figure 17, women have been divided into quintiles on the basis of their annualised lifetime equivalent income, and then the annual equivalent income of each quintile during every year of life has been plotted. As comparison with Figure 9 demonstrates, the standard of living achieved by women during their lifetimes is fairly similar to that of men. The standard of living of those in the bottom quintile does not show great variation across their lifecycle, although the flatness of the line should not disguise the fact that equivalent income during retirement is still only 53 per cent of the highest equivalent income achieved during the peak working years.

Figure 17

Annual Equivalent Income by Age For Females, Ranked by Quintile of Annualised Lifetime Female Equivalent Income



The impact of children upon lifetime standards of living is again clearly apparent, as the increases in earned income during the twenties and thirties are offset by the greater number of people amongst whom that income must be shared, resulting in slow growth in living standards during the late twenties and thirties. For the top four quintiles, living standards peak in the early fifties, after child-related responsibilities have eased but before the drop in average earnings really begins to make an impact. During retirement, real standards of living decline, with equivalent income averaging some 53 per cent of the peak level achieved only 15 years earlier, and the standard of living achieved being somewhat lower than that won during the early twenties.

While the equivalent incomes of most quintiles of women at a given age are somewhat lower than the equivalent incomes of men in comparable quintiles (due, for example, to single men typically having higher incomes than single women), the difference is far less pronounced than examination of personal incomes would suggest. However, the disparity between the equivalent incomes of men and women in their top respective quintiles is greater than the difference apparent at lower quintiles. For example, the peak equivalent incomes of men in the top quintile are 10 per cent higher than the peak equivalent incomes of women in the top quintile.

5. CONCLUSIONS

The tax-transfer system in Australia has a profound effect on lifecycle income, redistributing income from the years of work to years of retirement (intra-personal redistribution) and between individuals with different characteristics (inter-personal redistribution). Aggregate income taxes paid by all men and women in the simulation are so much greater than aggregate cash transfers received that they make accurate identification of the magnitude and direction of redistribution very difficult: the easiest way to analyse the type of redistribution occurring is therefore to compare the total dollar amount of all cash transfers received by all men and women with the total dollar amount of income taxes *used to finance those cash transfers.* This has been termed *adjusted* income tax, and amounts to 27.6 per cent of all income tax payments in the simulation. Accordingly, 27.6 per cent of the income tax paid by each individual in each year of life was calculated and designated as adjusted income tax.

When cumulative cash transfers were compared with cumulative adjusted income tax paid, the following groups emerged as net

winners, and were thus the beneficiaries of inter-personal redistribution from other taxpayers:

- males with lower lifetime standards of living (ie. in the bottom four deciles of males ranked by male annualised lifetime equivalent income);
- females, on average; and
- females with low to above average lifetime standards of living (ie. in the lower eight deciles of women ranked by female annualised lifetime equivalent income);

In other words, for all of the above groups, on average all adjusted income tax paid was received back in the form of cash transfers at some other point in the lifecycle.

The following groups were net losers, and thus paid more in adjusted income tax than they received in cash transfers during their lifecycle;

- males, on average;
- males in the top six deciles of males ranked by male annualised lifetime equivalent income; and
- females with the highest lifetime standards of living (ie. in the top two deciles of women ranked by annualised lifetime equivalent income).

Even for the latter groups the amount of intra-personal redistribution was substantial. For example, for males on average, about 45 per cent of all adjusted income tax paid was recouped at some point in their lifecycle. However, for those with the highest lifetime standards of living, very little of the adjusted income tax they paid contributed to the redistribution of income from one part of their own life to another. For males in the top decile of annualised lifetime equivalent income, around two per cent of their adjusted income tax payments were returned to them in the form of cash transfers, while for females in the top decile the figure was around 4 per cent. Thus, while some have argued that government programs of income redistribution simply shift income from one part of an individual's lifecycle to another, funding the transfers received while studying or retired from the income taxes collected from the same individual during the prime working years, the above findings indicate that this is not the case and that there is substantial inter-personal redistribution.

The transfer of income from men to women, while interesting, should not be overstated, as part of the losses made by many husbands were no doubt recouped by their wives through child transfers, and total family income might therefore not have been affected, despite the transfer of resources from husbands to wives. Nonetheless, the results certainly emphasise the importance of the social security system to women. The lower equivalent incomes of women, even after taking account of the tax-transfer system, underline the continuing importance of policies to improve women's economic prospects and opportunities - including equal employment opportunity policies, equal pay for equal work and equal access to education - as well as tax-transfer policies.

Despite the scale of intra and interpersonal transfers, living standards during the lifecycle for those with different characteristics remained highly unequal. In particular, most groups faced steep falls in their standard of living upon retirement. This result provides some support for the role of the state in intra-personal income redistribution from the years of work towards the years of retirement, and for policy changes

made in Australia since 1986, such as the spread of award-based superannuation and changes to preservation and vesting rules.

Finally, although living standards for both men and women tended to become more equal after the age of 50, when most children had left home, equivalent incomes during the years of family formation and growth were significantly lower than those achieved during the later years of middle age. While there is continuing debate about the extent to which the decision to have children is a private choice - and thus about the extent to which the state should intervene to support families with children - it is clear that the child transfers and income tax concessions available in 1986 were not sufficient to prevent families with children experiencing lower living standards during the years of child raising. Arguably, this again might suggest an expanded role for the government in redistributing resources to the most vulnerable periods of the lifecycle. Once again, however, the simulation modelled the 1986 social security system and policy changes made since then - including the introduction of Family Allowance Supplement for low income families in the workforce, the sharp increases in payments to social security recipients with children and the indexation of family allowance - have directed additional resources to this area of need.

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