

## FERTILITY, POPULATION and ECONOMIC GROWTH

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### **Economic Growth**

It is a relatively simple exercise to decompose the growth of GDP into growth components as follows:

$$GDP = \frac{GDP}{Hours} \circ \frac{Hours}{Emp} \circ \frac{Emp}{LF} \circ \frac{LF}{Pop} \circ Pop$$

Where Hours = Total work hours;

Emp = Employed;

LF = Labour Force; and

Pop = Population 15+.

Or

$$\begin{aligned} \text{Growth in GDP} &= \text{Growth in Productivity} \\ &+ \text{Growth in Average Hours Worked} \\ &+ \text{Growth in Employment Rate} \\ &+ \text{Participation Rate Growth} \\ &+ \text{Growth in the Population.} \end{aligned}$$

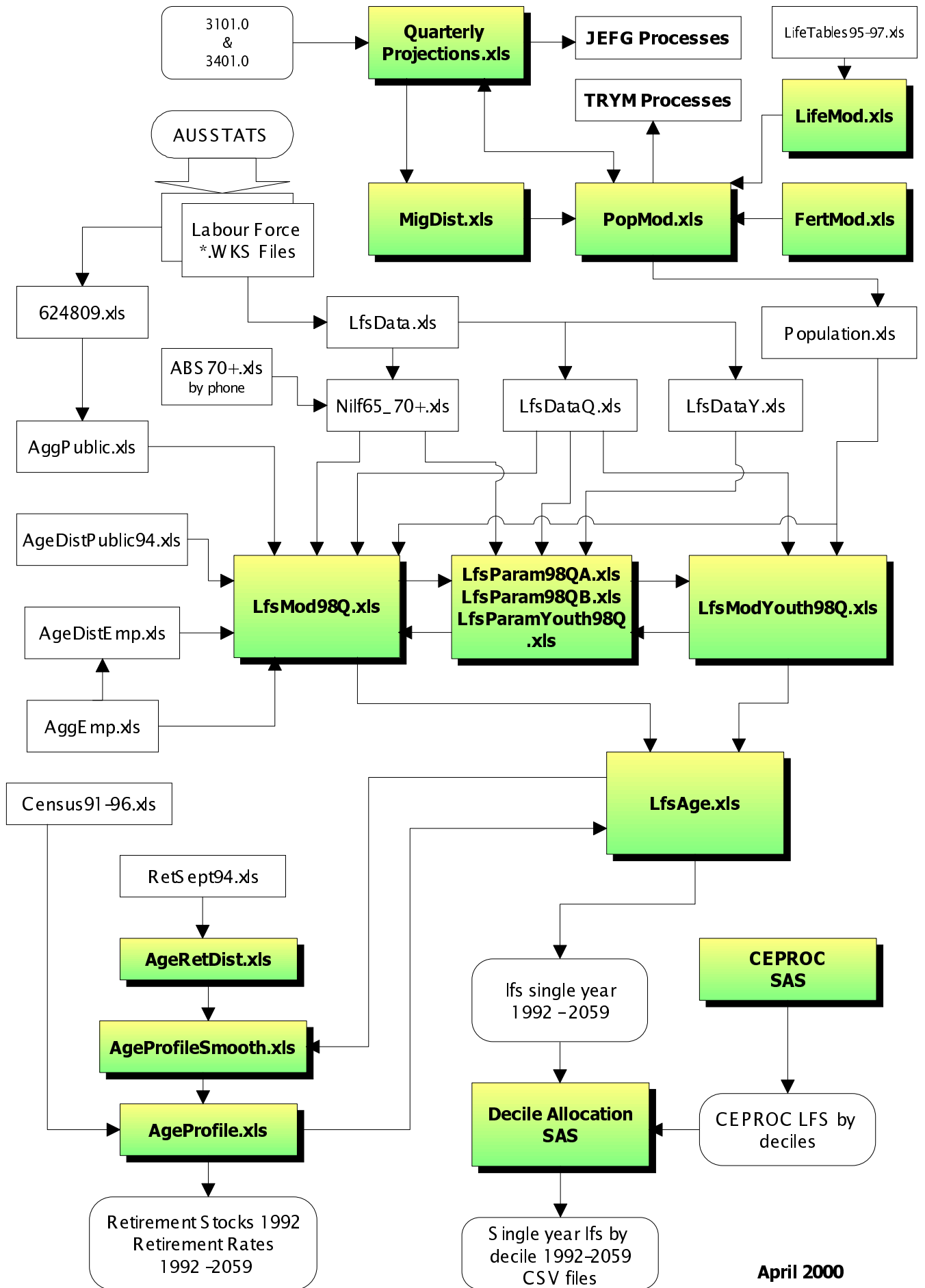
Except for growth in productivity, the RIM population and labour force projection framework (Chart 1) provides all the growth information required to estimate growth in GDP. The population module gives growth in the population. The LFS model gives participation rate growth and growth in employment rate. Growth in hours worked is driven by the compositional shift from full-time to part-time work and the change in average hours worked between males and females.

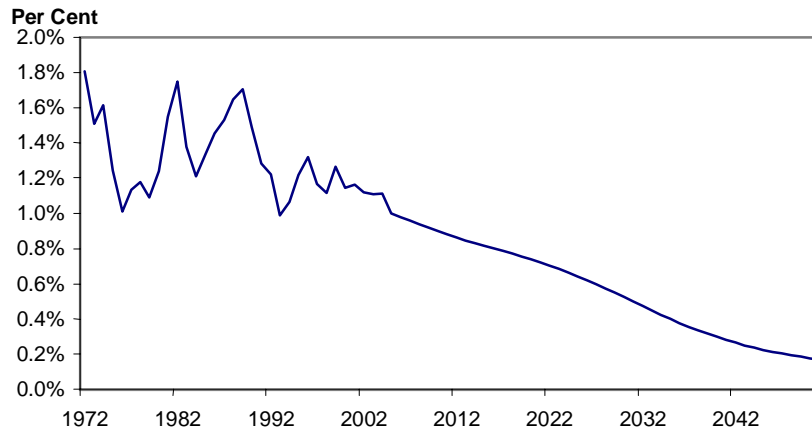
### **Population Projections**

Due to a rapid decline in birth rates along with the ageing of the “baby boom” cohort, Australia will experience a largely unavoidable ageing of the population over the next half century. It is unavoidable in the sense that almost all the ageing can be attributed to the fall in fertility.

Based on RIM's fertility projections and models of mortality and migration, RIM estimates the growth in population will fall from around 1.2 per cent in 1999 to less than 0.2 per cent per annum by 2051 (Chart 2).

Chart 1. RIM Demographic Modelling



**Chart 2. Historic and Projected Population Growth Rate - Australia**

### **Labour Force Behaviour**

Over the last decade there have been major changes in the working patterns for both males and females in Australia, including:

- a general decrease in the participation rate for men,
- a general increase in the participation rate for women,
- a general move from full-time to part-time employment,
- an increase in the age at which women have their first child,
- an increase in the number of women returning to the work force after child raising,
- longer periods spent in education by the young, and
- an increase in early retirement from career employment for both men and women.

Clearly these changes are not independent but reflect an underlying social trend for greater participation in the work force by women. These changes in working patterns are occurring in conjunction with increasing life expectancy, and as the baby boomers move through to retirement. In the next century males will spend an increasing proportion of their lives in retirement. Women, on the other hand, will spend more time in the work force as more re-enter the work force after child raising and stay in the work force longer, at least for the foreseeable future. These trends, which have been evident for a number of decades, have obscured the simultaneous increase in early retirement from career employment for both men and women.

Not with standing the obvious differences between male and female labour force attachment, a general proposition which underlies much of the analysis in this paper, is that the work/retirement behaviour of males and females is slowly converging.

## **Working Life**

Total participation rates in Australia have been rising over the last two decades. These movements come from increasing female participation being partially offset by falling male participation. These trends have their origins in a number of fundamental supply and demand factors occurring in our society<sup>1</sup>.

On the labour demand side there have been:

- attitudinal shifts by employers with regard to employing women,
- growth of industries which favour female employment, and
- increased use of part-time (and casual) employment (which fits the lifestyle requirements of many women).

On the supply side:

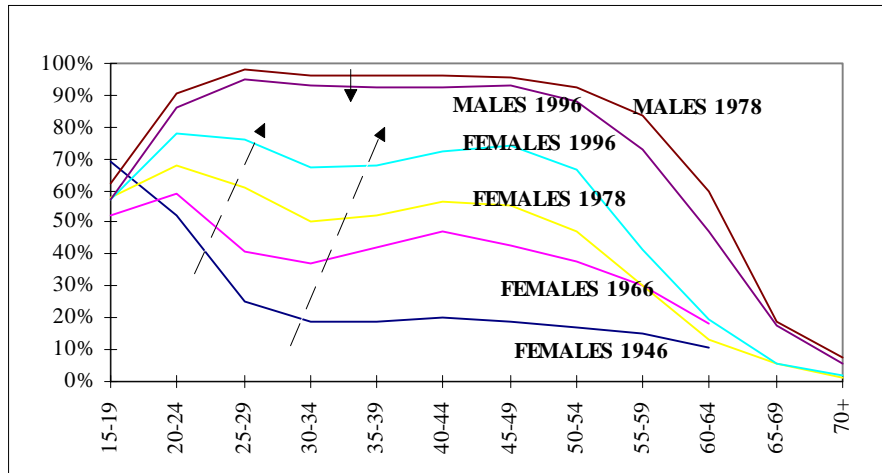
- the relative pay gap has narrowed between males and females,
- there is increased access to child care along with smaller families,
- delay in marriage,
- delay in child bearing,
- changes in marriage rates including increasing numbers of never married and divorced females, and
- an increase in the number of women not having children.

Social changes and economic circumstances have resulted in a greater acceptance of women in the work force. In part, these attitudinal shifts have been driven by the increased level of education of women which has made them more competitive in the labour market. All in all, these factors have significantly increased the benefits to women who enter the labour force which is directly reflected in their increased participation.

These factors appear to be producing a convergence of male and female labour market behaviour. In particular, unmarried women are behaving more and more like men and the behaviour of married women is converging, albeit more slowly, towards that of unmarried women.

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<sup>1</sup> For an excellent review of the demographic changes occurring in Australia see Christabel Young, *Balancing Families and Work: A demographic study of women's labour force participation*, DEET, Canberra, AGPS, 1990.

**Chart 3. Labour Force Participation by Age Group**

source: ABS 6203.0 and Young 1994

The convergence in labour force behaviour can be easily seen in Chart 3 which shows the age-specific participation rates of females over the last fifty years.<sup>2</sup> Over this period female labour force participation has been, and will continue to be, dominated by child bearing/raising responsibilities, which currently accounts for over fifty percent of the spells out of the work forces<sup>3</sup>. However, when one discounts for child bearing/raising, other labour force characteristics of women (particularly younger women) are looking more and more like those of their male counterparts<sup>4</sup>.

In summary, there appear to be four major mechanisms underlying the observed labour force participation patterns:

- gender shifting, with more female employment at the expense of male employment,
- growth in part time paid work, with the share of part-time and casual employment increasing,
- female re-entry, with more females re-entering the work force after child bearing/raising, and
- early retirement, where cohorts, which in the past would have retired at pension age, are now retiring earlier.

In general, each of these mechanisms exhibit slowly moving trends, which are expected to continue into the future, albeit necessarily at a slowing rate.

<sup>2</sup> Splitting this chart between married and unmarried women shows similar convergence.

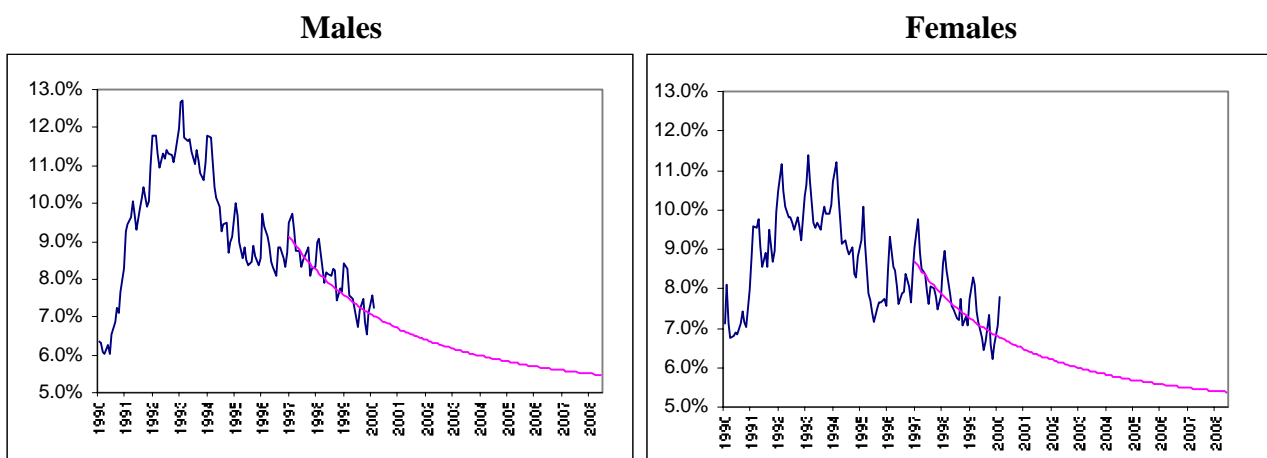
<sup>3</sup> Russell Rimmer and Sheila Rimmer, *More Brilliant Careers: The effect of career breaks on women's employment*, DEET, Canberra, AGPS, 1994.

## Labour Force Modelling

The labour force is projected in RIM with the Labour Force Status Model (LFSMOD) described in the Attachment.

Apart from estimated smooth time-varying parameter matrices, the LFSMODS model's only exogenous inputs are population projections from POPMOD, and a user supplied aggregate unemployment rate. Aggregate unemployment rate is projected, in this analysis, to asymptote to 5 per cent, for example, for both males and females, shown in Chart 4.

**Chart 4. Exogenous projections of aggregate unemployment rates**



The projection methodology relies on the assumption that there are stable underlying relationships which can be predicted as logistic or discrete cubic spline trends. As outlined in the technical details contained in the paper "Projecting the decline in fertility", the model projects the age profile of each relationship by age group<sup>5</sup>. In this case we use the Labour Force Survey published age groups, with the 65+ age group split into 65-69 and 70+. This split enables us to get a better handle on retirement and/or later life working. Chart 5 (over page) shows the projected participation rates for each age group for both males and females.

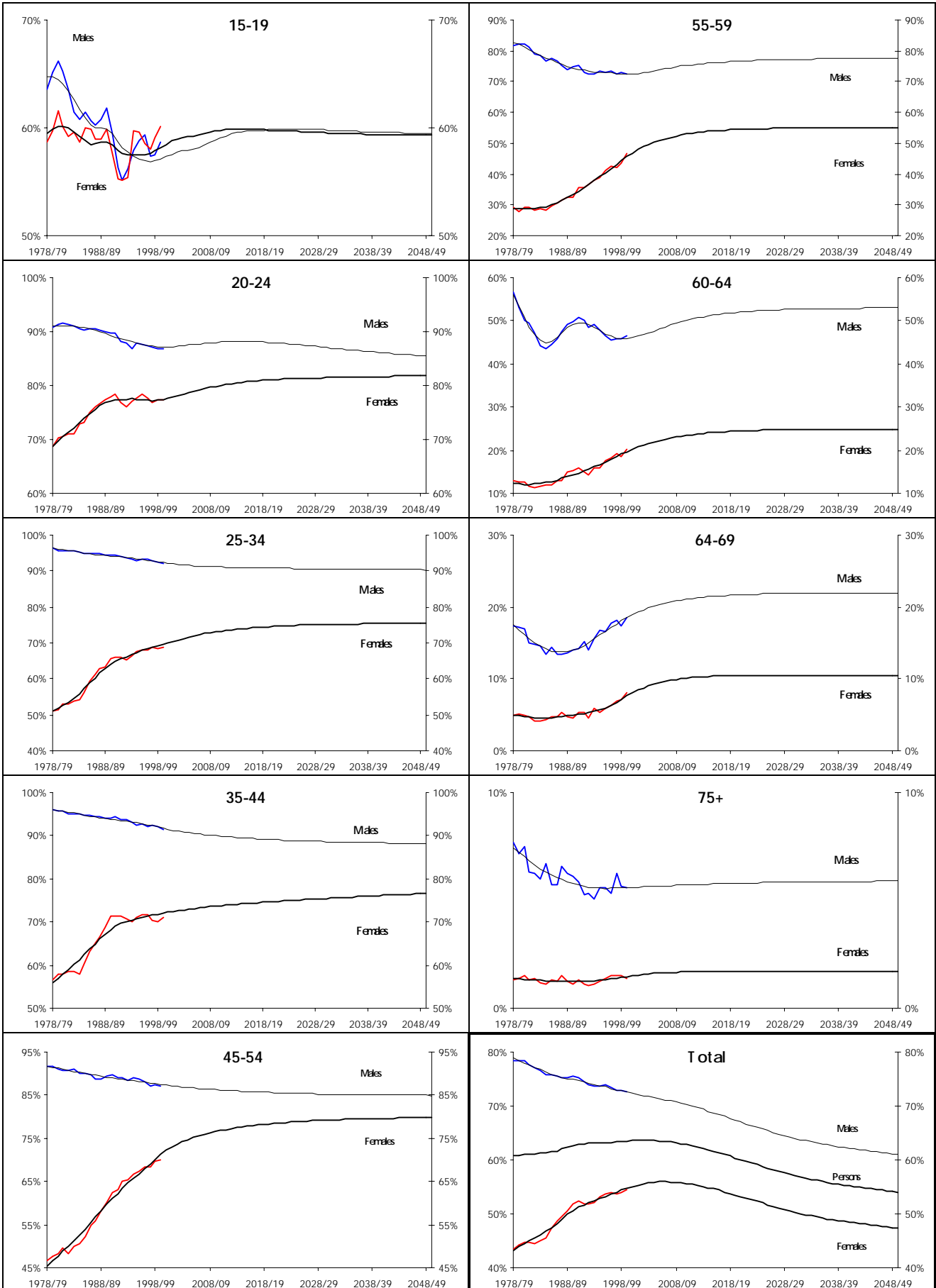
## Labour Force Participation

It could be argued that the labour force participation rates for females are already optimistic. Growth in participation rate for women of child bearing age has stalled over the last few years, yet our projections have continued growth into the projection period. Further, reversing all the falls in

<sup>4</sup> For example, analysis of labour force experience (ABS 6206.0.40.001) shows almost identical patterns between males and females for the number of employers/business and the number of spells of looking for work during the preceding year for persons in the labour force at some time during the preceding year.

<sup>5</sup> A youth model is also used to project single year of age labour force for males and females 15 to 24 years of age.

**Chart 5. Participation Rates - Total - Males and Females** Annual Smooth Projections



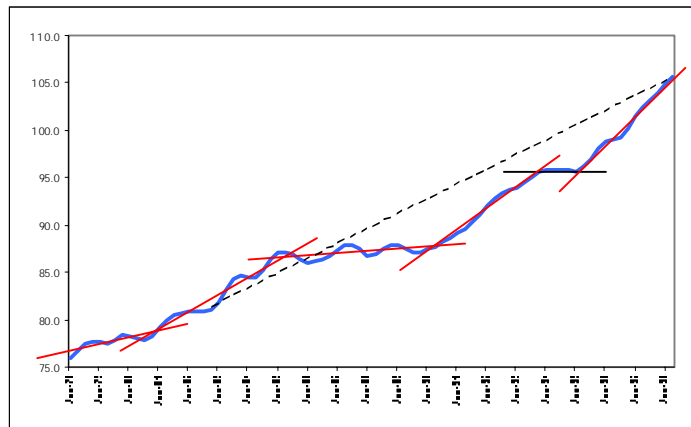
**RIM Projections August 2000**

male participation rates back to 1978 values still results in an aggregate participation with negative growth in 2059. Clearly to see any significant impact of aggregate participation rate on GDP growth will require a large change of work preferences of those 65 years and over.

### Productivity

Chart 6 shows productivity defined as trend GDP (chain volume measure) per hour worked from 1971 to 1998. Annual growth in this productivity measure from 1983 to 1998 was 1.6% (shown by the dotted line). This measure of productivity reflects the combined effect of labour, capital and other factors such as managerial efficiency and economies of scale<sup>6</sup>. In the exercise in this paper we make the assumption that the long-run productivity growth will be 1.75% per annum. This is above the long-run trend, but below the recent highs observed over the last year or so.

**Chart 6. Productivity Index – GDP to Hours worked**



Source ABS Cat No5206.0

### Pulling It All Together

If we use these population numbers, the labour force projections and the productivity assumption we can compare the growth in GDP over last 15 years with that which is expected to occur in the middle of the century.

**Table 1. GDP decomposition**

Growth Component	Annual Growth 1983 to 1998	Annual Growth 2044 to 2059
Population	1.7%	0.17%
Participation Rate	0.1%	-0.19%
Employment Rate	0.2%	0.0% (stable unemployment rate)
Average Hours	0.3%	-0.01%
Productivity	1.6%	1.75% (assumed constant)
GDP Growth	3.9%	1.72%

<sup>6</sup> Using a production function approach to separate the effects is an important research issue, but does not effect the growth story.



This analysis is important, not only because it provides GDP projections, but because it demonstrates that population growth has such a large effect on the outcome. Many government outlays, which are demographically sensitive, are basically projected as target population times expenditure per person. Clearly when presenting results as a proportion of GDP, population growth dynamics will appear in both the numerator and the denominator. Further, with a high labour productivity growth of 1.75%, the increasing income/wealth of the society will bring about, for example, high demand for high quality health services and also high costs as Health workers share in the prosperity. That is, projections of outlays and the GDP are NOT independent, so analysis which assumes they are is invalid.

As noted above, ageing of the population and the consequential decline in population growth is largely unavoidable. The reduced population growth component of some 1.4 percent points, means that there will be significant downward pressure on the long-run GDP growth unless there is compensation in other growth components. The question that must be asked is what is the upside risk to the GDP projections. That is, what is the likelihood of the projected downturn in labour force participation being reversed and/or productivity running well above historic trend.

### **Scope for Changes in Mature Age Labour Force Participation**

Today the working age population grows by 180,000 people a year. In the decade starting in just twenty years time the working age population will grow by 140,000 - not per year, but over the whole decade. In fact, the growth in the working age population is peaking right now, and even though the number of persons of working age will continue to rise, growth will start to fall as of next year.

Clearly, not only is the work force ageing, but the size of the work force as a proportion of the population is falling. Consequently, not only will the supply of mature age workers outstrip the supply of younger workers, but demand will outstrip supply.

It is important to consider the historic retirement behaviour when considering the possibility of changing labour force participation for persons over 45 years of age. For example:

- the 45-59 age group contains early retirees, both voluntary and involuntary;
- 60-64 year olds consists of a group who have reached what appears to be the socially accepted retirement age – to this group, the retirement age is currently well accepted as a social norm and it will take considerable effort and time to overcome the current model;

- those in the 65-69 year old group who are still working are those who have left full-time wage and salary employment and are either moving or have moved to part-time employment, or more likely, are self employed; and
- the 70 year and over group have little attachment to the labour force and most likely will not make a significant change to their labour force participation.

The significance of these groupings is not only linked to likely behaviour but arises from the relative size of these populations.

**Table 2. Projections of Proportions of Total Population:**

Age	1998	2021	2041
45-59	22.6%	23.9%	22.7%
60-64	5.0%	7.6%	7.0%
65-69	4.6%	6.7%	7.0%
70+	10.8%	15.2%	21.6%

As indicated in the table above, most of the population growth shows up in the 70 year and over group, which is the group least likely to contribute to increased participation in the labour force. However, there is also significant growth in the 60-69 age group. This provides a platform upon which to explore the potential for incentives for people to remain in the workforce beyond current trends in actual retirement age.

### **But will they want to work?**

There are a number of reasons why aged workers may not want to continue working:

- Wealth;
- Access to superannuation;
- Wage/leisure trade off;
- Retirement age inertia;
- Desire for a more flexible and accommodating working environment;
- Health; and
- Labour market disengagement.

Wealth is of particular interest in these long-run studies. Household wealth grows by about 11% per capita per annum. As discussed in the population paper, Australia will experience a declining

number of births resulting in smaller families. If we assume the bequest motive remains as strong as it is today, then individual bequests will be even larger. This will mean increasing individual wealth, which will place downside risk on people's labour force participation.

Further, there is the issue of overcoming the entrenched ageism observed in Australian organisations. A recent report based on a Drake Management Consulting survey noted:

“While we have long known that ageism is a problem in organisations, we were unaware of just how deep-rooted the problem is.”

“...the survey results come at a time when companies are beginning to recognise that knowledge and learning are crucial to their competitive success and instead of retaining our mature workers - our powerhouses of knowledge - we're relegating them to the scrap heap.”

### **Ageing and Productivity**

There is a widely held view that during the working life of an individual productivity peaks around mid life and then declines as one ages. Actual estimates of the age-productivity relationship are difficult and at best only show a weak relationship. There is a question of whether work performance (or potential work performance) does diminish as one approaches retirement age or whether the relationship simply reflects institutional age discrimination<sup>7</sup>. Answers to this question would give some insight into how increased labour demand flowing from ageing might influence the productivity growth path.

If productivity does decline with age, then with an ageing population, average aggregate productivity would fall exacerbating the pressure on economic growth.

It is exceedingly difficult to directly measure age-specific productivity. An alternate approach is to use age-earning profiles as a proxy for the age-productivity profiles on the assumption that labour earns its marginal product. However, it is also difficult to assess whether workers are receiving their marginal product or if older workers are receiving wages above their marginal product (Jackson 1998 p101).

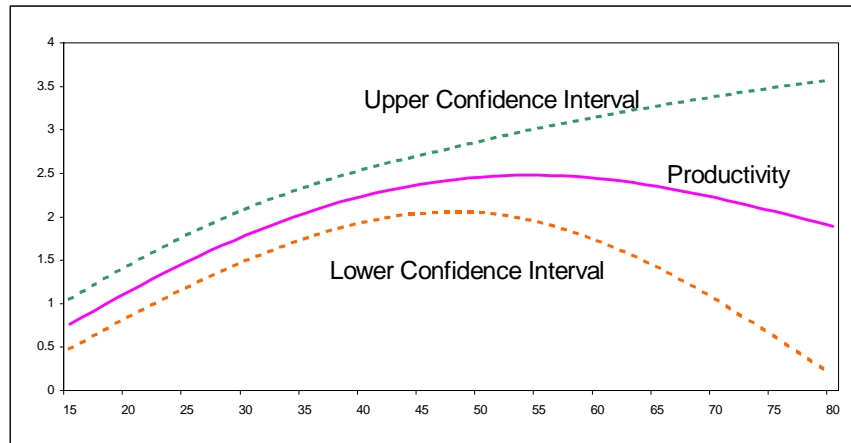
Sarel (1996), estimates an explicit age-productivity profile from a macroeconomic cross-country growth model using data on population structure and growth rates of income per person (Chart 7).

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<sup>7</sup> See Jackson (1998) chapter 5, Disney (1996) chapter 6 and Johnson and Zimmermann (1993) chapter 1.

This compelling result, however, rests on a number of restrictive assumptions and in particular on the use of income as a proxy for productivity. The latter needs careful consideration.

**Chart 7. Productivity by Age**



RIM analysis suggests that much of the downturn in the income profile comes from selection bias, in that the profile represents the average income of those left in employment. If, for example, wealthy individuals have a higher propensity to retire early then the earnings age profile will necessarily fall as the wealthy leave the workforce. In this case, using the average earnings age profile as a proxy for productivity is highly suspect.

### Conclusion

This paper demonstrates that the decline in fertility and the consequential ageing of the population and decline in population growth rates has a large effect on the growth in GDP. The paper also notes that pure compositional effects will produce a decline in the total participation rate, further reducing GDP growth. This raises many important questions. For example, what will happen to asset prices as the population ages and GDP growth falls? It is left to another paper to address the economic ramifications of these events. Note however that these events are occurring around the world as most developed countries face falling fertility and ageing populations. Gaining an understanding of the international effects of the decline in fertility and the consequential economic interactions will require a considerable research effort.

### **The Labour Force Modelling Approach**

The labour force modelling process is shown in Chart A1. This is a long-run annual model of the Australian labour force designed to capture structural (trend) behaviour at fine detail. The model projects persons by labour force status, age, gender and income decile. (Marital status projections are used in STINMOD-OUTYEARS.) Labour force status is split by employed/unemployed, full-time/part-time, public/private, wage and salary earners/employers/self employed. Persons not in the labour force are split by retired/never in labour force/permanently disabled/temporarily not in the labour force.

The approach can be characterised as disaggregated top down. It is disaggregated in the sense that each age group is modelled separately, such that the projected age profiles are smooth and plausible. It is top down in that it starts from projections of the population split by sex (and marriage if required), and decomposes the population generated by the population framework into its various labour force status components.

There is no short-run behavioural response in LFSMOD; the model simply runs off the observed underlying long-run movements of key, and hopefully stable, parameters, which are estimated as non-linear trends with consistent asymptotic values.

Chart A1.

**Labour Force Status Model - LFSMOD**

