

# Trends in the Disposable Incomes of Australian Families, 1982-83 to 1989-90

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**DISCUSSION PAPERS**

**TRENDS IN THE DISPOSABLE INCOMES  
OF AUSTRALIAN FAMILIES,  
1982-83 TO 1989-90**

**Bruce Bradbury, Jennifer Doyle  
and Peter Whiteford**

**No.16**

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Bruce Bradbury, Jennifer Doyle and Peter Whiteford

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## ABSTRACT

This paper describes and assesses trends in the disposable incomes of Australian families between 1982-83 and 1989-90. The paper's results are based on the 1985-86 Income Distribution Survey adjusted by micro-analytic simulation techniques to reflect changes in employment and earned and unearned incomes, as well as developments in the personal income tax and social security systems. A model of factors influencing mortgage repayments is also developed and used to assess trends in housing costs and in incomes after housing costs are deducted.

Overall, the paper estimates the increase in median real family incomes to be around 6.5 per cent between 1982-83 and 1989-90. Excluding farming families, this increase is reduced to only 3.3 per cent. The family types with the smallest income growth have been single young people and couples with children, whose real median incomes have remained essentially stable over the period (for non-farming families).

Real mortgage repayments for house purchasers are estimated to be an average of \$48 per week higher in 1989-90 than they would be if housing and finance markets had remained unchanged. The average purchaser aged under 30 years, however, is estimated to be paying \$79 per week more in real terms. Over all tenures, real housing costs are estimated to have increased by an average of \$14 per week.

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## CONTENTS

	Page
1. INTRODUCTION	1
2. PREVIOUS STUDIES AND METHODOLOGICAL ISSUES	5
3. TRENDS AFFECTING THE DISTRIBUTION OF REAL DISPOSABLE INCOMES	10
Demographic Changes	10
Employment Trends	10
Trends in Income Components	14
Changes to the Social Security System	16
Personal Income Tax Changes	20
Trends in Housing Costs	25
4. THE DISTRIBUTIONAL IMPACT OF CHANGES IN INCOMES AND TAXES	31
5. THE DISTRIBUTIONAL IMPACT OF HOUSING COST CHANGES	40
Mortgage Repayments	41
Effects of Interest Rate Changes	47
Overall Impact of Housing Cost Changes	49
6. THE DISTRIBUTION OF CHANGES IN DISPOSABLE INCOMES	51
7. SUMMARY AND CONCLUSIONS	54
REFERENCES	57
APPENDIX A: AGEING METHODOLOGY	59
APPENDIX B: METHODOLOGY FOR ASSESSING THE DISTRIBUTIONAL IMPACT OF HOUSING COST CHANGES	66

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## 1. INTRODUCTION

In recent years there has been considerable debate about trends in living standards under the Hawke Government. This debate has occurred in both the political and the academic arenas, with claims that living standards for the average family have fallen substantially over the period since 1983 and that inequality has increased – that ‘the rich are getting richer and the poor are getting poorer’, or that poverty has increased since 1983 (Watts, 1989, p.125). As evidence for these conclusions, reference is usually made to the real decline in the value of average weekly earnings and the increasing level of taxation at this level, together with the rise in the level of housing costs caused by high interest rates and increasing house prices. At the same time it is argued that income inequality has increased because the restraint in wages achieved under the Accord has not been matched by high income earners, who have also benefited from the cuts in the top marginal tax rate.

In seeking to counter these claims, the Government has pointed to the very large increase in employment and the reduction in unemployment since 1983, and has also emphasised improvements in the ‘social wage’, particularly the introduction of Medicare and increases in social security payments directed towards low income families with children. It has also been noted that new taxes such as the Fringe Benefits Tax and Capital Gains Tax and the attack on tax avoidance and evasion have substantially contributed towards improving the real progressivity of the tax system as a whole. While aspects of these claims may be debated, it would still seem an open question whether income inequality has increased or decreased in the period of the Labor Government.

In addition, there are other indicators that suggest that real living standards for the average family have increased rather than fallen. For example, while real average weekly earnings (AWE) fell by around 2.9 per cent between 1982-83 and 1988-89, real household disposable income per capita (HDIPC) rose by around 8.4 per cent over the same period. These divergent trends are illustrated in Figure 1.

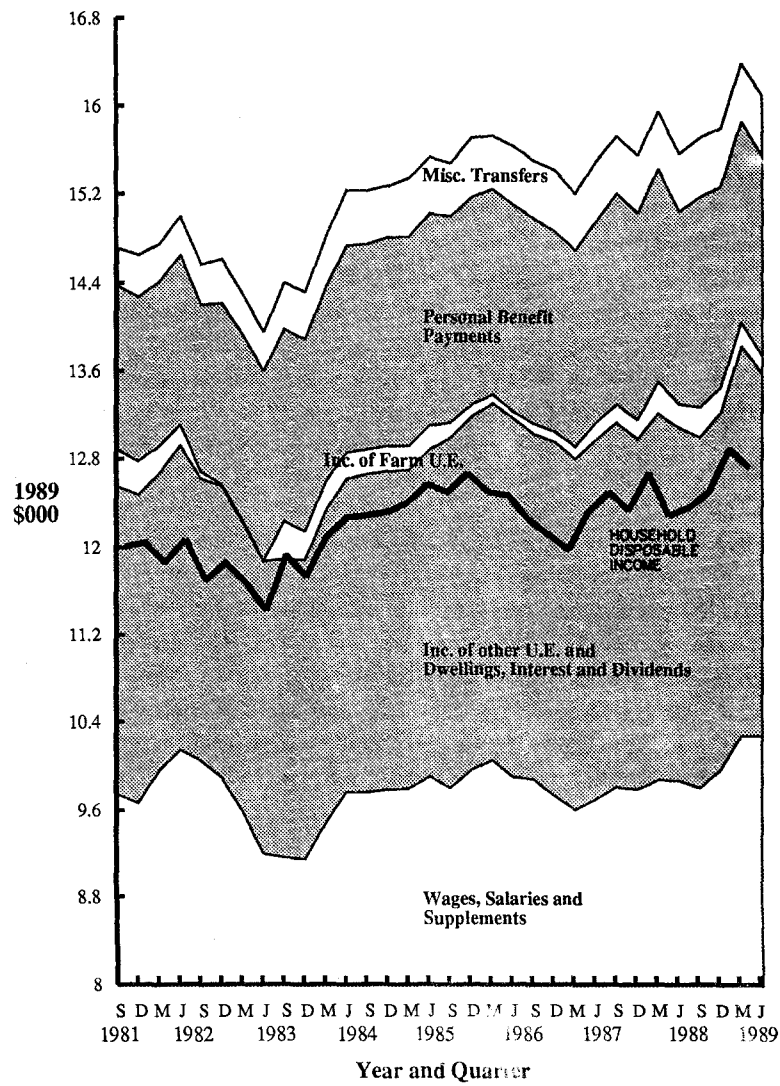
It can be seen that real AWE increased rapidly in the early 1980s, before falling in late 1982 and early 1983. Real AWE then rose very substantially to peak in the third quarter of 1984, whence it has fallen very substantially and fairly consistently. In contrast, real HDIPC fell in the early 1980s and has risen very substantially since its low point in mid-1983, despite a slump in 1986. It is also notable that real HDIPC is subject to much greater fluctuation than real AWE.

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**Figure 2: Components of Real Household Incomes Per Capita,  
1981 to 1989**



The fact that trends in two indicators of 'average' incomes can differ so markedly suggests that particular attention should be paid to the measures being used to describe trends in disposable incomes. Part of the explanation for the differences shown in Figure 1 is due to the increase in employment referred to earlier, while further factors include increases in asset income and in the real value of some social security payments over this period. None of these contributions to disposable income are captured by the average weekly earnings measure, but all are taken into account in the household disposable income per head measure.

Figure 2 illustrates trends in the components of household disposable income over the period since the early 1980s. It is apparent that the 'wages, salaries and supplements' component of household disposable income fell in 1982-83, primarily as a consequence of the large increase in unemployment in that period. Since late 1983, 'wages, salaries and supplements' has regained much of its real level, but it has declined as a proportion of household disposable income. Even though real wage rates have fallen over this period, the overall real level of wages and salaries has been maintained because of increased employment and increases in supplements such as superannuation. On the other hand, other components of household disposable income have risen significantly, notably income from unincorporated enterprise and dwellings, rents and dividends.

Both household disposable income per head and average weekly earnings, however, are limited indicators, in that they show nothing of trends in the **distribution** of disposable incomes. Nevertheless, it is clearly an interesting and important question which of these or other indicators best captures what has actually happened to the level and distribution of disposable incomes since 1983. Debate on these issues goes on at a number of levels and reflects a variety of perspectives. Despite the varying ideological positions adopted and the sometimes bewildering array of statistics marshalled to support particular arguments, the issues of whether living standards for the average family have fallen and whether income inequality has increased are at least potentially subject to factual investigation.

The objective of this paper is to present some initial results from a new and more comprehensive study of trends in disposable incomes for different income and family groups for the period 1982-83 to 1989-90. Whilst by no means all of the issues mentioned above are covered, the study does cover a much broader scope than is usual in this type of analysis. In the next Section we describe some of this previous research and how the methodology used in this paper differs from earlier studies, concentrating on its advantages and limitations.

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The concept of disposable incomes that we employ here encompasses the impact of changes in market incomes, government income transfers, income taxes and (short-run) housing costs. No account is made of changes in the social wage (i.e. government services received by families), nor non-cash incomes (e.g. fringe benefits such as superannuation) – both areas of major policy change over the last seven years. Similarly no attempt has been made to assess the distributional impact of changes in taxes other than income tax.

The factors which are taken into account in the model used here include; demographic changes, changing employment rates, trends in market incomes, changes in tax and income transfer policies and changes in housing costs. The separate trends for each of these factors are described in Section 3 of the paper. In Section 4, these different factors are analysed together to produce estimates of the trends in after tax incomes for different family types and income levels. Section 5 then describes our estimates of changes in housing costs for different family types, and in Section 6 these are integrated with the results of Section 4 to produce estimates of the trends in disposable incomes after housing costs have been deducted. Our key conclusions are summarised in Section 7.

## 2. PREVIOUS STUDIES AND METHODOLOGICAL ISSUES

There are two approaches usually taken to the measurement of trends in disposable incomes. The first of these is to take examples of different types of families at different set levels of income (such as proportions of average earnings or receiving particular government pensions or benefits) and estimate their tax liabilities net of relevant rebates and appropriate transfers such as family allowances. The disposable incomes thus calculated can be compared with movements in prices, and indexes of changes in real disposable income can be estimated. Examples of this approach include the studies of the tax-benefit position of the 'average production worker' (OECD, 1988), and in Australia, studies by Saunders (1982) and Moore and Whiteford (1986). It is also possible to supplement these studies by imputing for the illustrative families the value of the social wage benefits received in the form of public expenditure on health, housing or education (Norris, 1985).

This approach is a standard component of studies seeking to evaluate the impact of government taxation and transfer policies and is precisely the method used in political debates about falling living standards. But it has a number of important limitations. The most significant of these is that the approach can provide no more than an indicator of the likely nominal impact of government policies and cannot be used to judge actual distributional outcomes. This is because the approach only takes account of the specific

tax and transfer policies modelled, within the context of a limited number of family types and income changes in line with average earnings. But a comprehensive analysis requires consideration of changes in employment and unemployment, as well as changes in the size and distribution of other income sources. Even more important, the examination of income trends for hypothetical families does not give a picture of the overall position of such families within the income distribution. Whilst informative in addressing the partial impacts of particular policies, each of the hypothetical cases chosen typically reflects only a small proportion of the population - with the likely changes for the rest of the population not directly addressed.

The alternative approach is to analyse actual income data as collected in surveys such as those carried out by the Australian Bureau of Statistics (ABS) since the late 1960s. The major attraction of this approach is that the data should incorporate the effects of many of the missing factors referred to above. Trends in labour force participation and in demographic composition, and differential movements in income from different sources will all be reflected in the responses given to the survey questions. In recent years, the ABS has made the results of these surveys available on unit record computer tapes, which contain a wide range of data on individuals, families and households on a unit basis (with certain details suppressed to maintain confidentiality). The availability of these unit record tapes has very significantly contributed to the analysis of Australian social policy. Studies that have used the unit record tapes include Bradbury, Rossiter and Vipond (1986), Johnson (1988), and Brownlee and King (1989), all of which have analysed changes in the proportion of population in poverty, and Saunders, Hobbes and Stott (1989) which compares the distribution of income in 1981-82 and in 1985-86.

Studies of this sort also have their limitations, however. As with any sample survey, the data are subject to sampling error and non-sampling errors of various sorts. Paradoxically, to the extent to which survey methodologies are improved over time, comparability will suffer. Like any source of official data, there are inevitable problems involved in the measurement of income, particularly for groups such as the self-employed, where it may be considered that the reported income data are not good guides to their true economic circumstances (though the data may be an accurate reflection of the income definition for taxation purposes).

The most important limitation of income survey data, however, relates to their timeliness. Surveys take time to collect, compile and release. This causes obvious problems for the evaluation of current policies. The two most recent ABS Income Distribution Surveys, for example, were carried out in 1982 and 1986 (with annual income data for 1981-82 and 1985-86 respectively) - that is, before the election of the

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Hawke Government and more than three years ago. The period immediately prior to the 1983 election saw a rapid increase in unemployment, with the unemployment rate rising from an average of 6.1 per cent for 1981-82 to 10.1 per cent in March 1983 (on a seasonally adjusted basis). Similarly, there have been very important changes since the most recent survey was carried out for 1985-86. Major policy changes include cuts to the top marginal income tax rate, which were not fully implemented until 1987-88 and further cuts, particularly to the lower tax rates, in 1989-90; and the Government's family package, introduced from December 1987, which very substantially increased assistance to low income families with children. There have also been major economic changes since 1985-86; total employment grew from 6.86 million for the 1985-86 year on average to 7.8 million in August 1989 and the unemployment rate fell from 7.9 per cent for the 1985-86 year to 5.9 per cent in August 1989.

These and other related developments suggest that changes to the level and distribution of income under the current Government cannot be assessed solely with the aid of existing income surveys. In addition, a simple comparison of income survey data does not allow for the disaggregate analysis of policy changes from broader economic trends, precisely because the effects of the changes are incorporated into the observed results. That is, in comparing these data sources at different times we cannot disentangle the effects of changes in the income tax system from changes in the social security system, from trends in unemployment or employment, or from movements in wages or asset incomes, unless we use a model which explicitly allows us to estimate the effects of these and other relevant factors.

The approach adopted in this paper is to build on the strengths of these alternative approaches, so as to arrive at estimates of trends in the real disposable incomes of families that cover the entire period of interest and also take account of the effects of such factors as increasing employment, changes in demographic composition, differential changes in income by source and the actual distribution of income between different groups and family types. The technique used in this paper is called micro-analytic simulation; it was first used on Australian data by King (1987). Our analysis starts from the most recent Income Distribution Survey carried out for the 1985-86 financial year and involves statistically 'ageing' the data – both forward to 1989-90 and back to 1982-83 – to simulate the distribution of income in these years. In brief, the 1985-86 Income Distribution Survey covered about one-sixth of one per cent of the population of Australia. Each person and family in the unit record file is given a 'weight', so that users of the file can produce population estimates from the sample numbers, i.e. the weights give the number of persons in the population represented by an individual in the survey, with the weights differing between individuals in accordance

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with the number of persons with those specific characteristics in the population as a whole. Our methodology involves taking the 1985-86 Income Distribution Survey unit record file and adjusting both these weights and the income and housing cost variables to reflect changes in the composition of the population between the survey period and the periods used in the analysis.

The sample weights are first adjusted to reflect demographic changes on the basis of the age and sex distributions in the annual labour force series. The weights are then adjusted to ensure that the total level of employment in the year in the survey dataset corresponds to the employment levels in the years for which the estimates are simulated. Third, the value of the income variables in the data file are inflated or deflated to reflect trends in all the varying income components over the period. For example, an index of earnings for full-time and part-time workers of each sex was estimated on the basis of data from both the ABS Survey of Weekly Earnings of Employees (Distribution) and average weekly earnings figures, and this index was applied to the sample data. Both self-employment and asset incomes were inflated or deflated on the basis of measures from the National Accounts. Finally, models of the income tax and the social security systems are applied to calculate changes to disposable incomes. More details of this methodology are contained in Appendix A.

The nature and limitations of this analysis should be noted. The definition of family used is the ABS concept of 'income unit' or nuclear family, and this term is used synonymously with 'family' here.<sup>1</sup> Family disposable income is defined as the sum of the market income received by the head and spouse (if present), plus the income, either positive or negative, from the transfer and income taxation systems. Market income is the sum of income from the labour market and from capital, and labour market income is a function of the probability of employment in various categories and the wage in the relevant employment category. In addition, we also calculate housing costs and derive after-housing cost incomes. It should be emphasised that disposable income is not identical to living standards, which is usually defined as a broader concept covering such additional factors as the effects of indirect taxes, and government spending on housing, health and education. Nevertheless, disposable income is probably the most significant single component of overall living standards for most families.

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1 Income units comprise; single adults, sole parents with dependents, married (de jure or de facto) couples with or without dependents. Dependents are defined as single persons aged under 15 years, or 15-20 years and in full-time education. Adult children living with their parents, for example, are defined as separate income units.

The method used here is essentially intermediate between the hypothetical families approach and the results that would be obtained from income surveys conducted in the two years. The analysis is much more complicated than is possible with hypothetical families, but is a long way short of simulating the results of income surveys. Our goal has been to attempt to model the more important components of income changes - but many influences have been omitted. In the discussion below we point to the main qualifications which this places upon our conclusions. In future work we will attempt to broaden the scope of the modelling further, but limitation to some finite set of changes is inevitable. Nonetheless we believe the analysis as it stands is a significant advance over that currently available and the conclusions are of some interest.

While the assumptions used in the analysis are all derived from other ABS data collections, and thus reflect actual social and economic trends, the level of detail used in the analysis may have important effects. For example, the employment status of female sole parents is adjusted in line with changes in the employment status of all non-married women in the same age group. A further example is the adjustment of asset incomes, which simply started from the observed distribution of asset incomes in the 1985-86 survey and inflated or deflated these in line with movements in aggregate asset incomes. Similarly no account has been made of any increasing wage inequality within the four earnings categories considered here (male and female, full-time and part-time).

In addition, any review of trends over time can be significantly affected by the starting point and the end point for analysis. In this case, the choice of 1982-83 will have a significant impact on employment trends since that year saw the worst recession in the post-war period. Nevertheless, using this as the starting point cannot be said to unduly favour the Labor Government, since the start of the recession preceded their election. Indeed, from this point of view the choice of 1982-83 may provide an overly negative interpretation of labour market trends under the present Government, as unemployment increased so rapidly in late 1982 and early 1983 that unemployment on an annual basis did not reach its peak until 1983-84, when it averaged 9.6 per cent, compared with an average of 9.0 per cent in 1982-83.

In other cases, the starting point may be even more debatable; for example, personal income tax rates were higher in 1982-83 than in 1983-84, as the income tax cuts given by the previous Coalition Government did not have their full-year effect until 1983-84. Similarly, the Family Income Supplement (FIS) scheme was also an initiative of the previous Government, although the Labor Government has since increased the rates considerably and liberalised the income test. On the other hand, the Government has



foreshadowed a range of social security initiatives that will start in 1990, but will not be fully implemented until 1990-91.

A final and related factor is that all the trends identified in the analysis should not necessarily be thought of as being the result of government policies or initiatives. For example, there are differing views on the role of the Accord in wage restraint since 1983 (Lewis and Kirby, 1987; Moore, 1989). It might also be considered that the increasing labour force participation of married women over this period reflects longer term changes that have occurred in many similar societies. Some developments, such as changes to the income tax scales and in social security rates, clearly are the responsibility of governments, while other factors, such as demographic trends, are not or may only be subject to indirect influence. This paper does not seek to adopt a position on whether all the changes observed are the consequence of deliberate policies; the results are intended to be descriptive and readers can make their own inferences about causality.

### **3. TRENDS AFFECTING THE DISTRIBUTION OF REAL DISPOSABLE INCOMES**

#### **Demographic Changes**

Table 1 provides details of the changing age and sex structure of the population aged 15 years and over between 1982-83 and 1989-90. Over this period, the adult population increased from 11.4 million to 13.1 million, with the proportion of women increasing slightly from 50.6 to 50.7 per cent.

The main features apparent in the Table include the slight fall in the proportion of the population under 25 years, and the increase in the population between 35 and 44 years and over 65 years. These developments are of interest since, other things being equal, it might be expected that the increase in the proportion of the prime age (35 to 44 years) could be associated with somewhat higher average levels of income, while the increasing proportion aged over 65 years could be associated with a lower average level of income.

#### **Employment Trends**

The growth in employment since 1983 has been claimed by the Government to be 'a major achievement in advancing social justice and removing people and families from poverty' (Hawke and Howe, 1989, p.1). Employment growth between 1982-83 and 1988-89 has been very substantial – the total number of persons employed increased from 6.30 to 7.53 million over this period, or by 19.4 per cent. Of these 1.23 million

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**TABLE 1: AGE AND SEX DISTRIBUTION OF POPULATION AGED  
15 YEARS AND OVER, 1982-83 AND 1989-90**

Age	Distribution (Per Cent)			
	1982-83		1989-90	
	Males	Females	Males	Females
15-19	5.7	5.4	5.5	5.3
20-24	5.8	5.7	5.2	5.1
25-34	10.6	10.7	10.6	10.6
35-44	8.9	8.5	9.7	9.5
45-54	6.9	6.5	6.7	6.4
55-59	3.3	3.3	2.9	2.8
60-64	2.7	2.9	2.8	2.9
65 and over	5.5	7.6	5.9	8.1
TOTAL	49.4	50.6	49.3	50.7
No. ('000)	11,437.3		13,127.8	

Source: ABS. The Labour Force Australia. Cat. No. 6203. Jan. 1983, 1989.  
ABS. Projections of the Populations of Australia, States and Territories:  
1987 to 2031. Cat. No. 3222.0.

new jobs, 790 thousand (64.2%) have been full-time, and 440 thousand (35.8%) have been part-time.

Patterns for men and women differ. The total number of employed men has increased by 12.5 per cent, and of these jobs, nearly 84 per cent have been full-time. Female employment has increased over this period by 31.3 per cent. Just over half of these jobs (50.9%) have been full-time. Overall, therefore, while part-time employment has grown much faster than full-time employment, nearly two-thirds of all the employment growth since 1982-83 and 1988-89 has been full-time.

In taking account of these trends, our analysis involves adjusting overall employment rates for the different demographic groups, and for women by marital status. Table 2 shows the differing employment rates in 1982-83 and 1989-90 for the relevant groups. Employment rates are the proportion of the total population in each age group who are in employment, either full-time or part-time. These increases in employment rates may appear more modest than the increases in total employment referred to above, but it should be remembered that trends in total employment are a combination of increasing employment rates **and** increases in the size of the population.

For males, Table 2 shows fairly small increases in employment rates for those aged 15 to 19 years, 25 to 44 years and 60 to 64 years. The increase was more substantial for those aged 20 to 24 years, while other age groups have seen declines in employment rates over this period. For single females, there have been increases in employment rates for all age groups, except those aged 65 years and over – with the greatest increases in employment rates for those between 35 and 54 years of age. The most dramatic rates of employment increase, however, have been for married females for whom employment increased in all age groups, with the increase being around ten percentage points for all groups between 20 and 54 years of age.

As noted earlier, the rise of unemployment during 1982-83 means that, particularly for males, average employment levels were actually lower in 1983-84 than in 1982-83. If this year were taken as the starting point, greater increases in employment over the period would be apparent.<sup>2</sup> In Section 4 of the paper we present some estimates using 1983-84 employment rates for comparison.

It is particularly important to note that the adjustments to employment in this analysis are derived from these trends in employment rates. That is, full-time and part-time

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<sup>2</sup> The male 1983-84 employment rates corresponding to the age categories in Table 2 were, 46.5, 75.8, 87.6, 89.7, 85.5, 73.6, 40.5 and 8.9 respectively.

**TABLE 2: EMPLOYMENT RATES (PER CENT), 1982-83 AND 1989-90**

Age	1982-83			1989-90		
	M	F(S)	F(M)	M	F(S)	F(M)
15-19	49.8	46.2	36.6	50.8	49.2	39.8
20-24	77.7	73.1	49.0	81.3	75.4	59.4
25-34	88.3	68.6	45.1	89.0	69.7	55.4
35-44	90.3	59.0	54.1	90.8	65.0	65.4
45-54	86.1	51.0	45.3	85.4	58.1	55.1
55-59	74.4	32.5	25.3	69.8	33.6	30.7
60-64	44.3	13.5	10.2	45.5	15.6	14.4
65 and over	9.3	18.7	2.8	8.8	16.1	3.3

**Notes:** M: Males  
F(S): Single females  
F(M): Married females

**Source:** ABS. Labour Force Australia. Cat. No. 6203.0. Various issues.

employment are not separately adjusted, nor for those not in employment was any adjustment made to distinguish between those unemployed and those not in the labour force. The second of these factors is unlikely to have a significant impact on our results, since the incomes of those unemployed will not differ to a very great extent from that of those not in the labour force.

The failure to distinguish growth in full-time employment from part-time employment is likely to be more important, given that part-time employment has been growing at a faster rate over this period. The proportion of males employed part-time has increased from 6.1 to 7.2 per cent, whilst the proportions of single and married females employed part-time has increased from 21.5 to 27.8 per cent and from 45.2 to 46.7 per cent respectively. The main bias that this is likely to introduce is to artificially increase the estimated incomes of single females – where 6.3 per cent of the employed workforce have ‘switched’ from full to part-time employment. However some of this increase is accounted for by the age breakdown in Table 2, since the increase reflects, in part, changes in the age composition of the female workforce (which the model does encompass). Within the single female age groups of Table 2, all groups except 55 to 59 year olds have had part-time increases of less than 5 percentage points (the 55-59 group has increased by 8.5%). Whilst we expect that this simplification will only have a small impact on the estimates of disposable income presented here, we hope to more directly address this issue in further developments of the model.

### **Trends in Income Components**

Table 3 provides details of the trends in income components taken into account in our analysis. It can be seen that male full-time wage rates have fallen slightly in real terms over this period<sup>3</sup>, while part-time rates have fallen far more substantially. Female wage rates, in contrast, have increased slightly in real terms for both full and part-time workers. These wage rates are essentially weekly rather than hourly rates, and so it is not clear to what extent the changes in part-time rates in particular reflect either changes in working hours or changes in hourly rates. For the estimation of disposable incomes, this is irrelevant – though it would not be in a more general evaluation of the welfare increases accruing to different groups.

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3 The estimated decline of 1.9 per cent in full-time male wage rates differs from the estimated decline of 2.9 per cent in average weekly earnings because the two series are not precisely comparable in methodology or scope. See the explanatory notes to ABS, *Weekly Earnings of Employees (Distribution) Australia*, Cat. No. 6310.0 for further details.

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**TABLE 3: REAL CHANGES (PER CENT) IN INCOME COMPONENTS,  
1982-83 TO 1989-90**

Income component	Real change (%)
Wage rates-	
Male, full-time	-1.9
Male, part-time	-22.1
Female, full-time	+2.1
Female, part-time	+1.7
Farm, unincorporated enterprise	+765.8 (-4.0)
Non-farm, unincorporated enterprise	+19.6
Interest	+26.2
Dividends	+21.5
<b>Source: See Appendix A.</b>	

The trends for other income components differ markedly. It can be seen that the income from farm unincorporated enterprises has increased by over 700 per cent over the period since 1982-83. This reflects the fact that 1982-83 was an exceptionally bad year for farmers. The bracketed figure in the Table is the estimated real difference between the average of the 1981-82 and 1983-84 years and 1989-90. It can be seen that this shows a small real fall in farm incomes, rather than a massive increase. In our analysis we use the 1982-83 figures, given that this is the actual number relevant to our estimates (though we present some estimates which exclude farmers). It should not be thought, however, that farmers have fared exceptionally well since 1982-83, only that they fared exceptionally badly in that year.

It can also be seen that incomes from non-farm unincorporated enterprises, and from interest and dividends have increased substantially in real terms over this period, in contrast with the trends in wage rates. This is consistent with the rise in real interest rates over the period, and the increase in the share of the national income going to capital rather than labour (see Figure 2).

The average changes in Table 3 were used to adjust the incomes of the recipients in the survey. It should be noted, however, that in some cases this will lead to an understatement of inequality in the distribution of incomes, and in some other cases, to an overstatement. This is because wages have actually moved at different rates at different points in the earnings distribution. For example, between August 1983 and August 1988, real wages for full-time married male workers actually fell by 4.7 per cent at the first decile of the earnings distribution, but rose by 0.9 per cent at the median and by 1.4 per cent at the ninth decile. In contrast, real wages for married female full-time workers fell by about the same amount (0.4%) at all levels of their earnings distribution, while real wages for married part-time female workers rose by much more at the bottom of the earnings distribution (20.5%), than at the median (5.4%) or at the ninth decile (2.6%). These differences have not been incorporated into our analysis to date.<sup>4</sup>

#### Changes to the Social Security System

Table 4 provides details of the changes in the real value of selected social security and related transfers over the period since 1982-83. The table provides two estimates of changes in real value, one derived using the standard consumer price index (CPI), and the other using the CPI net of health and medical costs. The introduction of Medicare in

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<sup>4</sup> Source: ABS, *Weekly Earnings of Employees (Distribution) Australia*, Cat. No. 6310.0. Linear interpolation was used to calculate these percentile incomes.

1984 caused a fall in the CPI, but since the vast majority of social security recipients were already protected by Pensioner Health Benefit Cards or similar provisions, this second measure may be considered to provide a more appropriate indicator of the changing real value of payments for social security recipients. The final results presented in this paper use the CPI for estimating changes in real disposable incomes for those outside the social security system, but apply the CPI net of health and medical costs to pensioner and beneficiary units.

A further factor that should be borne in mind when considering these results is the effect of 'indexation lag'. Most basic rates of pensions and benefits are increased twice a year in line with movements in the CPI; at the beginning of the Government's period of office indexation occurred each May and November in line with the movement in the CPI in the six-month period to the previous December and June, respectively. For example, the indexation increase in May 1983 adjusted for the increase in the CPI between July and December 1982. In periods when the rate of inflation is falling, this implies that the increase in pensions will be in line with the rate of inflation in a period 11 to 5 months previously, and will be higher than the actual rate of inflation in the same financial year. This will give the result that the pension will tend to rise faster than the concurrent rate of inflation, even though it is only increased in line with the CPI.

This indexation lag effect will be exacerbated when trends in the real value of the pension are compared on a point to point basis, rather than year to year. For example, it has been claimed that 'pensions for the aged and the disadvantaged have been increased by 8.4 per cent in real terms' since the Government came to office (Social Justice Statement, 1988, p.2). As can be seen from Table 4, our estimate is that the real value of the pension increased by 5.8 per cent over this period (or 3.9% if the Medicare effect is taken into account). The difference between 8.4 and 5.8 per cent is the result of taking movements on a financial year basis, rather than from March 1983.

The real increase that has occurred for pensioners reflects a number of factors in addition to the remaining indexation lag effect<sup>5</sup>, including a modest real increase announced at the time of the introduction of Medicare, the \$2 per week real increase to be introduced in April 1990, and the effects of bringing forward the indexation increases from December to November 1989 and June to April 1990. This bringing forward of indexation increases leads to a higher real pension, since higher rates apply over a longer

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5 While there is an artificial element to this effect, it should be noted that there is also a lag between price increases and wage increases, and that pensions are subject to automatic indexation, while real wages have fallen.



**TABLE 4: REAL CHANGES (PER CENT) IN SOCIAL SECURITY AND RELATED PAYMENTS, 1982-83 TO 1989-90**

Type of Payment	CPI	Real change CPI(ex.HM)(1)
Married rate of pension and benefit	+5.8	+3.9
Standard rate of pension	+5.8	+3.9
Single unemployment benefit		
16-17 years	-11.9	-13.5
18-20 years	-1.5	-3.2
adult	+20.5	+18.4
Single sickness benefit		
16-17 years	-12.0	-13.5
18-20 years	-19.5	-20.9
adult	-1.5	-3.2
Additional pension/benefit for children		
Less than 13 years	+47.3	+44.7
13-15 years	+112.4	+108.6
Mothers/guardians allowance	+24.6	+22.4
one child under 6 years	-6.5	-8.2
Rent assistance		
no children	+18.7	+16.6
with children (2)	+51.5, +66.7	+48.8, +63.7
Family allowances		
one child	+17.9	+15.8
two children	-1.0	-2.7
Secondary assistance scheme	+81.0	+77.8
Tertiary education assistance	+17.1	+15.1

**Notes:** (1) CPI (ex.HM) is the CPI net of health and medical costs.  
(2) The range given reflects the further increases in rates of rent assistance for those with three or more children.

period in any year; correspondingly, the indexation delay in 1986 was equivalent to just over a 1.0 per cent per year real cut in the pension in the period for which it applied.

Trends in other social security payment rates are more diverse, with the changes in real value of single unemployment and sickness benefits depending upon the age of the recipient. It should be noted that rates of single sickness benefit are now aligned with the corresponding rates of unemployment benefit, which explains the substantial real drop in sickness benefit for 18 to 20 year olds especially, and the smaller decline in the rate for single adults. The corresponding rates for the unemployed, in contrast, have fallen more modestly or have been increased substantially, since in 1982-83 they were much lower than the rates for sickness beneficiaries. Rates of both payment categories for 16 and 17 year olds have fallen by more than 11 per cent. The other factor that should be noted in this context is the increased real level of secondary and tertiary assistance scheme payments (now AUSTUDY). These real increases in education payments and the real falls in payments for the sick and unemployed were part of the process of aligning youth payments on the basis of age rather than activity.

The other notable feature of Table 4 is the very large real increase in rates of child-related payments, with additional pension/benefit for children and the family allowance supplement increasing by between 44 and 108 per cent in real terms, rent assistance for those with children increasing by 50 per cent in real terms, and family allowances for the first child increasing by around 16 per cent (although for families with two or more children, the real value of family allowances has fallen). The mothers/guardians allowance paid to sole parents shows two trends, with the level of payments for those with children under six years falling and that for sole parents with older children rising. This reflects the effective abolition of the higher rate for young children in 1984.

These increases for low income families with children reflect the priority given to targeting increased assistance to these groups since 1983. Assisting families with children was given even greater emphasis following the Prime Minister's election pledge in 1987, that 'by 1990 no Australian child will be living in poverty' (Australian Labor Party, 1987, p.5), and the subsequent introduction of the 'family package'.

A final point to note is that adjusting the incomes of social security recipients over the period 1982-83 to 1989-90 has involved increasing rates of payment in line with Table 4 and increasing other income in line with the appropriate trends in Table 3, but not modelling the effects of changes to the income tests. In this context, it should be noted that the real value of the free area for pensions has fallen over this period, while the real value of the benefit free area has increased. In general, this would imply an over-

estimate of the total incomes of part-rate pensioners, although this factor would be mitigated somewhat by the effects of income tax.

### Personal Income Tax Changes

Personal income tax rate arrangements have been subject to nearly constant change over the past decade.<sup>6</sup> The current Government introduced changes to the rate scale in the 1984-85 Budget, following the September 1985 Statement on Tax Reform, and in the April 1989 Economic Statement. The main feature of these cumulative changes have been to provide for a nominal increase in the tax threshold, a substantial cut in the first positive rate from 30 to 21 cents in the dollar over a wide range of income, and a smaller cut to 29 cents over a narrower range, a cut in the next rate from 46 to 39 cents up to \$35,000 p.a., an increase from 46 to 47 cents over a very narrow range above \$35,000, and a large cut from 60 to 47 cents above that (not to be fully implemented until 1990-91).

In considering the tax rates facing family units of differing composition, however, it is also necessary to take account of appropriate rebates, such as the dependent spouse and sole parent rebates, and transfers such as family allowance and the family allowance supplement, which go to those outside the social security system. Despite recent nominal increases, the family rebates have fallen substantially in real terms since 1982-83. As shown in Table 4, however, the real value of family allowances for the first child and family allowance supplement have been increased in real terms.

Clearly, it is trends in the real value of tax thresholds and rebates that are relevant when considering changes in tax liabilities over time. Table 5 shows the income tax rate scales in 1982-83 and 1989-90, expressed in 1989-90 dollars, as well as the effective tax thresholds produced for different types of families by the dependent rebates.

Part A of Table 5 shows that taxes have increased and fallen over differing income ranges, with taxes rising at very low income levels because of the fall in the real value of the threshold, and then falling because of the cut in the first rate, and so on. These effects offset each other at different income levels, so that as a consequence single tax-payers with incomes less than \$11,992 per year in 1989-90 pay higher taxes than they would under the real 1982-83 scale; single tax-payers with incomes between \$11,992 and \$27,995 pay less tax; those with incomes between \$27,995 and \$34,553 pay more

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6 For a more detailed description of personal income tax changes under the Labor Government, see Whiteford and Doyle (1989a).

TABLE 5: PERSONAL INCOME TAX ARRANGEMENT - 1982-83 AND 1989-90

## A. Rate Scales

Income Range (1989-90 \$ per year)	Marginal Rate (cents per dollar)		Change in tax liability over income range (\$ per year)
	1982-83	1989-90	
0 - 5,100	0	0	-
5,100 - 7,273	0	21.0	+456.33
7,273 - 17,895	30.67	21.0	-1,027.05
17,895 - 20,600	30.67	29.0	+45.17
20,600 - 29,167	30.67	39.0	+713.55
29,167 - 31,785	35.33	39.0	+96.04
31,785 - 35,000	46.0	39.0	-225.05
35,000 - 50,000	46.0	47.0	+150.00
50,000 - 58,334	46.0	48.0	+166.68
58,334 and over	60.0	48.0	-12 cents for each \$1.00 over \$58,334

## B. Tax Thresholds

Type of Taxpayer	Effective Tax Threshold		% Change
	1982-83	1989-90	
Single	7,273	5,100	-29.9
Sole Parent	11,063	9,577	-13.4
Single Income couple			
- without children	11,685	9,862	-15.6
- with children	12,391	10,815	-12.7
Pensioner			
- single	8,161	8,196	+0.4
- married couple(1)	8,161	7,576	-7.2
Beneficiary			
- single	7,273	6,671	-8.3
- married			
without children	11,685	12,003	+2.7
with children(2)	12,391	12,003	-3.1

- Notes: (1) The difference between the effective thresholds for single and married pensioners in 1989-90 reflects the decision to increase the rebates to cover the basic pension plus the pensioner free area, which is less for each of a married couple than for a single pensioner.
- (2) It should be noted that in 1982-83, additional benefit for children was taxable. Additional benefit was made non-taxable from March 1984.

tax; those with incomes between \$34,553 and \$38,135 pay less tax; and single tax-payers with incomes between \$38,135 and \$60,713 pay more tax, while those with incomes over \$60,713 pay less tax than they would if the 1982-83 scale had been maintained and indexed to inflation.

These results are of particular interest since they indicate that the benefits of the cut in the top marginal rate do not actually arise until much higher real income levels than is often supposed. In fact, tax-payers with incomes between \$35,000 and \$58,334 are actually facing a higher rather than a lower marginal tax rate than they would if the 1982-83 tax scales had been indexed. This is simply an illustration of 'fiscal drag' in operation.

Part B of Table 5 shows the effective tax thresholds produced by the various personal and dependent rebates. It can be seen that effective thresholds have fallen for sole parents and for those with dependent spouses. This will produce different 'break-even' points than those described above, although the general effects will be similar. It should be noted that the effective tax threshold for single pensioners has increased slightly in real terms because of increases in the relevant pensioner rebate. The threshold for pensioner couples has fallen in real terms, although it will rise in 1990-91 as it is increased to cover the pension free area. The beneficiary rebates were introduced by the current Government, and while effective thresholds for single beneficiaries and couples with children have fallen in real terms, the rebates are sufficient to insure that those beneficiaries without private income do not actually pay tax on their benefits. In fact, the results should be interpreted with care, since beneficiary couples with children have also had their additional benefit payments for children exempted from tax since March 1984. This has meant that even while their effective tax threshold has fallen in real terms over this period, they are better off since those with no private income would have actually paid tax on their basic benefit payments in 1982-83 but do not in 1989-90 because of the combined effects of the rebates and the tax-exemption of additional child payments.

Table 6 shows the results of these divergent trends for different types of tax-payers at different levels of income (expressed in constant 1989-90 dollars). The results are expressed as percentage changes in real disposable incomes, which are calculated as total taxable income, minus income tax net of relevant rebates, plus family transfers.<sup>7</sup>

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<sup>7</sup> The analysis in this section does not take account of the Medicare levy, although the overall results discussed in Sections 4 and 6 of the paper do incorporate its effects.

**TABLE 6: EFFECTS OF CHANGES TO THE TAX-TRANSFER SYSTEM;  
CHANGE (PER CENT) IN REAL DISPOSABLE INCOMES FOR DIFFERENT  
FAMILY TYPES, 1982-83 TO 1989-90**

Taxable Income(1) (\$p.a.)	Change in real disposable income (%)			
	Single person	One income(2) couple, two children	Two income(3) couple no children	two children
10,000	-2.1	+19.8	-1.2	+19.8
15,000	+2.3	+13.8	-3.3	+9.8
20,000	+3.6	+10.9	-2.1	+7.4
25,000	+1.2	-0.7	+0.4	+0.4
30,000	-0.7	-2.1	+2.2	+2.1
35,000	-0.01	-1.3	+2.6	+2.5
50,000	-0.4	-1.4	+1.1	+1.1
70,000	+2.5	-0.6	-0.2	-2.0
100,000	+8.5	+5.8	-0.3	-1.6

**Notes:** (1) Expressed in constant 1989-90 dollars.  
(2) Dependent spouse assumed to have no taxable income.  
(3) Income is assumed to be earned in the ratio 60:40.

The results for single people are of interest, since they show the effects of the rate scale changes alone. It can be seen that at very low income levels, there have been falls in real disposable incomes, because the fall in the real value of the tax threshold has more than offset the effects of the cut in the first rate. (As noted above, these results do not apply to social security recipients with no private income, who have been fully protected from these effects by the operation of the special pensioner and beneficiary rebates.) There have been real tax cuts and increases in real disposable incomes, therefore, over a range of income up to nearly \$28,000 per year. Above this level, there have generally been falls in real disposable incomes, because of the effects of the falling real value of the threshold for the 46 cent (now 39 cent) rate. This effect has been increased by the falling real value of the threshold for the top rate, so that the effects of the cut in the top rate are not realised until quite high income levels, whence they start to deliver very large tax cuts.

This basic set of effects applies also to single income couples and to sole parents, but is modified at low income levels by the increased value of family allowance supplement, and at higher levels by the falling real value of the relevant rebates and family allowances for two or more children. In the example in Table 6, it can be seen that there are very large real increases in disposable incomes for low income families with children, followed by falls in disposable incomes for a very wide range of income, before the effects of the cut in the top marginal rate begin to dominate. Even so, at very high incomes, single income couples with children have not done as well as single people, because of the fall in the value of the dependent spouse rebate and the effects of the income test imposed on family allowances.

The situation for two income couples is more complex, and depends upon the precise ratios in which incomes are earned (in this example, it is assumed that earnings are in the ratio 60:40, i.e. at \$10,000, one earns \$6,000 and the other \$4,000, and so on). Thus, at low income levels, the fall in the real value of the tax threshold has a greater effect than the cut in the first rate, and because this influences the tax liabilities of both earners, the effect covers a wider range of income than it does for single persons. These sorts of interactions mean that increases in real disposable incomes for two income couples are concentrated on those with individual incomes in the \$12,000 to \$28,000 range, and joint incomes between \$24,000 and \$56,000. At joint incomes of \$100,000, for example, there are tax increases, because one partner earns \$60,000 and the other \$40,000, and since they are taxed as individuals, they each suffer the sorts of losses that apply to single persons at these income levels. Once again, for two income families with children, the results at low income levels are dominated by the effects of the family

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allowance supplement, while at higher income levels, the results reflect the fall in the real value of family allowances and its income-testing.

The results in this Table are of particular interest since these are exactly the sort of calculations used in static analyses of trends in real disposable income. Once again, it should be emphasised that these results implicitly assume that persons pay tax in line with their nominal liabilities and receive transfers according to their entitlements. To the extent that tax avoidance and evasion have been reduced since 1982-83, equity will have been enhanced in a way not shown by this Table. The issue of take-up of transfers is also important, since the results in Table 6 are so significantly affected by the increased real value of FAS payments. Analysis of the 1985-86 Income Survey suggests that apparent take-up of the then FIS program may have been very low (Whiteford and Doyle, 1989b). In the results given in the next section, we have avoided this problem by constraining total FAS expenditure to be equal to the Department of Social Security's own forecasts. In the context of determining trends in disposable incomes arising from the actual effects of policy initiatives, this clearly is the correct approach to adopt.

In moving from this sort of analysis to estimates of trends in disposable incomes based on income distribution data, the results will be affected by the actual distribution of income units of varying types in different income ranges. For example, analysis of the 1985-86 Income Survey suggests that only about 10 per cent of all families had taxable incomes in that year currently equivalent to \$50,000 p.a. or more. Nearly 90 per cent of this group, however, were two income families, who as can be seen from Table 6 had either only modest real increases in disposable incomes or experienced small real tax increases. This means that while some **individuals** in the higher income groups will have benefited very greatly from the cut in the top tax rate, higher income **groups** as a whole will have benefited much less.

### Trends in Housing Costs

Whilst high interest rates have the effect of raising the incomes of lenders, for borrowers they lead to lower disposable incomes. The effect of such high interest rates on housing costs in particular is generally considered especially relevant to the measurement of living standards. In this Section, therefore, we look at some of the recent trends in factors influencing housing costs.

Why should housing costs be considered differently from other costs facing households? Previous sections have looked at income trends relative to prices using price indexes for overall expenditures. Amongst other things, these indexes incorporated estimates of the



impact of housing costs on total expenditures.<sup>8</sup> If costs had increased uniformly across the population, this would be a reasonable measure of changing living standards. However the last few years have seen major economic changes affecting the housing and financial markets which have had very different impacts on different population groups. These impacts have varied by location, tenure and type of housing finance.

Some indicators of changes in housing costs over the last decade are shown in Figures 3 and 4. The former includes trends in real private (non-government) rents, home loan interest rates and real house prices.<sup>9</sup> To facilitate comparison, these are here expressed as index numbers with 1982-83 as the base year. All these indexes have risen significantly over the 1980s.

The greatest increase has been in house prices, particularly in Sydney where after a slight drop in the early 1980s prices accelerated to reach around 170 per cent of their 1982-83 level. Longer term trends in nominal house prices in selected cities are included in Figure 4. These are shown with a logarithmic vertical axis, so that a straight line represents a constant percentage rate of increase. The CPI is also drawn – with the vertical distance between it and the price curve giving an indication of changes in real house prices. Clearly evident in this Figure is the volatility of house prices, both in real and in nominal terms. Whilst general inflation has slowed in the last few years, house price inflation has increased from its long term trend. We shall see below that this has important implications for current housing costs.

It would seem initially, however, that the rise in home loan interest rates over the period has had a much wider impact upon the living standards of home purchasers, as the recent house price rises have only affected new purchasers. The only group excluded from these rises have been those people with savings bank mortgages taken out before April 1986 – who have had a 13.5 per cent ceiling placed on their interest rate. Around half of

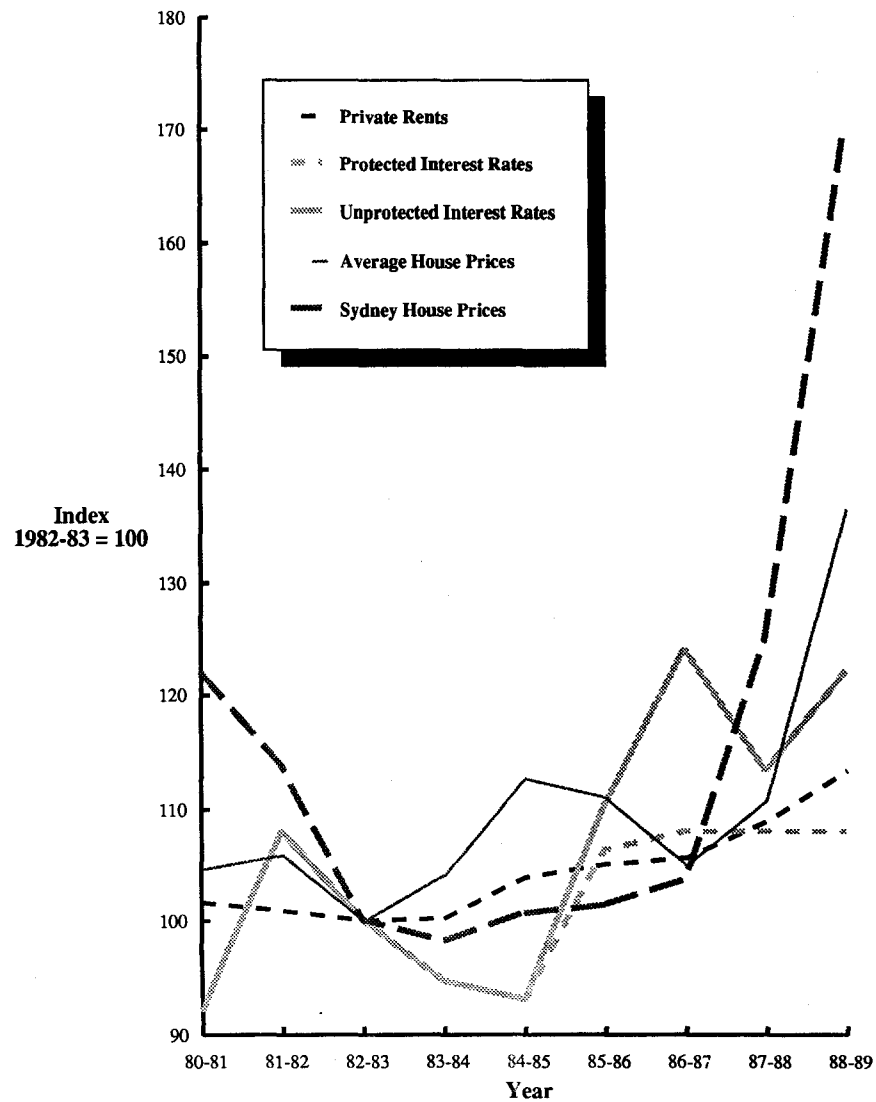
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8 Though only the interest costs of purchasers have been incorporated (and those only since the beginning of 1987).

9 House price data are the Real Estate Institute of Australia annual averages of median house prices for Sydney, Melbourne, Brisbane, Adelaide, Perth and Canberra. A simple unweighted average of the price levels in each of these cities was used to compile the average price index shown. Interest rates are the annual average predominant interest rate for new savings bank housing loans to individuals for owner-occupation (Reserve Bank of Australia *Bulletin*, various issues). Prior to 1983-84 the average of the financial year end 'minimum of predominant range' and 'maximum of predominant range' was used. The private rental index is from ABS *Consumer Price Index*, Cat. No. 6401.0, various issues.

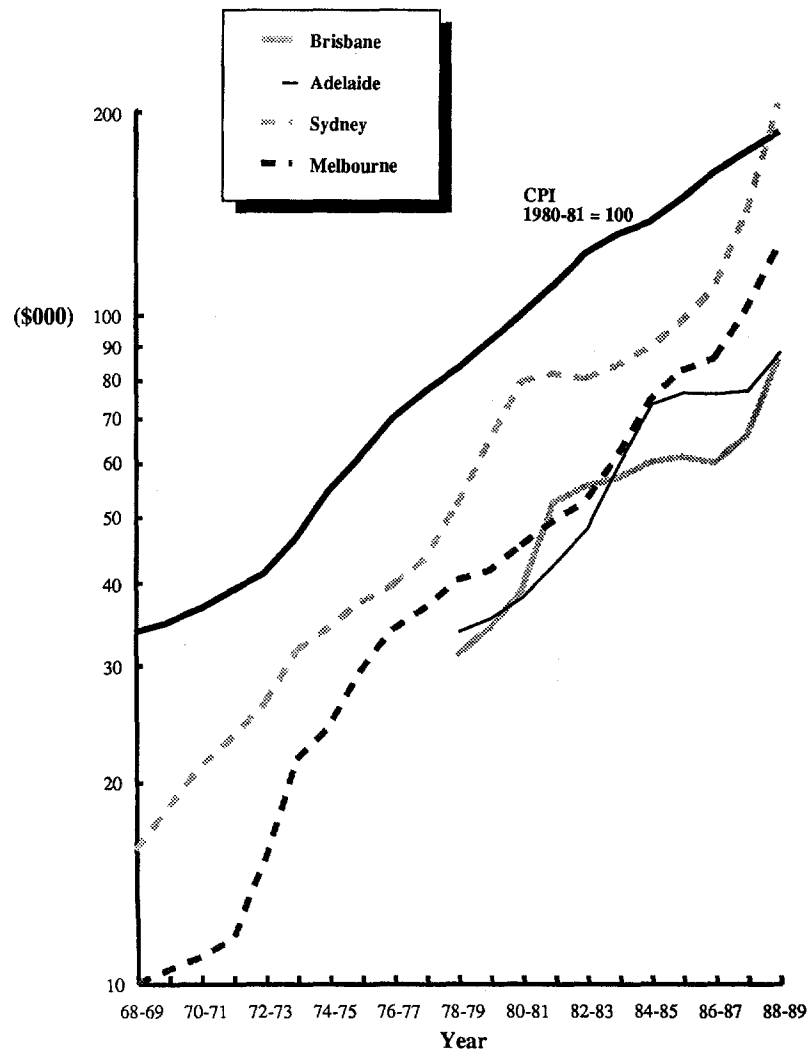
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**Figure 3: Indices of Real Housing Costs, 1980-81 to 1989-90**



Note: All price indexes deflated by the consumer price index (excluding housing costs).  
For sources and detailed definitions see text.

Figure 4: Median House Prices, 1968-69 to 1988-89



Source: Real Estate Institute, unpublished data. Sydney and Melbourne data prior to 1978-79, BIS-Shrapnel (1986).

first mortgages are obtained through savings banks<sup>10</sup>, and we estimate that in 1989-90 just under three in ten purchasers will be covered by this provision (see Appendix B). The impact of these interest rate rises has thus been very uneven, with the main burden being borne by younger families purchasing their housing in the years since 1986. For older households nearing the end of their mortgages, the impact of these changes on expenditures have been relatively small.

For those excluded from the home purchase market, private dwelling rents have increased steadily over the period, reaching 112 per cent of their 1982-83 level in 1988-89, though in some cities such as Sydney there appears to have been a significant moderation in rent rises in 1989.

The situation for government renters is less clear. The CPI for government rental levels has increased much faster over the period than the index for private renters. However, this index is of limited relevance as it is intended to refer only to the CPI target population of urban wage and salary earning households. The high government rent increases in the CPI series mainly reflect the tendency of government housing authorities to move towards charging market rents, supplemented with an income tested rebate. This has led to significant rent increases for higher income tenants, but has little impact upon the bulk of tenants. In fact, available information suggests that real government rents have decreased slightly. The housing surveys conducted by the ABS show a 9 per cent real decline between September-November 1982 and September-December 1986, followed by a 6 per cent increase to February-May 1988.<sup>11</sup>

Table 7 summarises these housing cost trends in terms of indexes relative to September-December 1986 (the collection period for the 1985-86 Income Distribution Survey). The overall inflation rate projection of 7.5 per cent for 1989-90 was used for the calculation of the 1989-90 indexes. Between 1982-83 and 1989-90 the CPI including housing costs grew at a slightly faster rate than the CPI excluding housing. Relative to either CPI measure, private rent levels and local government rates increased in real terms, whilst government rental levels declined. Home loan interest rates increased by between 1.0 and 4.5 percentage points.

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10 In February-May 1988 53 per cent of purchasing income units had their first mortgage with a savings bank (ABS 1988 Housing Survey, *Housing Finance of Purchasers*, Table 8).

11 The average rents (in current dollars) were \$34.5, \$40.0 and \$46.8 per week for the three surveys respectively. These were deflated here using the CPI for the corresponding quarters. Source: ABS 1988 Housing Survey, *Housing Costs and Occupancy*.

TABLE 7: INDEXES USED FOR HOUSING COST IMPUTATION

	Year			
	1982-83	Sept-Dec 1986	1989-90	(1989-90 + 1982-83)
<i>Price indexes</i>				
(Relative to September-December 1986)				
Consumer Price Index	0.768	1.000	1.253	(1.63)
CPI excluding housing	0.770	1.000	1.246	(1.62)
Private rents	0.732	1.000	1.343	(1.83)
Government rents	0.879	1.000	1.325	(1.51)
Local Government rates	0.729	1.000	1.222	(1.68)
<i>Home loan interest rates</i>				
Savings bank loans taken out before the 3rd of April 1986	12.5%	13.5%	13.5%	(1.08)
Other loans	12.5%	15.5%	17.0%	(1.36)

**Note:** For sources see text.

#### 4. THE DISTRIBUTIONAL IMPACT OF CHANGES IN INCOMES AND TAXES

Whilst the previous sections describe many of the most important influences upon family incomes over the past seven years, it not easy to gain an understanding of the overall impact of these changes on family living standards. The complexity of the determinants of disposable incomes is the main justification for the development of micro-analytic models of family income. In this section, the estimated overall impact of the income and taxation changes described above on different family types at different incomes levels is described. The impact of housing costs on disposable incomes is discussed in Section 5 and the results from the two Sections integrated in Section 6.

Our basic estimates of the distribution of net disposable incomes are presented in Table 8. This shows the percentile distribution of real family income levels in both 1982-83 and 1989-90, across all families, and within families of different types. All estimates have been converted to 1989-90 dollars using either the standard CPI or the CPI excluding hospital and medical expenses (the latter for pensioner/beneficiary families).<sup>12</sup> The number 4.0 in the top left cell of the Table, for example, indicates that, in 1982-83, 10 per cent of single persons aged less than 25 had incomes less than or equal to \$4,000 (in 1989-90 dollar equivalents). As might be expected, median incomes vary greatly across the different family types, with the median incomes of non-aged couples significantly above that of other groups.

Changes over time are emphasised in Table 9, which compares percentage changes in real disposable incomes for different types of family units at different points in the income distribution. These numbers are derived directly from those of Table 8, as the difference in income levels in the two years at each percentile, divided by the income level in 1982-83. The results differ markedly between different groups and within groups at different income levels.

As well as the estimates derived directly from Table 8, this Table also contains estimates for couples and all families using an alternative weighting schema. These estimates are presented in brackets. As was noted earlier, part of the synthetic ageing process used in this study involves the adjustment of the weights on the original data file to reflect changing employment rates (and demographic changes). Because the required external employment data is only available for persons, this adjustment has been made to the person weights in the file. Following the ABS procedure in the original data, these have

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12 A weighted index of the two indices were used for families receiving pension or benefit for only part of the year.

**TABLE 8: REAL DISPOSABLE INCOMES, 1982-83 AND 1989-90**  
**(1989-90 \$000 PER YEAR)**

Family type	Percentiles					
	10	25	50	75	90	99
Single person						
- Less than 25						
1982-83	4.0	7.7	<b>12.3</b>	16.6	20.1	30.4
1989-90	4.1	7.7	<b>12.5</b>	16.9	20.3	32.6
- 25 to 64						
1982-83	6.1	7.9	<b>17.3</b>	23.9	29.7	51.8
1989-90	6.5	8.3	<b>17.7</b>	23.4	28.7	54.7
- 65 and over						
1982-83	6.5	6.9	<b>7.4</b>	9.2	13.6	29.4
1989-90	6.8	7.1	<b>7.7</b>	9.6	14.1	34.2
Couple, without children						
- Head less than 65						
1982-83	11.6	18.2	<b>28.8</b>	39.9	51.0	87.1
1989-90	12.3	19.4	<b>30.4</b>	41.1	51.6	97.1
- Head 65 and over						
1982-83	11.1	11.6	<b>13.4</b>	17.5	28.4	64.8
1989-90	11.6	12.1	<b>14.0</b>	18.2	30.1	68.1
Couple, with children						
1982-83	14.9	23.0	<b>30.8</b>	39.1	48.7	90.9
1989-90	17.5	23.7	<b>30.8</b>	39.5	48.9	97.6
Sole parent						
1982-83	6.0	8.2	<b>10.9</b>	17.7	27.4	41.1
1989-90	6.9	9.3	<b>12.1</b>	20.0	26.7	39.0
All families						
1982-83	6.7	10.4	<b>18.2</b>	29.8	41.2	68.9
1989-90	7.1	11.1	<b>19.1</b>	30.3	42.0	75.0
All families (excluding self employed)						
1982-83	6.7	9.9	<b>17.1</b>	28.2	38.6	59.1
1989-90	7.0	10.2	<b>17.5</b>	27.7	38.6	57.9

**TABLE 9: PERCENTAGE CHANGE IN REAL DISPOSABLE INCOMES BY PERCENTILES WITHIN EACH FAMILY TYPE 1982-83 TO 1989-90**

Family type	Percentiles						Number in 1989-90 (million)
	10	25	50	75	90	99	
Single person							
Less than 25	2.5	-0.5	<b>1.0</b>	1.8	0.5	7.2	1.27
25 to 64	7.6	5.6	<b>2.6</b>	-2.1	-3.2	5.6	1.41
65 and over	3.9	4.1	<b>3.8</b>	4.1	3.7	16.1	.75
Couple, without children							
Head less than 65	6.2	6.7	<b>5.4</b>	3.0	1.3	11.4	1.26
(spouse weighted)	(8.0)	(11.3)	( <b>9.6</b> )	(4.9)	(2.9)	(12.8)	
Head 65 and over	3.9	4.0	<b>4.3</b>	3.5	5.8	5.1	.59
(spouse weighted)	(3.9)	(4.1)	( <b>4.4</b> )	(4.5)	(7.1)	(5.1)	
Couple, with children	17.6	3.1	<b>-0.2</b>	1.0	0.2	7.3	2.02
(spouse weighted)	(19.1)	(5.5)	( <b>2.1</b> )	(3.7)	(3.4)	(8.6)	
Sole parent	15.0	13.0	<b>11.5</b>	13.3	-2.6	-5.0	.27
All families	5.9	6.7	<b>5.0</b>	1.4	1.8	8.8	7.57
(spouse weighted)	(5.9)	(6.9)	( <b>6.5</b> )	(3.6)	(4.2)	(13.4)	



then been averaged within each income unit to produce the income unit weights required for the estimation of Tables 8 and 9 (and subsequent Tables).

However, as is explained more fully in Appendix A, we believe that this procedure will not fully reflect the changes in income distribution resulting from the increase in married women's labour force participation between 1982-83 and 1989-90. An alternative approach which more fully reflects these changes is to use the weights for the spouse as the income unit weights. The estimates obtained using these results appear in brackets in the Table, and are always higher than those produced by the alternative weighting procedure. In general, we would expect the true increase in incomes to lie between these estimates, though closer to the bracketed figures.<sup>13</sup>

Overall, the median income of all families is estimated to have risen by 5 per cent in real terms over the period 1982-83 to 1989-90, or 6.5 per cent if we use the spouse weighted results.<sup>14</sup> These estimates can be compared with the increase in real HDIPC shown in Figure 1, which indicates an increase in average disposable incomes of around 8.4 per cent over the period.<sup>15</sup> In proportionate terms, and using the average weights, the median income of sole parents rose by the highest amount (11.5%), followed by non-aged couples without dependents (5.4%), aged couples (4.3%), single persons over 65 years (3.8%), and then by single persons between 25 and 64 years (2.6%). The median income of young single people increased by only 1 per cent in real terms over this period, while couples with dependents are the only group for whom the median income is estimated to have fallen in real terms.

When a full account is taken of the increased family income arising from the increasing employment of married females the position of non-aged couples improves significantly. Couples without children now have the second highest increase in median incomes (9.6%), and the median income of couples with dependents is now estimated to have increased rather than decreased over the period. However, this latter group have still

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13 One reason for expecting the true estimates to lie below the bracketed figures is our non-accounting for the increase in the proportion of married women working part-time. Given that the estimates using the average results roughly reflect half the increase in married women's employment, they might be thought of as an estimate which includes some compensation for the welfare losses of decreased home production as some women are 'forced' into employment to meet family bills.

14 The overall 'spouse weighted' results are obtained by using the spouse weight for the income unit weight when there was a spouse, and the head's weight when there was not.

15 This difference arises from a number of factors, e.g. the analysis in this paper does not include the impact of increasing coverage of superannuation.

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fared fairly poorly, with incomes increasing at a relatively slow rate (only 2.1% over the seven years). Only single young people have had a lower increase. This relatively poor result for couples with dependents probably stems from the combination of falling real wages for men, declines in family allowances for larger families, and increased income tax rates for some families.

It should be remembered that all the changes in Table 9 are in relative terms. For example, despite having the largest percentage increase in median incomes, in both years over 90 per cent of sole parent families had incomes below the median income of couples with children (Table 8).

Turning to the situation of very low income groups, it is apparent that sole parents and couples with children at the first decile within each group have fared particularly well. This is primarily the result of the real increases in social security payments and the introduction of the FAS scheme. The increase of 7.6 per cent in the real incomes of the 10th percentile of single adults aged 25 to 64 represents both the increase in employment and the real increase in the adult unemployment benefit rate.

At the twenty-fifth percentile, sole parents continue to fare relatively well, while young people have experienced the lowest real increases in disposable incomes. The turn-around for couples with dependents – from large real gains at the first decile to much more modest gains – reflects the very tight targeting of the FAS scheme and the fact that couples with dependents, on average, have much higher incomes than the other groups.

Turning to the high income groups within each family type, it can be seen that at the ninth decile for each group, it is the aged who have had the largest increases in real disposable incomes. This is a reflection of the substantial real increases in asset incomes (including farm incomes) referred to earlier. It is only the increase in married women's employment that has prevented other groups at the ninth decile experiencing either very low real increases in disposable incomes or losses. For the top one per cent of each group, however, the situation is somewhat different, with all family types except sole parents having enjoyed substantial real increases in disposable incomes (the estimates for this top group should be considered only approximate given the sample size).

In examining these estimates it is important to bear in mind some of the limitations of the model. Incomes from pensions and benefits, for example, have been adjusted in line with movements in the base rates. No adjustments have been made to reflect the changing coverage of pensions and benefits over the period (though this has been done for family allowances and for FIS/FAS). The main results which this is likely to affect are those for young single persons and the aged. The many changes in eligibility

requirements for youth unemployment benefits and educational allowances have not been modelled, and these may affect the results for the former group in unpredictable ways. The main change for the aged was the introduction in 1985 of the pension assets test. This was largely responsible for the reduction in the coverage of the age pension from 74 to 66 per cent between 1982-83 and 1985-86 (Saunders, 1987). This means that the 1982-83 income estimates for the aged in Table 8 are under-estimates, as some aged who are not receiving pension because of the assets test would have been able to in 1982-83. Correspondingly, the estimates for the income increases for the middle range of percentile groups for the aged are probably over-estimates. (Those at the bottom end of the distribution follow the change in the base rate of pension, whilst those at the 90th and 99th percentiles would be excluded from the pension because of the income test.)

As noted earlier, we have not been able as yet to incorporate information of changes in earnings distributions into this analysis. The data discussed in Section 3 suggest that earnings inequality for groups such as married males has increased over the period whilst for married female part-time workers inequality decreased. The impact of these changes on the overall distribution are difficult to estimate precisely, but most likely would imply a less progressive pattern of income changes for non-aged married couples. To address this issue fully, however, it would be necessary to take account of any possible reductions in non-monetary income as a result of the fringe benefits tax. If the increases in wage rates for higher income earners represented a 'cashing-out' of fringe benefits previously received, then assessment of the distributional effect would be more complex.

Keeping in mind these qualifications some broad trends are apparent. Across the family types, couples with children and single persons less than 25 seem to have done worst, and sole parents the best. Within family types, varying patterns can be seen. Among sole parents, gains generally decline with increasing income, suggesting that income inequality among sole parents has declined, and conversely, that the gap between the high income sole-parents and middle income couples has increased. This is a reflection of the targeted nature of the Government's increased income support for sole parents, combined with such factors as the reduction in the real value of the sole parent rebate.<sup>16</sup> Couples with children have also experienced significant real income gains at the bottom end, but only small increases at the median. The increases for the aged, however, have been more uniform, with real pension increases at the bottom end being complemented by increases in asset incomes at the upper end of the distribution.

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16 Maintenance income has been assumed to increase with general inflation. Over the next few years, the introduction of the child support scheme may lead to some income increases for middle and high income sole parents – though the impact of this scheme in 1989-90 is probably only minor.

Looking at the overall pattern, and if the 99th percentile results are excluded, the general picture given by these results is one of either stable or decreasing inequality. However, incomes **have** increased significantly at the very top end of the income distribution for some groups, and so this conclusion must be qualified. It is probably worth repeating that this increase at higher incomes **does not** represent differential wage increases of higher income groups – as the model used here assumes uniform rates of wage increases. Some of the source of these increased incomes can be inferred from Table 10 which excludes income units where either the head or the spouse was employed in agriculture in their main job during 1985-86. As was noted earlier, farm incomes were particularly low in 1982-83, and so the income trends of farmers are very different from those of the rest of the population.

The removal of farm income does indeed have a dramatic effect. The overall median income increase is halved, and the large income gains at the 99th percentile significantly reduced. With farmers removed, the only groups where the 99th percentile do significantly better than the 90th percentile, are single persons aged 25-64 and the two categories of non-aged couples. Additional analysis shows that when all self-employed are removed, the income gains at the top end are also removed – suggesting that the increase in incomes for the high income groups in Table 9 is a combination of increasing incomes for farmers, combined with higher incomes for the self-employed generally. This is consistent with the pattern shown in Table 3 for capital income trends. Clearly, increases in self-employment (and capital) incomes over the period have been major contributing factors towards increased incomes - and inequality of incomes.

With farmers removed, many more of the categories in Table 10 show negative income trends over the last seven years, with real falls in the incomes of couples with dependents, for example, only just averted by the increase in married women's labour force participation.

The final Table for this Section (Table 11) provides some additional information on the impact of the changes in employment rates on incomes – providing a slightly more sanguine perspective on the economy's performance over the life of the present Government. As was noted earlier, whilst unemployment was near its peak in March 1983, in terms of financial year average employment rates, 1983-84 was significantly worse than 1982-83, particularly for male employment. It may thus make more sense to use this low point as the reference mark for evaluating recent trends. The estimates in Table 11 were compiled in an identical fashion to those in Table 9, but with 1983-84 employment rates used in the 1982-83 disposable income estimation. In general the

**TABLE 10: PERCENTAGE CHANGE IN REAL DISPOSABLE INCOMES BY  
PERCENTILES WITHIN EACH FAMILY TYPE 1982-83 TO 1989-90**  
(Farm-employed families excluded)

Family type	Percentiles					
	10	25	50	75	90	99
Single person						
Less than 25	2.4	-0.6	<b>0.5</b>	1.1	-0.3	-3.9
25 to 64	4.1	4.0	<b>2.3</b>	-2.9	-3.7	3.0
65 and over	3.7	3.9	<b>3.7</b>	3.3	1.4	1.5
Couple, without children						
Head less than 65	4.8	0.5	<b>1.6</b>	1.2	-0.9	8.6
(spouse weighted)	(7.5)	(5.4)	<b>(6.5)</b>	(3.3)	(0.9)	(9.6)
Head 65 and over	3.9	3.9	<b>4.2</b>	1.6	-1.0	0.6
(spouse weighted)	(3.9)	(3.9)	<b>(4.3)</b>	(2.5)	(0.2)	(0.6)
Couple, with children	10.0	0.5	<b>-1.5</b>	-0.8	-1.1	3.1
(spouse weighted)	(12.0)	(2.6)	<b>(0.8)</b>	(2.0)	(1.9)	(4.0)
Sole parent	15.3	13.6	<b>12.8</b>	13.3	-2.6	-1.7
All families	4.7	3.7	<b>2.3</b>	-0.7	-0.3	1.0
(spouse weighted)	(4.7)	(3.8)	<b>(3.3)</b>	(1.4)	(1.8)	(4.0)

**TABLE 11: PERCENTAGE CHANGE IN REAL DISPOSABLE INCOMES BY  
PERCENTILES WITHIN EACH FAMILY TYPE, 1982-83 TO 1989-90  
(1982-83 estimates based on 1983-84 employment rates)**

Family type	Percentiles					
	10	25	50	75	90	99
Single person						
Less than 25	4.9	2.9	<b>1.5</b>	2.1	0.9	7.7
25 to 64	8.2	6.3	<b>3.1</b>	-2.0	-3.2	5.6
65 and over	3.9	4.1	<b>3.8</b>	4.1	3.7	16.1
Couple, without children						
Head less than 65	6.3	8.4	<b>5.8</b>	3.1	1.4	11.4
(spouse weighted)	(7.9)	(10.9)	(9.3)	(4.9)	(2.9)	(11.4)
Head 65 and over	3.9	4.0	<b>4.3</b>	3.5	6.3	5.1
(spouse weighted)	(3.9)	(4.1)	(4.4)	(4.6)	(7.1)	(5.1)
Couple, with children	18.4	3.4	<b>0.0</b>	1.2	0.5	7.3
(spouse weighted)	(19.1)	(5.5)	(2.2)	(3.9)	(3.6)	(8.3)
Sole parent	15.0	13.0	<b>11.5</b>	15.3	-2.2	-5.0
All families	6.1	7.8	<b>5.7</b>	1.6	2.1	9.7
(spouse weighted)	(6.1)	(8.0)	(6.8)	(3.6)	(4.3)	(13.4)

changes are as one might expect, with gains to those groups with labour market attachment – though the overall picture is changed only slightly.

## 5. THE DISTRIBUTIONAL IMPACT OF HOUSING COST CHANGES

Despite the fact that the analysis to date has shown increases in median family incomes, there is a widespread view that real family incomes have fallen because of increases in housing costs. It is to an examination of trends in these costs that we now turn. In Section 3 of the paper, the dramatic changes in housing markets over the last decade were noted, and it was suggested that these changes may have quite important distributional outcomes. In this Section we describe some initial results from a simulation of housing expenditure changes. It should be stressed that these results are concerned with housing expenditures only – rather than with a full account of the distributional implications of housing market changes. Rising house prices, for example, imply higher current mortgage expenditures for new purchasers, but also (possibly unrealised) capital gains for established owners. Only the former of these effects is described here. The rationale for this restricted analysis stems chiefly from the fact that housing expenditure outlays are a significant constraint upon other consumption, and in the short-run this constraint is largely unavoidable. In keeping with this short-run focus, the analysis does not consider some possible responses to increased home purchase costs, such as people being forced to delay their move from rental to ownership tenure. Whilst such questions of access are of interest in their own right, they have only a marginal impact upon overall average housing costs, and so are not included in the model described here.

The method used in this section is similar in concept to that of the previous Section, in that the data contained in the 1985-86 Income Distribution Survey (IDS) are adjusted to reflect the distribution of housing costs in both 1982-83 and 1989-90. Housing costs were defined as the total of rents, mortgage repayments and rates and were calculated separately for each type of tenure.

One limitation of the 1985-86 IDS is that public sector tenants are not separately identified from those in the private sector. However, as noted above, there have been significant differences in rental trends for these two groups. Tenancy status has thus been imputed on the basis of a number of family characteristics and rents have then been adjusted according to the index numbers shown in Table 7. The imputation procedure used is described in more detail in Appendix B.

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For home owners, we have adjusted local government and water and sewerage rate payments in line with the CPI component 'local government rates and charges'. Home maintenance costs have been ignored as no expenditure data on these items is available from the IDS.

### Mortgage Repayments

The imputation of mortgage repayment changes is, however, much more complicated. In Appendix B a model is developed which describes the impact of house prices and interest rates on home loan repayment rates. The main elements of this model are summarised here.

Under the standard annuity home loan, the current repayment will depend upon the current amount outstanding, the rate of interest charged, and the period of time remaining before the loan has to be extinguished. The current amount outstanding will depend both upon the initial value of the loan, which is assumed here to be a constant function of house prices at the time of purchase, and also on interest rates over the life of the loan. (Higher interest rates mean that the amount outstanding will be reduced at a slower rate.) For a given outstanding debt, the current repayment will then be a function of the interest rate and the period remaining. An increase in interest rates, for instance, will have greatest impact upon those people who have just recently taken out a loan (for whom most payments are interest rather than principal). The method used here uses changes in these factors to adjust the data on mortgage repayments recorded in the 1985-86 IDS.

The model described in Appendix B shows that, for a family who purchased their home 'e' periods ago, and who have 'n' periods remaining on their loan, the relative repayments in some year other than 1986 can be estimated as

$$r_t/r_{t^*} = \{H_{t-e}/H_{t^*-e}\} \cdot \{X(i_{t,n})/X(i_{t^*,n})\} \cdot \{Y(t,e,n)/Y(t^*,e,n)\} \quad (1)$$

where 't' denotes the comparison period, and 't\*' the reference period (September – December 1986). The first term in the formula reflects the direct effect of different housing prices (at the time of purchase), whilst the second term reflects the impact of current interest rates and the third term the impact of interest rates over the life of the loan. This formula was used to adjust mortgage repayments for each income unit in the 1985-86 IDS data set.



The two main assumptions required for this adjustment are that changes in interest rates and house prices occur uniformly across the demographic groups of interest and that repayment rates are adjusted speedily to reflect interest rate changes. Whilst neither of these assumptions is likely to be strictly correct and the indexes used to represent house prices and interest rates only approximate, the focus here on changes in repayment rates will mean that these biases should only be small. The most likely systematic variation - that current repayments have not been fully adjusted to reflect recent increases in interest rates - will mean that the estimates of repayment increases presented here may be an **over-estimate**. However given that such moderation in repayments is only provided through an increase in future debt, the imputed welfare loss given by this estimation may not be so inappropriate.

A modified version of equation (1) can also be used to describe repayment changes between 1982-83 and 1989-90 by using  $t$  to refer to 1989-90 and  $t^*$  to refer to 1982-83. This equation is evaluated separately for each income unit, depending upon the values of  $t$ ,  $e$ ,  $n$  and  $i_t$ . For the whole population of purchasers, the geometric mean of the increase in repayment rate  $r_t/r_{t^*}$  can be decomposed as,

$$\bar{r}^* = \bar{H}^* \cdot \bar{X}^* \cdot \bar{Y}^* \quad (2)$$

where  $\bar{r}^*$  denotes the geometric mean of  $r_t/r_{t^*}$ , and  $\bar{H}^*$ ,  $\bar{X}^*$ , and  $\bar{Y}^*$  the geometric means of  $\{H_{t-e}/H_{t^*-e}\}$ ,  $\{X(i_t, n)/X(i_{t^*}, n)\}$  and  $\{Y(t, e, n)/Y(t^*, e, n)\}$  respectively. Alternatively, the increase may be described in real terms as,

$$\bar{r}^*/P = \bar{H}^*/P \cdot \bar{X}^* \cdot \bar{Y}^* \quad (3)$$

where  $P$  is a price index representing the general price inflation between 1982-83 and 1989-90. Equation (3) can thus be used to decompose the real increase in mortgage payments into components due to house price inflation, interest rate changes and historical levels of interest rates. These geometric means are shown in Table 12 for different age groups of purchasers, along with the mean years of occupancy and prospective mortgage duration for each age group.<sup>17</sup> The details of the derivation of these variables are described in more detail in Appendix B.

As can be seen from the first line of Table 12, the average years of occupancy of purchasers varies greatly with age, from an average of 1.4 years for the youngest group

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17 The Tables in this Section have been compiled independently of the re-weighting procedure used for the previous Section. That is, all income units retain their 1985-86 income unit weight.

**TABLE 12: FACTORS INFLUENCING INCREASES IN MORTGAGE REPAYMENTS BETWEEN 1982-83 AND 1989-90.**

	Age of Income Unit Head					
	<30	30-39	40-49	50-64	65+	All
Years of occupancy (e)	1.4	4.1	7.6	12.1	18.1	6.3
Prospective duration of loan (years) (n)	18.9	18.3	15.6	17.1	31.5	18.0
Proportion with protected status in 1989-90	0.05	0.26	0.38	0.43	0.70	0.30
Relative interest rate	1.35	1.29	1.25	1.24	1.16	1.28
Components of increase						
House prices ( $\bar{H}^*$ )	2.11	2.03	2.12	1.97	1.78	2.04
Real House prices ( $\bar{H}/P^*$ )	1.30	1.25	1.31	1.22	1.10	1.26
Interest rate effect ( $\bar{X}^*$ )	1.23	1.17	1.12	1.10	1.09	1.15
Period interest effect ( $\bar{Y}^*$ )	1.01	1.02	1.04	1.06	1.05	1.03
Total real increase ( $\bar{r}^*/p$ )	1.62	1.50	1.53	1.43	1.25	1.50
(Total real increase - arithmetic mean)	(1.65)	(1.52)	(1.56)	(1.47)	(1.30)	(1.53)
Weekly repayment (1989-90)	\$206	\$158	\$129	\$92	\$47	\$144
Increase in weekly payment, 1982-83 to 1989-90 (\$1989-90)	\$79	\$51	\$41	\$31	\$16	\$48

to 18.1 years for the oldest. This differing duration has two main effects. The first stems from the fact that in 1989-90 all those income units whose mortgage is less than (on average) 45 months old will not be eligible to receive the 13.5 per cent protected interest rate. The third line of the Table indicates that only about 5 per cent of income units with heads aged under 30 will be eligible for this concession, whilst 70 per cent of the oldest age group are expected to be eligible. Overall, three in ten income units are estimated to be eligible for this concession in 1989-90.<sup>18</sup> The differing fractions of the population eligible for the interest rate concession are also reflected in the fourth line of Table 12, which shows the average of the interest rate in 1989-90 divided by the interest rate faced by the same type of household in 1982-83. Overall, interest rates have increased by 28 per cent, but with average increases of 35 per cent among income units with head aged under 30.

Duration of occupancy also affects loan repayment rates through its determination of the time of purchase of the dwelling – and hence the purchase price. The fifth line of Table 12 describes the geometric means of the relative house prices in the two years (as in equation (2)), whilst the sixth line presents the same information, but deflated by overall (non-housing) consumer price changes between 1982-82 and 1989-90 (equation (3)).

The way these indexes are calculated is as follows (for more details see Appendix B). For each income unit, the years of occupancy ( $e$ ) are first estimated. The house price index for the year which was  $e$  years prior to 1989-90 is then divided by the house price index for the year  $e$  years prior to 1982-83. House price indexes for capital cities are assumed to apply to their respective states. This index thus provides a measure of the relative initial house prices for households in the same duration category in the two years. The geometric mean of this ratio across income units in the same age group appears as  $\bar{H}_e$  in Table 12. This ratio is then divided by the increase in consumer prices between 1982-83 and 1989-90 to provide the estimate of the increase in real house prices over the period.

Because of increased house price inflation in recent years (particularly in Sydney, see Figures 3 and 4), Table 12 shows a higher increase in real house prices for younger income units. Overall, real house prices are estimated to have increased by 26 per cent. Unless these increases were met by increased deposits it would be expected that they should flow directly into higher mortgages and hence higher repayments for purchasers in 1989-90 compared to 1982-83.

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18 This differs from the 28.8 per cent in Appendix B because the Tables in this Section exclude income units without stable annual incomes (the standard ABS exclusion for annual income data was used).

Whilst the large increases in house prices for recent purchasers may seem plausible, it is surprising that real house prices are estimated to have risen strongly, even for well established purchasers. Over the long-run, real house price increases have been relatively modest, averaging around 2-3 per cent per annum. However, it is important to note the lagged nature of the impact of house price increases. This can be illustrated for an average income unit purchasing their home 6 years before the reference year and living in Melbourne (for example). The median Melbourne house price in 1976-77 (6 years prior to 1982-83) was \$34,000, whilst in 1983-84 (6 years prior to 1989-90) it was \$61,600 – 1.81 times larger. Over the same period, the overall CPI increased by a factor of 1.87, implying real house prices fell slightly. However, to estimate the real (i.e. price adjusted) impact of house prices on mortgage repayments between 1982-83 and 1989-90 it is overall prices in these two years that are relevant. Between 1982-83 and 1989-90 the CPI is expected to rise by a factor of 1.63 (or 1.62 if the index excluding housing is used). Hence the impact of house prices on real mortgage repayment rates for this hypothetical family type has increased over the period ( $1.63 < 1.81$ ).

Thus, even if real house prices stay constant in terms of the CPI at time of purchase, a fall in the overall rate of inflation (as has occurred recently) will mean that mortgage repayments at a later date will increase in real terms (in terms of the CPI at the time of repayment). Whilst this implies that the real house price increases shown in Table 12 are in some sense an artifact of falling inflation rates, such changes do nonetheless have significant impact upon current expenditures. Thus, in terms of the short-run model described here, it is appropriate that they be included.

The impact of rising interest rates on repayments ( $\bar{X}^*$ ) is, in fact, lower than the impact of real house price inflation for each of the age groups considered in Table 12. The variations in this effect by age follow the same pattern as described for the relative interest rates, with greater increases for the younger age groups. An additional reason for the impact of interest rates to be higher for younger age groups is that we would expect their prospective duration of loan to be higher, with a correspondingly higher proportion of the repayments being repayments of interest rather than capital. However, Table 12 indicates that the mean prospective duration of mortgage falls only up to the middle age bracket. This is most likely an artifact due to our assumption that income units with very low apparent repayment rates had very long prospective mortgage durations (see Appendix B). Such cases are more likely to occur among older households because of the increased prevalence of war service loans and similar instruments. Hence the prospective durations for these older categories are probably over estimated. Given, however, that such income units are also assumed to have protected loan status, the impact on the interest rate effect is probably only minor.

Overall, rising interest rates between 1982-83 and 1989-90 have led to repayment increases of 15 per cent. For income units with heads aged under 30 the average increase has been 23 per cent. The most extreme value for the interest rate effect would be for households who have just taken out mortgages and who are not facing protected interest rates. The standard interest rates for such households would be 12.5 per cent in 1982-83 and 17 per cent in 1989-90 – an increase of 36 per cent. This is only slightly above the relative interest rates shown for the youngest age group in Table 12. The reason the overall interest rate effect,  $\bar{X}^*$ , is significantly less than this (a 23% increase) is because part of the effect of higher interest rates is to delay repayment of principle until later in the loan. For income units already paying off some of their principle, this means that their repayments will rise at a slower rate than the increase in the interest rate.

The final component of the house price model is the impact of past interest rates on repayments. Given the generally rising interest rates over the last decade, it is not surprising that this implies higher loan balances outstanding – and hence higher current repayment rates. However, the effect is only relatively minor.

As shown in equation (3) the combination of the house price, current interest rate and period interest rate effects provides an estimate of the increase in home loan repayments over the period. For example, in the first column of Table 12,  $1.62 \approx 1.32 \times 1.23 \times 1.01$  (our calculations were carried out with more precision than two decimal places). The geometric mean of this index is shown, followed by the arithmetic mean in brackets. This indicates that, on average, home purchasers in 1989-90 were paying about 50 per cent more in mortgage repayments in 1989-90 than in 1982-83.

Note that this story for purchasers in general does not necessarily apply to **individual** purchasers. If they had stayed in the same house during this period, they would not have had any increase in repayments due to their house price increase. The increase in nominal repayments they would face would have simply been that due to the current and period interest rate effects – i.e. an increase of 18 per cent ( $1.03 \times 1.15 = 1.18$ ). To express this in real terms, this would need to be offset by the general increase in prices – leading to a decrease in real terms of 13 per cent ( $1.18/1.62 = 0.73$ ). This, of course, is simply a restatement of the general fact that repayments under annuity loans remain constant in nominal terms, and hence fall in real terms over the life of the loan.

The final two lines of Table 12 express the average changes in repayment rates in dollar terms. The line second to last shows the average weekly loan repayment estimated for 1989-90 whilst the last line shows the difference between this figure and the estimated

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1982-83 repayment in 1989-90 prices.<sup>19</sup> Thus, if interest rates had not changed, and house price inflation had always been at the same rate as non-housing inflation between 1982-83 and 1989-90, home purchasers would have been paying \$48 per week less in repayments in 1990-91. For the youngest group of buyers, this reduction would be \$79 per week.

Clearly then, the average home purchaser is spending much more of their disposable income on housing costs in 1989-90 than in 1982-83. However, just as in the previous section, the extent to which this is a direct result of government policy is debatable. In fact most of the increase in estimated mortgage repayments comes about because home purchasers in 1989-90 will, on average, be paying off more expensive houses than in 1982-83. Whilst part of this is a result of the boom in house prices since 1987, it also reflects the interaction of generally slowing inflation with the lagged impact of house price inflation on home loan repayments.

### Effects of Interest Rate Changes

One aspect of the housing market that is more directly amenable to policy intervention is home loan interest rates. This model can also be used to illustrate the effect of such policy changes. Table 13 illustrates the effect of two possible changes in interest rate policy. The first describes the impact of increasing the interest rate on all unprotected loans from 17 to 18 per cent, whilst the second describes the impact of reducing all loans with interest rates over 13.5 per cent back to that lower interest rate level. Note that for both these options, the interest rates of protected loans are assumed unchanged. In Table 13, two results for each of these examples are described. The first is the average change (in dollars per week) in mortgage repayments anticipated, whilst the second describes the percentage change in repayments. These are shown for 6 different lifecycle groups.

Overall, a further 1 per cent increase in interest rates is estimated to increase average repayments by \$5 per week, or 2.8 per cent. This increase is significantly less than the increase in interest rates of 5.8 per cent  $((18-17)/17)$ . This is because of the 30 per cent of loans that are assumed protected, together with the fact that for loans with relatively short prospective durations, some of the interest rate increase can be offset by reductions in current principal repayments.

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<sup>19</sup> Note that these are not always directly comparable to the figures above (e.g.  $51/(158-51) \neq 1.52$ ) because these repayment levels are computed at the individual income unit level rather than on the basis of the averages shown in the Table.

**TABLE 13: IMPACT OF CHANGES IN INTEREST RATES ON HOME  
LOAN REPAYMENTS IN 1989-90**

	Lifecycle Group						
	Single person <65	Couple only, head <40	Family with dependents	Couple, head 40-64	Couple, head 65+	Single person, 65+	All
Mean weekly repay- ment in 1989-90	\$172	\$217	\$143	\$101	\$51	\$17	\$144
<i>Impact of increase in unprotected interest rate to 18%</i>							
Mean increase (\$pw)	\$6.2	\$8.8	\$4.9	\$2.6	\$0.6	\$0.2	\$5.0
Mean % increase	3.2%	4.1%	2.8%	1.9%	0.6%	1.4%	2.8%
<i>Impact of reduction of all interest rates to 13.5%</i>							
Mean reduction (\$pw)	\$18.4	\$25.7	\$14.2	\$7.5	\$2.0	\$0.7	\$14.5
Mean % reduction	9.2%	11.1%	8.2%	6.1%	2.0%	4.7%	8.1%

If all interest rates were to drop to 13.5 per cent, repayments on average would be expected to drop by \$14.50, or 8.1 per cent. Under either hypothetical change, the lifecycle group with the highest repayment rate, couples without dependents and with the head aged under 40, would experience the largest absolute and percentage changes. A further 1 per cent increase would leave them \$9 a week worse off, whilst a reduction in interest rates to 13.5 per cent would reduce their housing expenditures by an average of \$26 per week.

#### **Overall Impact of Housing Cost Changes**

The overall distributional impact of housing cost changes for income units in all tenures is shown in Table 14. This Table shows the average real increase in weekly housing expenditures between 1982-83 and 1989-90, together with the averages of this increase expressed both as a proportion of 1982-83 expenditures, and as a proportion of 1985-86 weekly income. Housing expenditures here include mortgage repayments, rent payments and local government, water and sewerage rates. These results are shown separately for six different lifecycle groups, and by income quintiles within each lifecycle group. Because of evidence that some self-employed have disproportionately large housing expenditures relative to their incomes (Bradbury, Rossiter and Vipond, 1986), income units with either head or spouse self-employed during the survey year have been excluded from this table.

Overall, real housing costs are estimated to have increased by an average of \$14 per week (in 1989-90 dollars). In other words, if housing costs had increased in line with other prices, income units in 1989-90 would be spending \$14 per week less for their housing than they actually were. This increase is much less than the \$48 per week shown for purchasers in Table 12 because, as Table 7 indicates, other housing costs for outright owners and renters have only increased modestly over the period and government rents have fallen in real terms.

This average increase of \$14 per week represents 17 per cent of 1982-83 housing costs and 4 per cent of 1985-86 weekly gross incomes. The lifecycle group with the highest increase in housing costs, in both dollar and percentage terms, were the younger couples. Average housing costs for this group are estimated to have increased by \$48 per week, or 34 per cent of 1982-83 housing costs. This large increase is mainly because recent home purchasers are predominant within this group. This group thus faces the brunt of the home price and interest rate impacts upon housing expenditures.

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**TABLE 14: DISTRIBUTIONAL IMPACT OF HOUSING COST CHANGES,  
1982-83 TO 1989-90(1)**

Lifecycle group	Gross Income quintile of lifecycle group(2)					
	1	2	3	4	5	All
<b>Single person &lt;65</b>						
Mean expenditure increase (\$1989-90/wk)	\$4	\$5	\$7	\$11	\$26	\$11
Increase as % of 82-83 expenditures	12	12	14	16	23	16
Increase as % of 85-86 gross income(3)	13	4	3	3	5	5
<b>Couple only, head &lt;40</b>						
Mean expenditure increase (\$1989-90/wk)	\$14	\$36	\$43	\$65	\$74	\$48
Increase as % of 82-83 expenditures	16	28	34	43	47	34
Increase as % of 85-86 gross income(3)	4	6	6	8	7	6
<b>Family with Dependents</b>						
Mean expenditure increase (\$1989-90/wk)	\$9	\$19	\$27	\$29	\$33	\$24
Increase as % of 82-83 expenditures	12	22	28	30	30	25
Increase as % of 85-86 gross income(3)	10	5	5	4	4	6
<b>Couple only head 40-64</b>						
Mean expenditure increase (\$1989-90/wk)	\$3	\$4	\$7	\$10	\$20	\$9
Increase as % of 82-83 expenditures	8	9	12	14	18	12
Increase as % of 85-86 gross income(3)	2	1	2	2	2	2
<b>Couple only, head 65+</b>						
Mean expenditure increase (\$1989-90/wk)	\$1	\$2	\$1	\$1	\$2	\$1
Increase as % of 82-83 expenditures	4	8	4	5	4	5
Increase as % of 85-86 gross income(3)	1	1	0	0	0	1
<b>Single person 65+</b>						
Mean expenditure increase (\$1989-90/wk)	\$2	\$1	\$2	\$1	\$2	\$2
Increase as % of 82-83 expenditures	7	6	7	5	5	6
Increase as % of 85-86 gross income(3)	2	1	2	1	1	1
<b>All</b>						
Mean expenditure increase (\$1989-90/wk)	\$5	\$10	\$13	\$16	\$25	\$14
Increase as % of 82-83 expenditures	10	14	17	18	22	17
Increase as % of 85-86 gross income(3)	8	3	3	3	3	4

- Notes: (1) Includes income units with positive housing costs and with neither head nor spouse self employed.
- (2) Income quintiles were calculated separately for each lifecycle group on the basis of 1985-86 gross income.
- (3) Excludes cases with zero incomes.

To assess the distributional impact of such housing cost changes, it is necessary to assess them in the light of other indicators of families' resources. This has been done here by estimating the impact of the expenditure increases as a percentage of the income units' (weekly) gross income in 1985-86. The actual magnitudes of these percentages have only limited relevance (a comparison with net incomes in 1989-90 might be more appropriate<sup>20</sup>), but the changes in these percentages across lifecycle and income groups can be used to assess the impact of housing cost changes on the distribution of incomes after housing costs.

In absolute terms, and as a percentage of initial housing costs, the changes in housing expenditures generally increase for the higher income quintiles. This reflects the two facts that the higher income households are more likely to be purchasers, and that they purchase more expensive properties. As a proportion of income, however, the trend is less consistent. For all households, it is the lowest income quintile for which the increase in housing costs has had the greatest proportionate impact upon disposable incomes. This pattern also appears for the single person (aged under 65) income units, and families with dependents, but is reversed for young couples without dependents.

## 6. THE DISTRIBUTION OF CHANGES IN DISPOSABLE INCOMES

The results of Sections 4 and 5 are integrated in Table 15. This Table presents information on changes in the distribution of **after housing** incomes between 1982-83 and 1989-90. The method used is the same as for Table 9, but instead of being based upon incomes after tax, the calculation is based on gross incomes less income tax and housing expenditures. Additionally, price deflators which exclude housing costs have been used to calculate real changes, as the consumption to which income net of housing costs would be applied excludes housing.<sup>21</sup>

As might be expected on the basis of the previous section, the picture in terms of after housing cost living standards is quite different from that given by net income alone. Rather than an overall median increase of 5 per cent (or 6.5%), the increase is now

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20 1985-86 incomes were used for the purely practical reason that their use permits the calculation and discussion of this Table to be done independently of the results of the income ageing described in the previous Section.

21 The CPI excluding housing costs was used for non pensioner/beneficiary households. The ABS does not publish a price index excluding both housing and hospital and medical expenses. Such an index was calculated here by adjusting the index excluding housing by the ratio between the CPI excluding hospital and medical charges and the standard CPI. This calculated index was used, as before, for the calculation of real income trends for pensioner/beneficiary families.

**TABLE 15: PERCENTAGE CHANGE IN REAL DISPOSABLE INCOMES  
(AFTER HOUSING COSTS) BY PERCENTILES WITHIN EACH  
FAMILY TYPE - 1982-83 TO 1989-90**

Family type	Percentiles					
	10	25	50	75	90	99
Single person						
Less than 25	0.0	-3.1	<b>-0.6</b>	1.3	-0.2	7.0
25 to 64	-2.8	1.5	<b>-5.0</b>	-4.9	-2.0	3.5
65 and over	2.7	3.9	<b>4.6</b>	3.9	5.7	16.0
Couple, without children						
Head less than 65	12.1	3.5	<b>0.7</b>	0.4	0.2	13.4
(spouse weighted)	(13.7)	(7.4)	<b>(4.2)</b>	(2.9)	(1.3)	(11.9)
Head 65 and over	5.7	4.8	<b>5.4</b>	4.7	5.8	6.6
(spouse weighted)	(5.7)	(4.8)	<b>(5.2)</b>	(5.5)	(6.4)	(6.6)
Couple, with children	6.8	-2.6	<b>-4.0</b>	-1.2	-0.6	2.1
(spouse weighted)	(9.1)	(-0.3)	<b>(-1.7)</b>	(1.1)	(2.0)	(4.5)
Sole parent	24.2	21.1	<b>15.4</b>	2.5	-3.2	-7.6
All families	4.5	3.6	<b>0.5</b>	-1.3	0.1	7.3
(spouse weighted)	(4.6)	(3.9)	<b>(1.5)</b>	(1.0)	(2.6)	(11.2)

estimated at only 0.5 per cent (or 1.5%). This difference reflects the fact that the CPI used to deflate incomes in Table 9 does not include all the increases in housing costs identified in the previous Section. If it did, we would expect the overall average to be very similar in the two Tables (though the distributional patterns might be different). The main reason for this difference is that the CPI has only incorporated the interest component of home loan repayments since the beginning of 1987 (by which time interest rates had risen to around 15.5%), and that it does not incorporate the lagged effect of house prices in the way we have done here.<sup>22</sup>

As might be expected from Table 14, the groups for which median after housing income trends are most divergent from the net income trends in Table 9 are non-aged couples with and without children, and single persons aged 25 to 64.<sup>23</sup> The non-aged groups (with the exception of sole parents) are also the groups which have encountered the slowest growth in after housing incomes between 1982-83 and 1989-90. The two non-aged single person categories have both experienced real decreases in disposable incomes, as have couples with children. These decreases would be even larger if farm families were excluded.

In general, the aged are better off because of their high proportion of outright ownership. The exceptions are the low income single aged, for whom real rises in private rent levels are probably responsible for increased housing costs. Overall, the median increase in real after housing incomes for the aged has been around 5 per cent.

The situation of the bottom 50 per cent of sole parents is in fact **improved** after housing costs (compared to Table 9) – though those above the median are significantly worse off compared to when after-tax incomes alone are considered. This reflects the divergent impacts of the estimated real drop in government rents compared with the high proportion of expenditure on housing of those sole parents purchasing or privately renting. It should be noted, however, that the estimate of government rent levels used here is far from ideal, and better measures are required to make definitive statements.

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22 Another hypothetical justification for the divergence could be that the quality of housing has increased significantly over the period – and hence our estimates of price rises are over-estimates. Whilst this may be the case, it does not appear the CPI methodology makes any explicit allowance for quality changes either.

23 The relatively big drop in after housing income for this latter group in Table 15, compared to the pattern found for the non-aged single in Table 14 reflects the inclusion of self-employed in Table 15 – who for single persons in particular had high levels of housing cost increases relative to their incomes.

## 7. SUMMARY AND CONCLUSIONS

This paper has presented the results of a new analysis of trends in the disposable incomes of Australian families in the period 1982-83 to 1989-90. These results should be thought of as only a first step in the understanding of such trends, and we have tried to make clear the many limitations of the methodology used and the assumptions required for the modelling of trends in the disposable incomes of families. In future development of this model, attention will be paid to improving the realism of the assumptions, particularly about trends in full-time employment relative to part-time employment, and in movements in earnings at different levels of the earnings distribution. Additional research is also required into better methods for integrating information on changes in the employment status of persons into the analysis of family income trends.

Despite these limitations, this analysis is both more comprehensive and more systematic than previous research on recent trends in the distribution of disposable incomes. As such, the conclusions should be of interest to those seeking to understand the impacts of economic changes and policy responses on living standards.

Our conclusions on the trends in the after-tax incomes of families can be summarised as follows. When we take full account of the family income increases due to increasing married women's employment, the overall real increase in median family incomes is estimated at around 6.5 per cent between 1982-83 and 1989-90 (Table 9). Excluding farming families, this increase is reduced to only 3.3 per cent. When using 1983-84 employment rates as the bench-mark, these estimates of income growth increase by somewhat under one percentage point (Tables 10 and 11).

Different family types, however, have experienced quite divergent trends. The results which probably have most policy relevance are those calculated for non-farming families, as 1982-83 was an unusually bad year for farmers. Among non-farming families, the greatest increase in median incomes has been for sole parents, whose median income has risen by 12.8 per cent – though their income levels still remain very much below that of other families with dependents (Tables 10 and 8). Couples without dependents have also experienced significant median real income gains of 6.5 per cent and 4.3 per cent for those with heads aged under and over 65 respectively. The single aged have had median income increases of around 3.7 per cent. The family types with the smallest income growth have been single young people and couples with children, whose real median incomes have remained essentially stable over the period. Indeed, if it were not for the increasing labour force participation of married women, it appears that (non-farm) couples with dependents would have experienced falling real incomes.

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As well as disaggregating by family types, we have also examined trends in the distribution of incomes within each family type. At the very top end of the income distribution, increases in farm incomes and other capital incomes have led to large real income increases for some families. Setting these aside, the trend within each family type, and for families overall, appears to have generally been one of either stable or decreasing inequality. Possibly this conclusion would change if our model took account of evidence of increasing inequality of wages, but this evidence also needs to be assessed in the light of possible changes in non-monetary incomes resulting from the introduction of the fringe benefits tax.

Irrespective of whether the Government's pledge to 'end the need for child poverty' has been met, it is clear that the Family Package of increased additional payments to low income families with children has had a significant impact upon the living standards of the poor. Again excluding farm families, the real income levels of the 10th percentile of two parent and sole parent families with children are estimated to have increased by 12 and 15 per cent respectively (Table 10).<sup>24</sup> For dual parent families at the median income, however, the tight targeting of this assistance means that they have barely maintained their real incomes.

In addition, many families have faced large increases in housing costs over the last few years. Because of the magnitude of these changes and their implications for living standards, this paper has devoted significant attention to the estimation of housing cost trends. The largest increases in housing costs have been for home purchasers, who, as a group, have encountered significant increases in home loan interest rates and house prices. We estimate that, on average, these housing market changes have led to families purchasing their homes paying an additional \$48 per week in mortgage repayments (in 1989-90 dollars). This is an increase of around 50 per cent on what they otherwise might have paid if interest rates had not increased and house price inflation had not been greater than non-housing inflation between 1982-83 and 1989-90. Because of the interacting patterns of interest rate protection, house price trends and repayment methods, this increase is much greater for younger income units. Those with heads aged under 30 years, for example, are estimated to be paying \$79 per week more in mortgage repayments (Table 12).

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24 These real increases are greater than the real increase of 8.4 per cent in household disposable income per head, which is the measure used to update the Henderson poverty line over time. This in turn implies that the extent of poverty among families with children as measured by the poverty gap must have fallen over the period.

More than half of this increase in mortgage repayments (for all ages) has been due to house price increases. These have increased repayment rates not only because real house prices have risen steeply in recent years, but also because of the lagged impact of house price inflation on current home loan repayment rates.

Whilst governments have little control over house prices (at least in the short-term), interest rates are more directly a reflection of government policy. The paper also estimates the impact of some possible changes in interest rates on mortgage repayments. A reduction of interest rates to 13.5 per cent, for example, is estimated to lead to a \$14.50, or 8 per cent reduction in average housing costs. For couples with head aged under 40 and without children, such an interest rate reduction would lead to a \$26 per week reduction in housing costs (Table 13).

Finally, the paper considered the impact of these housing market trends on incomes after housing costs had been deducted. Over all tenures, real housing costs increased by an average of \$14 per week (Table 14). As a consequence of these trends, even when including farming families, median after housing incomes are estimated to have declined for non-aged single people and couples with children (Table 15). Overall, real median after housing incomes are estimated to have increased only slightly (1.5%) – though if farm families were excluded the overall trend would be a decrease in after housing incomes.

As was noted in the introduction, the purpose of this paper has been primarily descriptive, rather than policy oriented. Obviously, the question of which policies would be best to improve family living standards is a very complicated one. Our goal has simply been to draw a picture of the impacts of recent changes in the Australian economy on family disposable incomes. Many of the changes we have described can easily be identified as the results of particular government policies – many others cannot.

Whilst the limited nature of our analysis does not allow a conclusive response to the statement that 'the rich are getting richer and the poor are getting poorer', we do feel confident in asserting that increases in employment and income support for families with children over the last seven years have significantly improved the circumstances of the poorest groups. The rise in capital incomes does also seem to have benefited the very rich and those with significant savings (e.g. the middle class aged). Middle income families however, have not done so well, particularly when incomes after housing costs are considered. Unfortunately for governments, median income families also tend to contain median voters.

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## APPENDIX A: AGEING METHODOLOGY

This Appendix describes in more detail aspects of the static ageing model used in this paper.

### REWEIGHTING

For this analysis, only two factors were used in the reweighting of the file, demographic changes, and changes in employment levels. These weights were first calculated at an individual level, and then averaged to derive weights for each income unit.

#### Demographic Changes

The first step in the reweighting process was the adjustments of the file weights to reflect the demographic structure in each of the analysis years. This was done on the basis of the age/sex distribution of the population in the January Labour Force Surveys (see Table 1). The 1989-90 figure was calculated by applying the rates of estimated population growth given in **Projections of the Populations of Australia, States and Territories: 1987 to 2031** (ABS, Cat. No. 3222.0) to the population distribution in January 1989. Because the labour force surveys have a scope very similar to that of the income survey, the file weights were adjusted to exactly correspond with these population estimates. No adjustment was made for changes in the number of dependent children in families.

#### Employment Levels

Modelling changes in employment patterns is more difficult than demographic trends because of the variability in employment status throughout the year. This analysis adopts a very simple approach of adjusting the sample weights to ensure that the total level of employment over the year in the survey dataset corresponds to the corresponding employment level as recorded in the labour force surveys over the year. If employment has increased, for example, this involves increasing the weights of those with full-year employment, decreasing the weights of those with no employment, and leaving the weights of those with some employment unadjusted. This reweighting is undertaken separately for each age/sex group with females further distinguished by marital status (see Table 2).

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This method relies on the fact that both the income survey and the ABS Labour Force Surveys can provide estimates of the total **person employment weeks** over the year. Actually **person employment weeks per person week** is the concept used here (this reflects the 'intensity' of employment rather than a population dependent figure). Summing over the labour force surveys for the months of August, November, February and May<sup>25</sup> this variable is defined as,

$$y_t = \Sigma(\text{persons employed}) / \Sigma(\text{persons in population})$$

An equivalent estimate can also be derived from the income survey. Let 'j' denote the weeks of employment during the year, then person employment weeks per person week can be defined as,

$$\begin{aligned} e_t &= (52w_{t(52)} + \sum_{j=1}^{51} jw_{t(j)}) / 52w_t \\ &= (w_{t(52)} + (1/52)\sum_{j=1}^{51} jw_{t(j)}) / w_t \end{aligned} \quad (\text{A.1})$$

Where  $w_{t(52)}$  is the total number of cases with 52 weeks employment, and a dot subscript represents summation. Because the Labour Force Survey definition of employment is unlikely to exactly correspond to the income survey definition (the latter is retrospective, whilst the former is current), it would not be appropriate to require that these two estimates of employment intensity coincide. Rather, the goal is thus to ensure that,

$$e_t/e_0 = y_t/y_0 \quad (\text{A.2})$$

Where the subscript 0 denotes, the reference year (1985-86) and t subscript denotes some comparison year. That is, the relative change in employment intensity in the two datasets are equated. With the information available there is no unique way of undertaking this adjustment, and so a relatively simple method is used here. This involves leaving the weights of people who experienced part-year employment unadjusted, and altering the weights of those with full and those with no employment to reflect the desired changes (keeping the total population constant). (An alternative – slightly more complicated – method would be to inflate the weights of those with part-year employment by the same factor as for those with full-year employment.) That is, we define,

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25 Only these four mid-quarter (rather than the 12 available) months were used to simplify calculations. Employment rates in 1989-90 were assumed equal to those in 1988-89.

$$\begin{aligned}
e_t &= e_0 y_t / y_0 && \text{(from equation A.2)} \\
e_t &= (\alpha w_{0(52)} + (1/52) \sum_{j=1}^{51} j w_{0j}) / w_0. \\
w_{t.} &= \alpha w_{0(52)} + \sum_{j=1}^{51} w_{0j} + \beta w_{0(0)} = w_0.
\end{aligned}$$

Using equation (A.1) these can be solved for  $\alpha$  and  $\beta$  to get,

$$\begin{aligned}
\alpha &= 1 + (y_t / y_0 - 1) (\sum_{j=1}^{52} j w_{0j}) / (52 w_{0(52)}) \\
\beta &= 1 - (y_t / y_0 - 1) (\sum_{j=1}^{52} j w_{0j}) / (52 w_{0(0)})
\end{aligned}$$

Where  $\alpha$  is the weighting adjustment factor for cases with 52 weeks employment,  $\beta$  is the factor for cases with no employment, and cases with part-year employment retain their original weights. The expressions for these weighting factors, are functions of the number of cases with no employment ( $w_{0(0)}$ ), 52 weeks employment ( $w_{0(52)}$ ), and the total number of weeks of employment in the original dataset ( $\sum_{j=1}^{52} j w_{0j}$ ).

There are a number of drawbacks with this simple method. First, the reweighting does not adjust the proportion of the population with part-year employment. More important however, is that changes in part and full-time employment are not distinguished. The lack of distinction between unemployment and not in the labour force is of somewhat lesser importance as income levels do not differ much between these two states.

The relative growth in part-time employment, therefore, cannot be fully captured by this model though it will be captured to the extent that this growth was reflected in compositional changes in the employed workforce.

#### Calculation of Income Unit Weights

For the standard results presented in this paper, income unit weights have been calculated as the harmonic mean of the weights belonging to each adult person in the income unit. An adjustment is also made to account for the differing proportions of incomplete income units. This method follows that used by the ABS in the construction of the initial 1985-86 IDS dataset.

However when heads and spouses have experienced differing employment trends, this method may lead to inappropriate weights. In particular, when employment rates for heads have stayed relatively constant, but those for spouses have increased significantly, this will lead to the income distribution of income units being shifted downwards. This

is essentially because only part of the increase in married women's employment is translated into the income unit weight.

This tendency can be illustrated with a simple example. Suppose there were only two married couple income units in the file, each representing 100 income units in the population with initial weights as follows,

WH	WS	$\bar{W}$	EH	ES
100	100	100	e	n
100	100	100	e	e

Where WH and WS are the head and spouse person weights,  $\bar{W}$  is the income unit weight, and EH and ES are the employment states of the head and spouse (e=employed, n=not employed). The employment rate for heads is 100 per cent and that for spouses 50 per cent. Suppose now that the external data source suggests that the spouse should now have an employment rate of 75 per cent. The weights would thus be adjusted as follows,

WH	WS	$\bar{W}$	EH	ES
100	150	120	e	n
100	50	67	e	e

$\bar{W}$  is calculated as the harmonic average (e.g.  $120 = 2/(1/100 + 1/150)$ ) and so does not add up to 200, but this is not particularly important (the problem described here would recur even if the arithmetic average were used). If we calculate the head's and spouse's employment rates from the income unit weight, the head's employment rate is still 100 per cent but that of the spouse is only 64 per cent ( $=120/(120+67)$ ) rather than the 75 per cent required. In this case, the income unit weight would ensure the appropriate estimates of employment rates (and hence incomes) only if it were defined to be equal to that of the spouse. This result, of course, is special, and rests upon the assumption that the employment rate of the head is the same irrespective of the weights applied.

This aggregation problem does not appear to have any simple solution. Reweighting directly using a matrix of head by spouse employment probabilities does not seem possible given the limited data available, and would significantly complicate the exercise of matching employment intensities over the year. This is clearly an area where further research is required.

For the present paper we have presented two sets of results. The first uses the harmonic mean of head and spouse weights. This is appropriate when the employment rates of heads and spouses have increased together. Given however that the employment of

married women has grown much faster than that of men, and that employment rates for men are very high, it seems that the hypothetical example given above is a reasonable approximation to the actual changes in employment patterns between 1982-83 and 1989-90. Hence we have also presented results using spouse weights only.

## INFLATING INCOMES

Levels of income from different sources are inflated in line with changes in indicators of average incomes. Implicitly this method assumes that the distribution of incomes from each source has remained constant. The inflation factors used are as follows.

### Earnings

Data limitations have forced a rather complicated method of inflating earnings levels. The ABS survey **Weekly Earnings of Employees (Distribution) Australia** (Cat. No. 6310.0) (WEED) has the same scope as the income survey but is however, conducted only once each year, in August. The **Average Weekly Earnings** (Cat. No. 6302.0) (AWE) survey of employers, in contrast, is conducted quarterly. In order to take advantage of the longer run trends evident in the WEED data, and possible within year trends evident in the AWE data, the following formula is used to derive an index of earnings for full and part-time workers of each sex. To simplify notation, the formula is described only for the 1985-86 year.

$$E_{ts} = \text{WEED}(\text{Aug85})_{ts} \cdot \text{AWE}(\text{av85-86})_s / \text{AWE}(\text{Aug85})_s$$

where the subscript t indicates full or part-time, and s indicates sex. WEED(Aug85) is the average weekly total earnings of the category, AWE(Aug85) is the corresponding August estimate of average weekly total earnings of employees, and AWE(av85-86) is the average of this measure over the four quarters of the year. Wage incomes in the file were inflated by the value of  $E_{ts}$  for the relevant period, divided by the figure for the 1985-86 year. Wage growth from 1988-89 to 1989-90 was assumed to be 6.5 per cent in accordance with the budget forecast.

### Income from Self-Employment

Following King (1987) the National Accounts estimates of 'income of farm unincorporated enterprises' and 'income from non-farm unincorporated enterprises' were used to inflate self-employment incomes. The farm/non-farm distinction was made on

the basis of industry of employment during the year (non-farm was assumed where not recorded). Income for 1989-90 was assumed to be at the same real level as in 1988-89 (a CPI projection of 7.5% was used).

Because these National Accounts measures are sums rather than averages, incomes could not simply be inflated by their ratios, as the population size changes over time. Rather, self-employment incomes for the  $i$ th year were multiplied by the following factor,

$$S_i = \{NA_i/NA_{85-86}\} / \{(SE \text{ total} - r.w.) / (SE \text{ total } 85-86)\}$$

where NA is the National Accounts measure, (SE total 85-86) is the total income from the relevant group of self-employed in the 1985-86 IDS, and (SE total - r.w.) is the total income of the self-employed in the re-weighted (but uninflated) data. Thus, for example, if the population of self-employed increases faster than the National Accounts aggregates, the  $S_i$  factor could be less than one.

### Asset Incomes

Income from interest, and income from dividends were inflated in the same way as income from self-employment using the National Accounts measures of 'other interest etc received' and 'dividends received'.

Income from rent was calculated from the private rental component of the CPI (with a 7.5% projection for 1989-90). Income from superannuation, annuities, employment termination, workers' and other compensation, maintenance/alimony, taxable capital gains, and from 'any regular source not elsewhere coded' were inflated by changes in the CPI.

### Basic Rates of Pensions and Benefits

With annual data, it is not possible to try to model changes in income tests. Rather, this model simply inflates components of pensions and benefits by changes in base rates. An algorithm is used to split pension/benefit payments into component parts, which were then adjusted by the indices in Table 4. The components separately identified were: base rate of pension (Veterans' Affairs are not distinguished); base rate of benefit - distinguished by age category, and sickness/UB-special beneficiaries; Mothers' Guardians' Allowance; Additional Pension for Children; Additional Benefit for Children; Rental Assistance; Other.

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## TAXES AND FAMILY TRANSFERS

Tax was calculated taking into account the taxable and non-taxable components of pensions, benefits and other income. Deductions from gross income were allocated according to taxation statistics on mean deductions by income category (in 1982-83) and a uniform 3 per cent deduction in 1989-90. Tax was calculated according to the standard rate scales in the two years (including the medicare levy in 1989-90), and family and pensioner/beneficiary rebates calculated. Other rebates were calculated on the basis of taxation statistics (1982-83) or as a uniform 0.4 per cent deduction in 1989-90.

### Family Allowances and FAS

The income test for family allowances and FAS was calculated on the basis of 90 per cent of the current year's taxable income. FIS take-up (only relevant during the last two months of 1982-83) was assumed to be 10 per cent. FAS take-up was assumed to be 58 per cent (in expenditure terms). This take-up rate was varied from 4 per cent for those with annual entitlements of less than \$500 to 75 per cent for those with entitlements of \$4,000 or more (6 categories were used). These proportions gave total expenditure estimates of \$621 million and 196,000 recipient families. This \$621 million is 11 per cent higher than the budget estimate of FAS expenditure, but this corresponds to our over-estimate of the number of children aged 0-14. We estimate 4.1 million children, compared to 3.7 million in **ABS Projections of the Populations of Australia, States and Territories, 1987 to 2031, Cat. No. 3222 (Series C)**. Hence average FAS payments per family should be approximately correct.<sup>26</sup>

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<sup>26</sup> Our estimate of total FA expenditure in 1989-90 is also greater than the budget estimate by a similar proportion (\$2.01 billion compared to a budget estimate of \$1.86 billion).



## APPENDIX B: METHODOLOGY FOR ASSESSING THE DISTRIBUTIONAL IMPACT OF HOUSING COST CHANGES

This Appendix describes two aspects of the modelling of housing costs; the calculation of mortgage repayments and the imputation of public housing tenure.

### MORTGAGE REPAYMENTS

This Section develops a model to describe the impact of changing house prices and interest rates on mortgage repayments on families of different types. The model assumes that all mortgages are of the standard annuity type (sometimes termed **credit foncier**) with current interest rates used to calculate the constant repayments required to repay both mortgage and principal by the end of the loan period.

#### The Model

The following notation is used to describe the mortgage of a particular income unit,

$t$	<i>current period</i>
$n$	<i>loan periods remaining</i>
$e$	<i>loan periods elapsed</i>
$H_t$	<i>index of house prices at time <math>t</math></i>
$A_s$	<i>initial value of mortgage ( = <math>\alpha H_s</math> )</i>
$A_t$	<i>amount outstanding at time <math>t</math></i>
$i_t$	<i>interest rate at time <math>t</math></i>
$r_t$	<i>repayment per period at time <math>t</math></i>

For such a loan, the current repayment (per period) is given by

$$r_t = A_t i_t / \{1 - (1+i_t)^{-n}\} \quad (\text{B.1})$$

It is assumed that repayments are adjusted in accordance with this equation whenever interest rates change. The current amount outstanding ( $A_t$ ) will depend upon the initial loan value as well as the rates of interest over the period ( $t-e$ ). This can be calculated by starting with the initial period,  $t-e$ , and noting that the outstanding balance at the end of the next period will be the sum of the balance of the first period, plus interest over that period, less repayments during that period. That is,

$$\begin{aligned}
A_{t-e+1} &= A_{t-e} + i_{t-e}A_{t-e} - i_{t-e}A_{t-e} / [1 - (1+i_{t-e})^{-(e+n)}] \\
&= A_{t-e} \{ 1 + i_{t-e} - i_{t-e} / [1 - (1+i_{t-e})^{-(e+n)}] \}
\end{aligned}
\tag{B.2}$$

This formula can then be applied repeatedly to calculate the current balance as a product of the initial loan balance,  $A_{t-e}$ , and a function of interest rates over the period  $(t-e, t)$  and the remaining period of the loan,  $n$ . This function is denoted as  $Y(t, e, n)$ . Hence,

$$A_t = A_{t-e} Y(t, e, n)$$

Inserting this into equation (1) gives the current repayments as,

$$r_t = A_{t-e} Y(t, e, n) X(i_t, n) \tag{B.3}$$

where

$$X(i_t, n) = i_t / [1 - (1+i_t)^{-n}]$$

$X(\cdot)$  thus represents the impact of current interest rates upon repayments, whilst  $Y(\cdot)$  represents the impact of past rates. Our objective here is to estimate the impact on repayments of changes in interest rates and house prices between some reference period  $t^*$  and a comparison period  $t$ . If we assume that the distribution of elapsed duration of loan,  $e$ , and the prospective duration of loan,  $n$ , is the same in both periods, and incorporate the assumption that house prices change in proportion to the house price index  $H_t$  we get,

$$r_t / r_{t^*} = H_{t-e} / H_{t^*-e} \cdot X(i_t, n) / X(i_{t^*}, n) \cdot Y(t, e, n) / Y(t^*, e, n) \tag{B.4}$$

where  $H_{t-e}$  and  $H_{t^*-e}$  are the house price index at time of purchase for the comparison and reference periods respectively and  $e$  and  $n$  are duration variables which vary across families. The first term in the above equation thus reflects the impact of relative house prices, the second term the impact of current relative interest rates on repayments, and the third term the impact of past interest rates. This fraction is then used to inflate the mortgage expenditures of households in different periods.

## Data

Estimation of the parameters of equation (B.4) for each income unit necessarily involves a number of assumptions, as much of the required data is unavailable from the 1985-86 IDS. This survey contains information on current mortgage repayments,  $r_{t^*}$ , current

amount owing on mortgage,  $A_{t^*}$ , as well as a range of other characteristics of the dwelling. Information on current or past interest rates, the elapsed or prospective duration of the mortgage, or the initial purchase price (or mortgage) of the dwelling are not directly available. The following sub-sections describe the methods used to impute these variables.

### Interest Rates

Interest rates enter equation (B.4) in two locations, in determining the current repayments for a given loan, and in influencing the current mortgage balance. Given that many loans will cover long periods, and that the years we are modelling are relatively close together, the former of these influences is likely to be the most important. Within the  $X(i_t, n)/X(i_{t^*}, n)$  term, the most important influence (assuming that  $n$  is on average large) is simply the ratio of the interest rates at times  $t$  and  $t^*$ . Hence, whilst variations of interest rates between mortgages means that precise modelling is impossible, as long as estimates can be made of relative rates in the two periods, the analysis should be approximately correct.

The reference interest rates used here are the interest rates for 'New housing loans to individuals for owner occupation (predominant rate)' published in the Reserve Bank of Australia's *Bulletin*.<sup>27</sup> Up until April 1986 loans for existing mortgages followed these rates for new loans. Since this date, however, there has been a divergence. Savings bank loans which approved before 3 April 1986 are subject to a 13.5 per cent maximum interest rate, whilst rates for new and non savings bank loans have generally been higher. However, the IDS contains no data on either the date of loan approval or the source of finance.

The interest rate status has thus been calculated using the imputed duration of occupancy variable described below, together with information on the rate of payment and amount outstanding on the loan. Assuming that the loan is of the standard reducing balance type, the ratio of the monthly repayment to the amount outstanding gives an upper bound for the monthly interest rate (as can be seen from equation (B.1)). Interestingly, 26.9 per cent of the sample in September-December 1986 had such upper bounds of 13.5 per cent (per annum) or less – indicating that their interest rate was either below 13.5 per cent, or their loan balance was not decreasing (possibly their repayments had not been increased

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27 For earlier periods where this index was not available, the average of the Reserve Bank indexes of 'minimum of predominant range' and 'maximum of predominant range' was used. Source, Reserve Bank *Bulletin*, various years, and dX Time Series Data.

to cover the interest rate rises up to 13.5%). These cases were assumed to be of protected savings bank status with 1986 interest rates of 95 per cent of this upper bound. A further 10.7 per cent of the sample had interest rate upper bounds of greater than 13.5 per cent but less than or equal to 15.5 per cent (the unregulated loan rate in Sept-Dec 1986). These cases were also assumed to be protected savings bank loans, but with 1986 interest rates of 13.5 per cent.

Of those loans with interest rate upper bounds greater than 15.5 per cent, 25 per cent (or 13.7% of the total) were randomly allocated savings bank status. This ensured that a total of 51.3 per cent of loans were assumed to have savings bank status.<sup>28</sup> Of the randomly allocated 13.7 per cent, 12.4 per cent (of all loans) were assumed on the basis of the imputed duration of occupancy variable (see below) to have purchased before April 1986 and hence have protected interest rates of 13.5 per cent. All other income units were assumed to have interest rates of 15.5 per cent in 1986.

Income units which were assumed to have interest rates of either 15.5 or 13.5 per cent in 1986 were assumed to have interest rates of 12.5 per cent in 1982-83. Other cases with 1986 interest rates below 13.5 per cent had interest rates set equal to 12.5/13.5 times their 1986 rates.

For 1989-90 interest rates it was necessary to take into account when the dwelling was purchased and the source of loan. The 48.7 per cent of cases with non-savings bank loans were assumed to have interest rates of 17 per cent. Savings bank loans with durations over 45 months (28.8% of all loans) were given the same interest rates as for 1986 ( $\leq 13.5\%$  p.a.). Other loans which were assumed not protected in 1986 (1.3%) were assigned 17 per cent interest rates, whilst those which were assumed protected in 1986, but not in 1989-90, were given interest rates of 17.0/13.5 times their 1986 interest rates. Hence, for 1989-90, 28.8 per cent of all purchasing income units were assumed to have long duration savings bank loans with interest rates of 13.5 per cent or less.

As noted above, the most important impact of interest rates for the model being described here is in the relative levels of interest rates in 1982-83 and 1989-90. Despite the complicated nature of the above adjustments, these relative rates have only two values, 1.08 ( $=13.5/12.5$ ) and 1.36 ( $=17/12.5$ ). Just under three in ten (28.8%) income units were assumed to have relative interest rates corresponding to the protected interest

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28 The 1988 Housing Survey publication **Housing Finance of Purchasers** indicates that in February-May 1988, 53 per cent of first mortgages were from savings banks, 19 per cent from building societies, 12 per cent from Government agencies and 15 per cent from other sources. The use of 51.3 rather than 53 per cent stems from the approximate nature of the random assignment used.

rate structure. Conversely, it is estimated that by 1989-90 seven in ten income units purchasing dwellings will be facing unprotected interest rates.

#### **Prospective Duration of Mortgage, n**

Given data of the current repayments, and amount owing on the mortgage, together with an estimate of the interest rate, equation (B.1) can be used to estimate the prospective duration of the mortgage. Rearranging that equation gives,

$$n = -\ln(1 - A_i i_t / r_t) / \ln(1 + i_t) \quad (\text{B.5})$$

The 1986 interest rate estimate described in the previous Section was used to calculate the prospective durations of loans in 1986. This parameter n was assumed unchanged for the comparison periods. The model therefore does not take into account any possible lengthening or shortening of loan periods with changes in interest rates or financial practices.

The 25th, 50th and 75th percentiles of estimated n were 7.5, 15.3 and 24 years respectively. As noted above, some 27 per cent of cases who had very low repayments relative to their loan amounts outstanding had interest rates arbitrarily assigned as 95 per cent of the ratio between repayments and amount outstanding. Substituting this ratio for  $i_t$  in the numerator of equation (5), and assuming an interest rate of around 12 per cent in the denominator, this implies that such cases would have durations of around 26 years assigned. This is probably an over-estimate of the loan duration (particularly if the real interest rate is very low). However this particular assumption is unlikely to make much difference to the repayment ratios as these cases were assumed to be of savings bank protected status – with only a small increase in interest rates over the period.

#### **Elapsed Duration of Mortgage, e**

This variable is required for three purposes. First, to estimate, the years over which to calculate  $Y(t, e, n)$ . Second, to define the year in which to derive the house price index (time of purchase and taking out of mortgage are assumed identical here). Third, to impute whether the loan (if assumed from a savings bank) was taken out before April 1986. For the purposes here it is desired that this variable be estimated in a way which reflects both the aggregate distribution of mortgage durations, and the distribution of this variable across different demographic groups.

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To do this the variable 'year of occupancy of dwelling' collected by the ABS in the 1981-82 Income and Housing Survey was used. It is assumed that this also reflects the year that the current mortgage was taken out (this assumption of course is not required for the estimation of the appropriate price house price index to use). To impute this variable onto the 1985-86 IDS, the relationship between year of occupancy and a set of demographic variables in the 1981-82 survey was estimated, and the estimated relationship used to predict years of occupancy in 1985-86. The OLS estimation was carried out for those income units purchasing their dwelling. The independent variables used were: age of income unit head minus 40, the square and cube of this variable, fractional rank<sup>29</sup> of gross income, and the square of this variable, fractional rank of mortgage repayments, the square and cube of this variable, fractional rank of local government rates paid, the square and cube of this variable and dwelling type (5 categories). Interactions between these variables were also tested. The overall  $R^2$  of the model was 0.59.

Inspection of the duration data in the 1981-82 survey indicated that the distribution of occupancy duration could be closely approximated by a single parameter negative exponential distribution. Since the overall distribution of occupancy duration is particularly important in the model used here, the predicted duration was monotonically transformed to have a negative exponential distribution by first converting each score to a fractional rank and then calculating duration (in months) as  $-75\log(1-U)$  where  $U$  is the fractional rank. (Cases with missing data on local government rates were assigned the mean duration value.) The parameter (75) was chosen to provide the same proportion of dwellings (45.5%) with occupancy of 45 months or less as indicated by the 1988 Housing Survey.<sup>30</sup> As indicated above, this is the key criteria for the determination of relative interest rates.

The distribution of duration thus estimated was assumed fixed for each of the comparison years. The model thus does not permit variations in the duration of home ownership arising, for example, from changing rates of home purchase.

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29 Fractional ranks were used in order to ensure the same distribution of predictor variables in both years.

30 Linear interpolation of the estimates in Table 14 of ABS 1988 Housing Survey, Housing Finance of Purchasers was used to get this estimate.

### House Prices

The limited data available in Australia on house price movements mean that data must be combined from a number of different sources. For the period from 1978-79 to 1988-89 house price data are the Real Estate Institute of Australia annual averages of median house prices for Sydney, Melbourne, Brisbane, Adelaide, Perth and Canberra (these data were also used for 1977-78 in Sydney and Canberra). It has been assumed that the price movements in these capital cities were reflected across their respective states or territory (the only geographical regions distinguished in the 1985-86 IDS are states). The Canberra price index was used for the ACT/Northern Territory combined, and the unweighted average was used for Tasmania.

The only data available for earlier years appear to be the BIS-Shrapnel (1986) series for the median prices of house and land in Sydney and Melbourne (available back to 1959-60). These series have been used for NSW and Victoria, and the average of these two series for the other states. For the small proportion of cases imputed to have purchased their dwelling in years prior to this, the overall CPI was used.

### RENTERS

For private renters, the private rental component of the consumer price index was used to inflate rents (a 7.5% increase between 1988-89 and 1989-90 was assumed). For public tenants, the ABS household survey data described in the text was used, with CPI adjustment of the Sept-Nov 1982 figure to correspond to the 1982-83 year, and corresponding adjustment of the Feb-May 1988 figure to 1989-90.

The main problem with this procedure is that private tenants and tenants of government housing authorities are not distinguished on the 1985-86 IDS unit record file (though the data was collected). In order to represent the uneven proportion of public housing tenants across family type and income groups we have carried out an imputation process to randomly allocate a proportion of renters to this category.

This process involved three steps. First a logistic regression model was estimated on the 1981-82 Income and Housing Survey unit record file (for which detailed nature of occupancy was available) in order to estimate the predicted probability of public tenancy as a function of a number of demographic variables. The population for this estimation was income units with positive rents, not living in mobile dwellings or dwelling/non-dwellings combined, and with income recorded. The independent variables used were, age of head (minus 40), the square of this variable, state (6 binary variables), single

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person income unit, sole-parent income unit, income quartile (4 binary variables), rent quartile (4 binary variables), in a high-rise flat in Victoria, in a low-rise flat in Queensland, and a variable indicating living in a terrace in South Australia.<sup>31</sup>

The second step was to then use this model to predict the probability of income units in the 1985-86 survey being housing authority tenants. This is given by

$$P(H)_i = 1 / (1 + \exp(-X_i'\beta)) \quad (B.6)$$

where  $P(H)_i$  is the expected probability that income unit  $i$  will be a housing authority tenant,  $X_i$  is the vector of independent characteristics described above (though calculated now from the 1985-86 data) and  $\beta$  is the vector of parameter estimates from the logistic regression. Finally, this probability was compared with a random number between 0 and 1 to ascribe a rental status to the income unit. To account for the rise in housing authority tenancy rates between 1981-82 and 1985-86, 0.015 was added to  $P(H)_i$  before making this comparison.<sup>32</sup> With this adjustment, the total number of housing authority tenants was within one per cent of the number estimated in ABS publications from the 1985-86 survey (Cat. No. 6523.0). Applying the imputation procedure back to the 1981-82 data, the tenancy status of 80 per cent of cases was correctly predicted. Within those 18 per cent of (unweighted) cases who were actually housing authority tenants, 48 per cent were correctly predicted as such. Whilst this may seem low, it is a significant improvement over the 18 per cent prediction success that would have been achieved via a simple random allocation process.

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31 Other variables included during preliminary testing but which were not significant included, age of head cubed, and a set of variables reflecting other state/dwelling type interactions. It should be noted that the inclusion of rent quartiles as a predictor variable in this model introduces a degree of circularity – as the object of the exercise is to ultimately predict rents. However few cases would be expected to move from one quartile to the other between 1981-82 and 1985-86 as a result of the application of differential price indices.

32 However in making estimates of the changes in housing costs between 1982-83 and 1989-90 the proportion of income units in public housing was assumed constant (to simplify calculations).



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