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AUSTRALIAN LABOUR FORCE PROJECTIONS 1995 to 2011

Methodology and Preliminary Analysis

Steven Kennedy

Peter Rossiter

September 1994

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INQUIRIES

- *For further information about the contents of this Working Paper, please contact the author(s):*

Steven Kennedy - Canberra (06) 252 6617 (*telephone*) or (06) 253 1093 (*facsimile*).

Peter Rossiter - Canberra (06) 252 6024 (*telephone*) or (06) 253 1093 (*facsimile*)

- *For information on the Working Papers in Econometrics and Applied Statistics, please contact the Managing Editor, Steven Kennedy, on Canberra (06) 252 6617 (*telephone*) or (06) 253 1093 (*facsimile*), or write c/- Econometric Analysis (W42b), Australian Bureau of Statistics, P.O. Box 10, Belconnen, A.C.T. 2616, Australia.*

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Abstract

The ABS first published labour force projections in 1991. A new set of labour force projections was published in July 1994 in Labour Force Projections, Australia: 1995 to 2011 (ABS Catalogue No. 6260.0). The first step in producing the new set of labour force projections was to project participation rates to the year 2011. The ABS has modified its existing time-trend techniques for projecting participation rates by incorporating techniques that allow the data to play a greater role in determining the projection path. The projected participation rates have been combined with population projections to construct estimates of the labour force for sixteen age-by-sex groups. This paper details the assumptions and methodology used to construct the latest set of labour force projections. It also highlights interesting features of the projections which suggest how the composition of the labour force may change over time. Some of these features include a continuing decline in male participation, the ageing of the labour force, and changes to the life cycle profile of female labour force participation.

1. Introduction

Labour force projections such as those recently published in *Labour Force Projections, Australia: 1995 to 2011* (ABS Catalogue No. 6260.0) can be used in a variety of settings, including micro- and macro-economic modelling, policy forums, marketing strategies and government and business planning processes. This working paper examines the latest projections prepared by the Australian Bureau of Statistics.

The paper is divided into six sections. Section 2 reviews the involvement of the ABS and other national statistical agencies in producing labour force projections. This section also provides details of the data sources available for the ABS labour force projections.

The labour force projections are derived by combining independent projections of population and labour force participation rates. Section 3, which expands upon the methodological appendix of *Labour Force Projections, Australia: 1995 to 2011*, focuses upon the projection of labour force participation rates. The participation rate projection methodology is discussed in depth, and a detailed analysis of the implications for all age-by-sex groups is presented. No comparable examination of the population projections is presented here. The population projection methodology is discussed in *Projections of the Populations of Australia, States and Territories: 1993 to 2041* (ABS Catalogue No. 3222.0).

Section 4 presents and analyses the resulting labour force projections. Particular attention is given to identifying compositional changes in the labour force over time, and attributing these changes to the underlying population and participation rate changes.

The paper concludes with suggestions for further research into the labour force projections. The paper also contains two appendices: the first discusses possibilities for modelling participation rates within a time-trend framework; and the second presents a comparison of the ABS labour force projections published in 1991 and 1994.

2. Background

2.1 Previous ABS Labour Force Projections

The ABS first published labour force projections in 1991, in *Labour Force Projections, Australia: 1992 to 2005* (ABS Catalogue No. 6260.0). The methodology developed for the 1991 projections relied almost exclusively upon simple time-trend regression techniques to project participation rates to the year 2005. The projected participation rates were then combined with the demographic projections published in *Projections of the Populations of Australia, States and Territories* to construct estimates of the labour force for sixteen age-by-sex groups.

A similar approach has been adopted for the latest labour force projections, which extend to the year 2011. While the precise techniques have been modified, the time-trend regression methodology is still the preferred approach.

The 1991 publication of *Labour Force Projections, Australia: 1992 to 2005* contains a discussion of the development of labour force projections at the ABS. It explores issues surrounding the use of econometric modelling versus univariate time series techniques to project participation rates. The discussion at that time concluded that univariate time series techniques represented the most appropriate approach for the ABS.

The key arguments supporting this conclusion included the cost effectiveness of the univariate techniques and the failure of econometric models to produce significantly superior results.¹ These arguments have been accepted for the current projections, as no contrary evidence has come to our attention.²

The modifications employed in the construction of the latest participation rate projections reflect a decision to allow the data to play a greater role in determining projection paths. Previously the participation rate in 2005 was pre-determined (largely on the basis of international comparisons) for several age-groups. For the latest projections, an attempt has been made - while still constraining the projections to fall within a plausible range - to allow the data to determine the end-points and curvature of the projections. Nevertheless, it is important to recognise that these projections still represent only one of many possible scenarios.

¹ This does not mean the ABS ignores the benefits that can arise from attempts to model participation behaviour when projecting rates. This is illustrated in our attempt to explain short run movements in female rates (see Appendix 1).

² These arguments are supported in a paper by Dunlop *et al* (1982) and from an examination of studies by the United States Bureau of Labour Statistics, the New Zealand Department of Statistics and the Department of Employment in the United Kingdom.

2.2 International Labour Force Projections

Time-trend techniques are used by many statistical agencies to project participation rates. Reasons often cited for choosing these techniques are the expense involved in modelling participation behaviour, the difficulties in projecting independent variables when using behavioural models, and the stability of participation rates over time. Only two countries are known to be using behavioural models to project labour force participation rates, namely Finland and the United Kingdom. Despite the popularity of time-trend analyses, there are many problems associated with using these techniques to project participation rates. For example, when a significant change in behaviour occurs - that is, when a trend-break is observed - it is difficult to have confidence in the projections.

In conjunction with time-trend techniques, many statistical agencies also make use of what could be defined broadly as *tapering mechanisms*. Tapering mechanisms are used to slow the projected rate of change in order to constrain it from rising above or falling below given boundaries. The most common way of constraining and tapering participation rate projections is to transform the participation rate before estimating trends. This approach is used by statistical agencies in the USA and UK when projecting participation rates.

The United States Bureau of Labour Statistics (BLS, Department of Labour) outlined its method for projecting participation rates in a recent edition of the *BLS Handbook of Methods* (September 1992). The BLS calculates linear trends on transformed participation rate data, where the transformation takes the form:

$$\exp \left(\frac{p - A}{B - p} \right)$$

where p is the participation rate, and
 A, B are selected constants.

This transformation means that, when the projected logits are transformed back, they will not exceed B or fall below A (BLS Handbook of Methods, p.131). Normally A is set to 0 and B to 1. However, in the case of a strongly increasing trend in female participation, B may be set equal to the male participation rate, thus constraining the projected female rate from exceeding the male rate.

UK labour force projections, published in the *Employment Gazette* by the UK Department of Employment (April 1993), are based on a methodology similar to that used by the BLS. However, unlike the BLS, the British incorporate additional explanatory variables (apart from time trends) to estimate trends and projections. For example, when projecting male participation rates they use the level of unemployment as an additional explanatory variable. For some female age-groups, they use the number of children aged 0 to 4 and 5 to 9 years as explanatory variables. The British also make use of non-linear time trends and dummy variables in their regressions. Regressions (similar to those used by the BLS) are conducted on transformed participation rates where the dependent variable in this case is

$$\log \left(\frac{p}{1 - p} \right)$$

where p is the participation rate.

Participation rate projections using this transformation are thus constrained to lie between 0 and 1.

The ABS technique for constraining and tapering participation rate projections is not based upon transformations of the participation rate variable, though this technique was considered. It is unique in that it does not require the choice of constraining values. The ABS technique is presented in Section 3.1.

2.3 Data Sources

2.3.1 Participation Rates

Monthly participation rates, for sixteen age-by-sex groups, for the period from 1978 to 1993 were selected for analysis. Despite the existence of equivalent quarterly time series dating back to the mid-1960s, the monthly data were considered more suitable for two reasons.

- (a) The longer term institutional developments which have significantly influenced the growth in female participation rates did not emerge until the late 1970s. The earlier data may therefore contain little information relevant to the task of producing projections.
- (b) The data contained in the quarterly time series are not average rates calculated for the quarter, but rather the monthly rates pertaining to the mid-months of the quarters (February, May, August and November). Participation rates display strong seasonality, and consequently different choices of the representative month for the quarter (first month/mid-month/final month) can result in significantly different levels of the derived time series. This is not satisfactory for the purposes of the required analysis.

In this analysis, because of the strong seasonality present in the data (especially for the younger age-groups), seasonally adjusted participation rates were chosen rather than original (unadjusted) estimates. In general, the ABS encourages users to concentrate on the smoothed seasonally adjusted (trend) estimates when interpreting data. Despite the presence of a significant irregular component in some (especially older) age-groups, it was decided not to use smoothed seasonally adjusted estimates in the analysis. This decision was taken primarily because of

- (a) concern about the interaction between the smoothing methodology and the regression techniques proposed for forming the projections - in particular about the implications for standard errors on the parameter estimates; and
- (b) uncertainty about the impact of the asymmetric filters used to determine the curvature of the data in the most recent periods.

2.3.2 Population Projections

A critical examination of labour force projections should recognise the assumptions underlying both the population projections and the participation rate projections. Some features of the population projections which are important for labour force projections are discussed below. For a full discussion of the population projections please refer to *Projections of the Populations of Australia, States and Territories 1993 to 2041* (ABS Catalogue No. 3222.0).

A notable change to the population projections since the release of the previous labour force projections concerns the interpretation of the Series A and Series D projections. In 1991, Series A assumed a continuation of the existing high levels of overseas migration with Series D presenting an alternative low migration scenario. However in the 1994 projections, Series A reflects a continuation of the present low levels of net overseas migration being experienced, with Series D presenting an alternative based on higher levels of overseas migration.

The differences between Series A and D arise from different assumptions about future net immigration. The discussion of labour force projections in this paper is based primarily on the application of participation rate projections to Series A.³ The differences between Series D and Series A labour force projections are of most interest when comparing the *level* of projections. However, there is little difference between the two sets of projections when considering the *composition* of the future labour force.

³All discussion in this article refers to labour force projections based on Series A, unless otherwise indicated.

3. Participation Rate Projections

3.1 The Methodology

Three basic methods were used to project participation rates for the various age-groups:

- (i) *Constant rates*: assuming that the participation rate will remain at a constant level for future periods;
- (ii) *Linear trends*: fitting a linear trend to the participation rates, using the ordinary least squares (OLS) regression technique, and then extrapolating the estimated linear trend; and
- (iii) *Logistic trends*: fitting a logistic trend to the participation rates using a non-linear least squares methodology, and then extrapolating the fitted trend. (In some instances male and female rates for the same age-group have been modelled simultaneously, applying a restriction which forces the two trends to converge to a common rate.)

3.1.1 Constant Rates

Assuming a constant rate in future periods is the simplest technique for extrapolating participation rates. The constant rate is set to the average participation rate calculated over the most recent time period - usually the last five to ten years. This technique is most suitable for either very stable participation rates, or for cases where the data are highly irregular and no sensible trend can be detected.

3.1.2 Linear Trends

Linear trend extrapolation involves fitting the regression equation

$$p_t = a + b.t + e_t$$

where

- t is a linear time trend;
- p_t is the participation rate in time period t ;
- e_t is the residual in time period t ; and
- a, b are the parameters to be estimated;

by Ordinary Least Squares (OLS) methods.

The estimated parameters from this regression are then used to extrapolate into the future. Linear trends are commonly used to extrapolate participation rates which are well behaved and only gradually declining or increasing over time. Clearly, linear trends cannot be extrapolated indefinitely, since participation rates are bounded above and below by 100% and 0%, respectively. It is important, therefore, that the participation rates at the end of the forecast period be plausible.

3.1.3 Logistic Trends

Logistic trend extrapolation involves fitting the regression equation

$$p_t = 1 / (k + a.b^t) + e_t$$

where

- t is a linear time trend;
- p_t is the participation rate in time period t;
- e_t is the residual in time period t; and
- a, b, k are the parameters to be estimated;

by Non-Linear Least Squares (NLLS) methods.

It can be seen from the equation that, provided $b < 1$,

$$p_t \rightarrow 1/k \text{ as } t \rightarrow \infty.$$

That is, the logistic trend converges asymptotically to the value $1/k$. The logistic regression may be fitted to either increasing or decreasing data, and is particularly suitable for data which

- (i) display indications of tapering growth rates; and/or
- (ii) are constrained to lie within a specified range of values (for example, 0 to 1).

It may also happen that theoretical or empirical results suggest that the extrapolated trends should tend towards pre-determined maximum or minimum rates. In this instance, the appropriate value of k may be inserted in the equation, and there is then no need to estimate that parameter.

As foreshadowed above, the NLLS estimation technique may be adapted to allow simultaneous estimation of male and female participation rates within the same age-group. If the two logistic trends are constrained to have a common value of k, then it can be seen that the extrapolated trends will converge to the same rate. This approach is useful in cases where, in the absence of this constraint, the projected male and female participation rates would cross over and diverge within the time horizon of the projections.

The NLLS estimation technique can also be applied to other aspects of the data. For example, when projecting the 15-19 age-group, it was decided that the male linear trend was inappropriate. To overcome this, a logistic regression was used to project the ratio of the male and female participation rates. This projected trend was then multiplied by the projected female participation rate (linear) to produce the projected male rates. Specifically, NLLS estimation was used to fit the equation:

$$r_t = 1 / (1 + a.b^t) + e_t$$

where

- t is a linear time trend;
- r_t is the ratio of the male and female participation rates in time period t;
- e_t is the residual in time period t; and
- a, b are the parameters to be estimated;

thus constraining the ratio from falling below unity. The fitted values of the ratio were then multiplied by the female participation rate trend to produce a male trend projection that tapers over time to equal the female trend.

For the 1991 projections, several female age-groups were modelled by an interpolation technique which linked the end-point of the actual data with a participation rate of 85 per cent at the projected

time horizon. By contrast, the logistic trend approach allows the data to play a greater role in determining the threshold participation rates and the pace of convergence to these rates.

Logistic Transformations and Trends

An alternative way of constraining projections to fall within reasonable limits is to transform the dependent variable. This technique was considered as an alternative to the NLLS logistic technique, but ultimately rejected.

Regressing the transformed data on a constant and a linear time trend by OLS yields a non-linear projection which is constrained from exceeding any chosen limiting value. The form of the logistic transformation is

$$q_t = \log \frac{p_t}{(B - p_t)}$$

where

- q_t is the transformed dependent variable;
- p_t is the participation rate in time period t ;
- B is the chosen constraint.

Once this transformation is made, the regression equation takes the form

$$q_t = a + b.t + e_t$$

where

- t is a linear time trend; and
- a, b are the parameters to be estimated.

The regression is fitted using OLS, and the projected dependent variable is converted back to a participation rate by

$$p_t = \frac{B \cdot \exp(\hat{q}_t)}{1 + \exp(\hat{q}_t)}$$

For the purposes of confirmation and comparison, the logistic transformation was applied to four female participation rate projections and compared with the output of the NLLS method. In all four cases, the chosen constraint, B , was set equal to the end point of the male linear trend projections. If the female extrapolations had exceeded 85 per cent, a further judgement as to constraining projections might have been made. However, this was not the case in any of the four groups. The 85 per cent limit (adopted in the 1991 rate projections) is designed to reflect overseas trends - in particular the Scandinavian, USA and UK experience.

The NLLS logistic regression technique was preferred to the OLS logistic transformation approach for the following reasons.

- The logistic transformation technique, like the technique employed in 1991, requires the choice of an end point constraint. The NLLS logistic technique does not require such a choice, thus allowing the data to play a greater role in determining the projection path.
- The NLLS logistic technique maintains the assumption that female rates never consistently exceed male rates beyond the projection time frame.
- The NLLS logistic technique forces adjustment to a common limiting value upon *both* males and females. The logistic transformation OLS technique results in only the female projection being adjusted.

3.2 Assessment of the Projections

3.2.1 Assessment Framework

For each age-group, the appropriate participation rate projection was determined in the following way:

- OLS regression techniques were used to fit a linear time trend to the data. If the extrapolated linear trend was found to be inappropriate - because of unusual cross-sectional features of the data, significant divergence from international experience or because it conflicted with generally-accepted prior expectations - an alternative trend was derived. A logistic time trend or some variation of the logistic regression technique was fitted to the data, assuming the statistical fit was satisfactory. Otherwise, future rates were assumed to be constant..

Examples of the generally-accepted prior expectations include:

- (i) that female participation rates should not exceed male participation rates within any given age-group; and
- (ii) that differences between consecutive age-groups should be within reasonable limits, and should be explicable.
- Statistical criteria were also used in the evaluation process - in particular, measures of the goodness of fit of the respective trend estimates. Where the data indicated a period of significant stabilisation or an abrupt change of trend behaviour within the estimation period, attempts were also made to modify the trend estimates and resulting projections accordingly.
- International comparisons (most commonly with the United States and the United Kingdom) were also employed to assess the final set of projections. While keeping in mind the difficulties of comparing projections pertaining to different labour markets with different institutional features, these comparisons lent consistent corroboration to the projected changes in the composition of the Australian labour market.
- The implied life-cycle profiles of labour force participation were a useful assessment tool - giving an effective means of checking that the differences between consecutive age-groups projections were within reasonable bounds. Life-cycle profiles were used to assess the full implications of the projections upon average life-time labour force participation.

Limitations of the Methodology

There are clearly many limitations to the methodology at present employed to project participation rates. For this reason it is important to repeat the warning sounded in the 1991 publication of labour force projections - *there is no rigorous and coherent theoretical background* to the methodology chosen. Also, *projections of trend only provide a scenario which may be realised if the necessarily arbitrary assumptions about participation rates eventuate.*

Economic theory and widely-accepted expectations of future movements in the Australian labour market have been considered in the evaluation of these projections. Supplementary modelling exercises were also conducted. For example, a second explanatory variable (deviations from the average unemployment rate) was introduced to explain short run movements in female participation rates (see Appendix 1). These exercises were conducted not as an alternative to the chosen methodology but as a part of the process of confirming the trend lines produced by the time-trend regression methods. Ultimately, however, it was the historical data which had the greatest say in these projections.

3.2.2 Analysis by Age-group

As stated above, assessment of the participation rates for each age-group began with an examination of the fitted linear trends. Comparisons were then made with the corresponding age-group for the opposite sex, and with the contiguous age-groups for the same sex. Alternative formulations for the trend projections were then considered as required. Table 1 provides a summary of projection techniques employed for each age-group.

Table 1: Age-group Participation Rate Projection Techniques

Age	Males	Females
15-19	Logistic (Ratio), Linear	Linear
20-24	Logistic (Simultaneous)	Logistic (Simultaneous)
25-34	Logistic (Simultaneous)	Logistic (Simultaneous)
35-44	Logistic (Simultaneous)	Logistic (Simultaneous)
45-54	Logistic (Simultaneous)	Logistic (Simultaneous)
55-59	Logistic	Linear
60-64	Constant	Linear
65-99	Constant	Constant

Following is an exposition of the analysis for each age-group.

15-19 Age-group

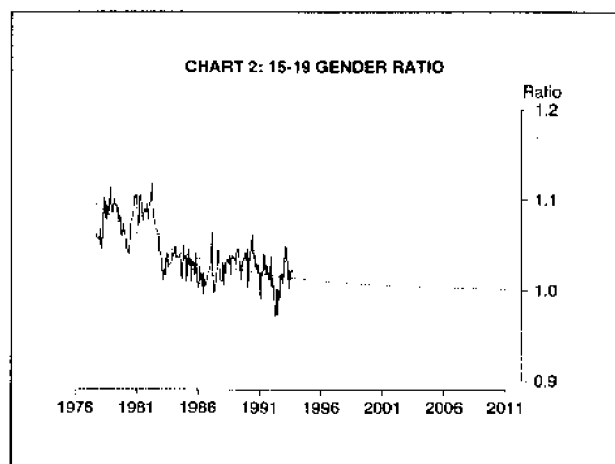
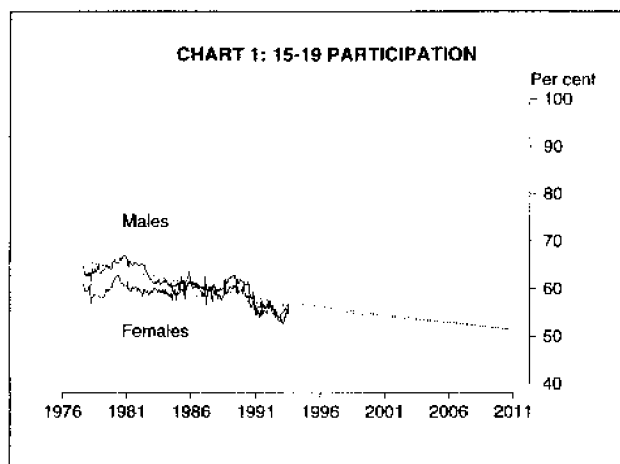
The linear trend results for this age-group showed male participation rates to be declining faster than the corresponding female rates. Although the male rates have been higher throughout the historical period, male and female rates have been very close in recent times. The results suggest, therefore, that the male participation rate will shortly fall below the female rate, and that the difference will continue to grow until the projection horizon. This appears improbable.

A likely cause of the difference between the estimated linear trend projections for males and females is an unusual feature of the male data. Over the last 15 years, the male participation rate has been declining from an unusually high point which occurred in the late 1970s. If we were to shorten the data and eliminate this period (or alternatively use the longer quarterly series) the linear trend would not exhibit the same behaviour.⁴ This example clearly illustrates the arbitrary nature of trend analysis which pervades all of the participation rate projections.

This phenomenon of the linear male trend falling below the female trend was also observed when constructing the 1991 projections. At that time, a decision was made to adjust the male participation rate trend projection. The average ratio of the male participation rate to the female participation rate, calculated between August 1986 and August 1990, was multiplied by the projected female participation rates to give an alternative male participation rate trend. Reproducing this approach on the current data would cause the ratio to stabilise at about 1.03.

For the current projections, an alternative method of stabilising the projected ratio was employed. Non-linear least squares estimation was used to fit a logistic regression (see Section 3.1.3) to the ratio, constraining it from falling below unity (see Chart 2). The fitted values of the ratio were then multiplied by the female participation rate trend to produce a male trend projection that tapers over time to equal the female trend (see Chart 1).

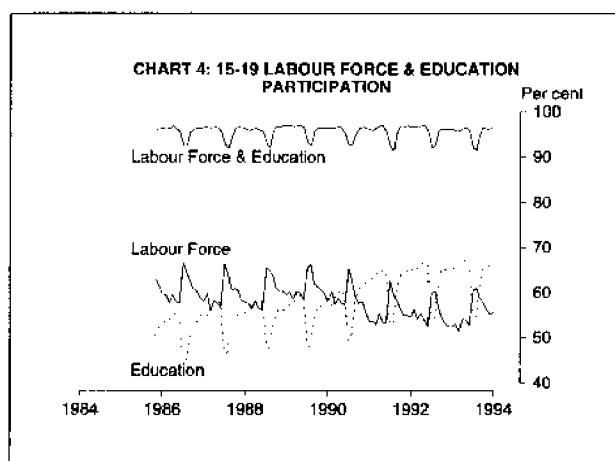
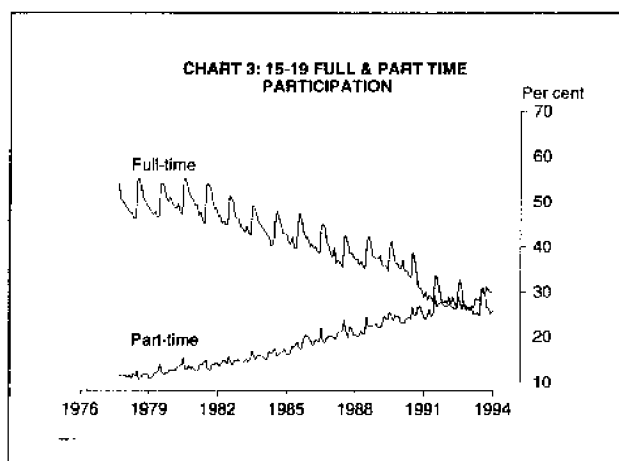
⁴ See Anderson and Ross (1987), p 15.

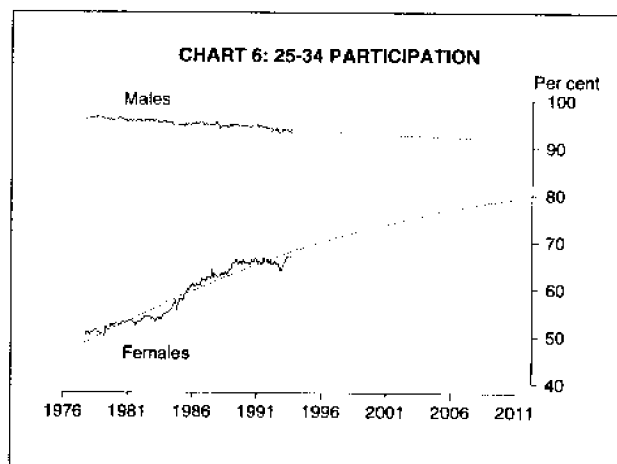
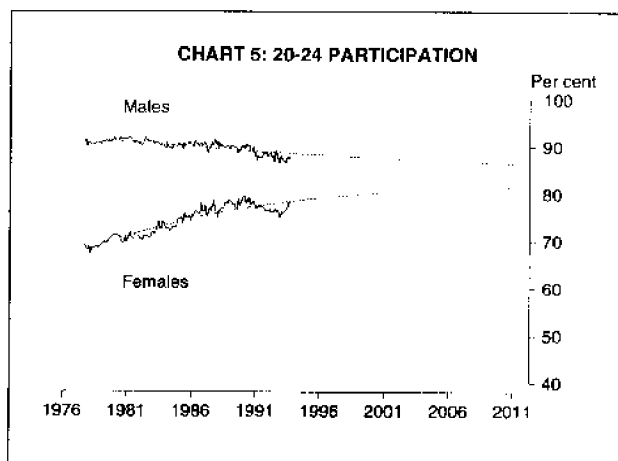


A number of factors have contributed to declining teenage labour force participation. Increased education retention is often cited as an important explanation for the decline. However, increased education retention is likely to account only for a fall in full-time labour force participation. Part-time labour force participation has tended to increase with increases in education retention in recent times. Chart 3 shows that over the last fifteen years full time participation has fallen while part time participation has risen. Chart 4 shows the correspondence between movements in education participation and labour force participation.

It is difficult to determine how much higher the education participation rate will rise, particularly since some age-groups within the 15-19 age-group are likely to behave quite differently. For example, 15-16 year olds are more likely to reach a 100% education retention rate than 18-19 year olds. The divergence in trend between part time and full time participation also indicates another problem when projecting total labour force participation. The potential benefits of further disaggregating the data are discussed in Section 5.

When examining the data for the 15-19 age-group, it was noted that the recent accelerating decline in labour force participation may be largely attributable to the recent economic recession. Therefore the question arises as to whether participation rates will recover to pre-recession levels. The current trend line is slightly above the current level of participation, suggesting that teenage male and female participation rates may recover slightly in the short term - before continuing the moderate rate of decline that is projected for the longer term. This teenage labour force scenario is broadly consistent with the one presented by the Department of Employment, Education and Training in the publication *Australia's Workforce in the Year 2001* (1991). There it is suggested that male participation rates will decline and female rates remain stable.





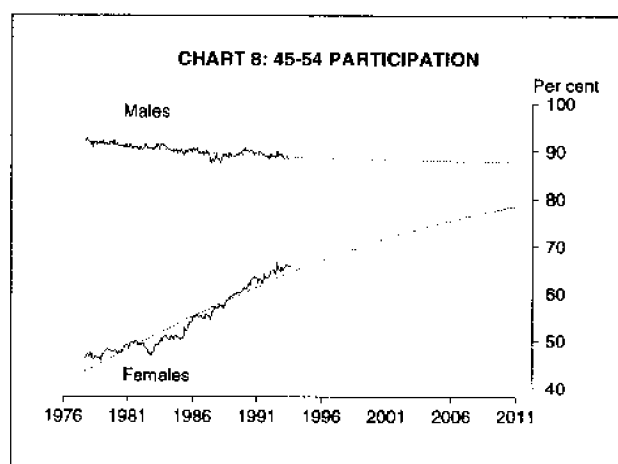
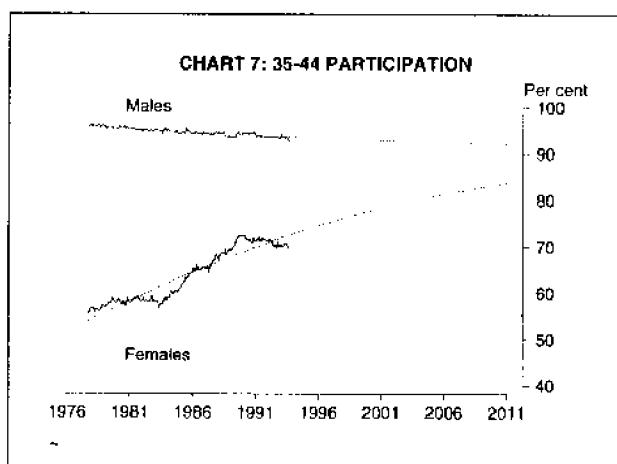
Prime Age-groups: 20-24, 25-34, 35-44 and 45-54 Age-groups

The four prime age-groups have all shown similar behaviour over the past fifteen years. Female participation has steadily increased whilst male participation has moderately declined. In the female 20-24, 25-34 and 35-44 age-groups, the data can be seen to have followed the business cycle, with dips in 1983 and 1992. Interestingly, the participation rate for females aged 45-54 did not decline during the recent recession. The only male age-group clearly affected by the 1991 recession is the 20-24 age-group (see Charts 5 to 8).

For all of these age-groups, the steeply rising linear trend in female participation is observed to exceed or nearly exceed the slowly declining male linear trend within the projection horizon. It was decided, therefore, to fit logistic trends to the data, employing the simultaneous non-linear least squares methodology to estimate male and female trends simultaneously.

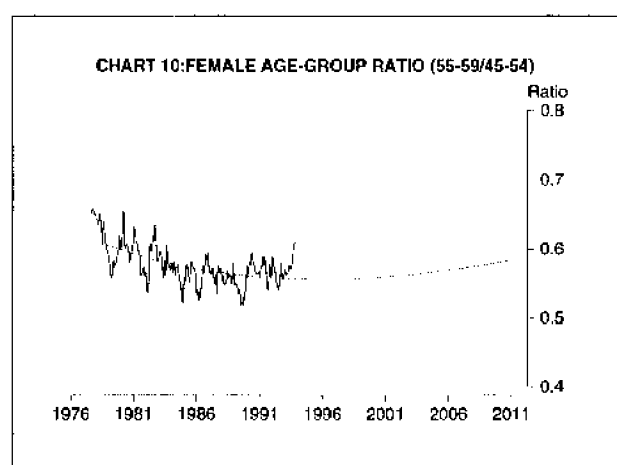
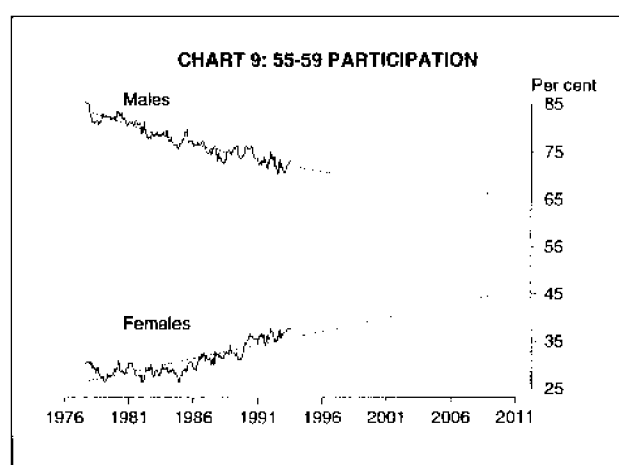
This method ensures that the male and female participation rate projections will converge, but not intersect, within the time horizon. In general, the male logistic projections are only slightly higher than the male linear projections. However, the female logistic projections exhibit quite significant tapering relative to their linear counterparts. Thus most of the adjustment to the common limiting value seems to be borne by the female projections.

It is noteworthy that the strong increases in labour force participation observed over the last fifteen years for all female groups show indications of tapering off. Some of the recent decline is likely to be the result of very poor employment opportunities. However, as the female participation rates approach closely both their corresponding male rates and the maximum rates observed in other countries, it may be expected that the observed growth rates will become less dramatic.⁵ Our projections are consistent with this expectation.



The question of how closely male and female rates might converge was considered when projecting rates for these age-groups. It might be assumed, for example, that a consistent 5 to 10 per cent gap will persist between the male and female participation rates for the 25-34 age-group. However, given the still significant gap between the male and female participation rates throughout the projection period, it was not found necessary to modify the existing methodology to impose such a gap. This result may change for future projections.

The data for the female 25-34 age-group seem to exhibit regular short term cycles which coincide with periods of low and high economic growth. Some modelling of this age-group was conducted to see whether, within the NLLS simultaneous framework, accounting for these short term cycles might affect the trend projection. In particular, the unemployment rate was incorporated as an explanatory variable in the regression. No significant effect on the projected trend was observed. See Appendix I for a full discussion of the experiment.



55-59 Age-group

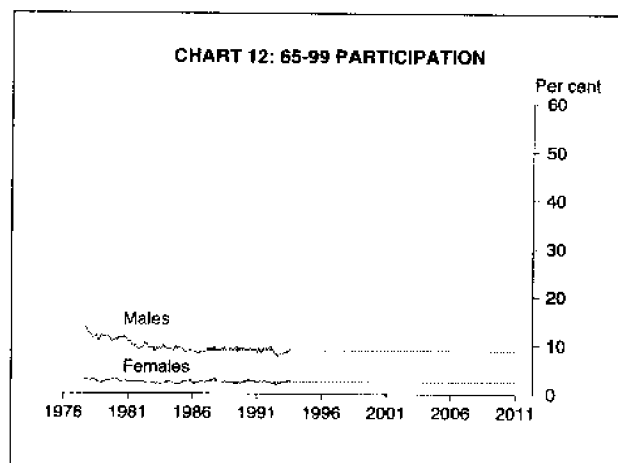
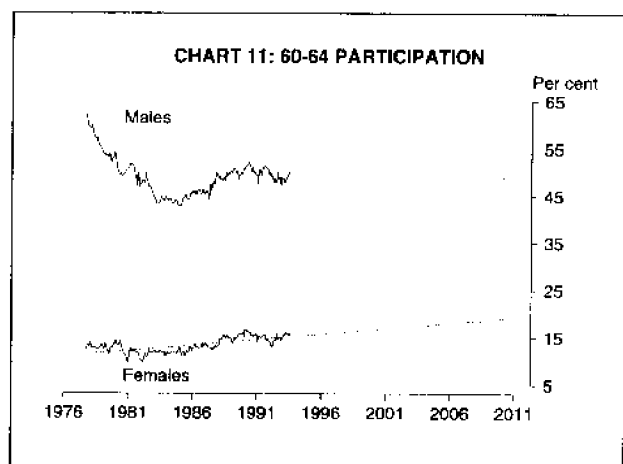
The linear trend was found to provide a satisfactory fit to the data for the female 55-59 age-group. When the 1991 projections were produced, it was found necessary to increase the slope of the fitted trend in order to stabilise the age-group ratio (55-59 age-group to 45-54 age-group) at around 0.60. No adjustment was necessary this time since the resulting age-group ratio approaches this level. The steeper linear trend in the current data has arisen because of continuing strong growth in the female participation rate over the last three years (see Charts 9 and 10).

A logistic trend was fitted to the male participation rates for this age-group, resulting in a more gradual decline than suggested by the linear approach. The logistic trend was preferred because of considerable doubt over the likelihood of a continuing strong decline in participation in this age-group.⁶ The superior statistical fit of the logistic trend supports this decision.

A number of influences may combine to determine future changes in male labour force participation for this age-group. These include changes in the tax treatment of retirement income, discouraged worker effects, and structural and technological change in the workplace.

⁵ This was also the view of the authors of *Restoring Full Employment: A Discussion Paper* (1993) by the Committee on Employment Opportunities, p 28.

⁶ See *Restoring Full Employment: A Discussion Paper* (1993) by the Committee on Employment Opportunities, pp 28-29 for some further discussion of this point.



60-64 Age-group

A linear trend was judged an inappropriate method of projecting male participation rates for this age-group. Instead, the average participation rate calculated over the period August 1987 to February 1994 was used to project a constant rate into the future. The resultant rate of 48.8 per cent is very similar to the assumption of 50 per cent used in the 1991 projections, and compares reasonably well with international experience (see Chart 11).

The dramatic decline in male participation rates in the early 1980s, which was subsequently reversed, makes this a very difficult age-group for trend analysis. Much of the temporary decline can be attributed to increased entitlements to war service pensions.⁷

For the 1991 projections of female participation rates, it was found necessary to increase the slope of the linear trend projection in order to stabilise the ratio between the 60-64 year old and 55-59 year old age-groups. However this adjustment proved to be unnecessary for the current projections (see Chart 18).

65-99 Age-group

As in the 1991 projections, both the male and female participation rates for this age-group are assumed to have stabilised at a constant rate. The average participation rates calculated over the period August 1986 to February 1994 have been used. Linear regression results suggest declining trends for both males and females, although there is also evidence that the rates have stabilised in recent years. Therefore the constant rate assumption appears appropriate (see Chart 12).

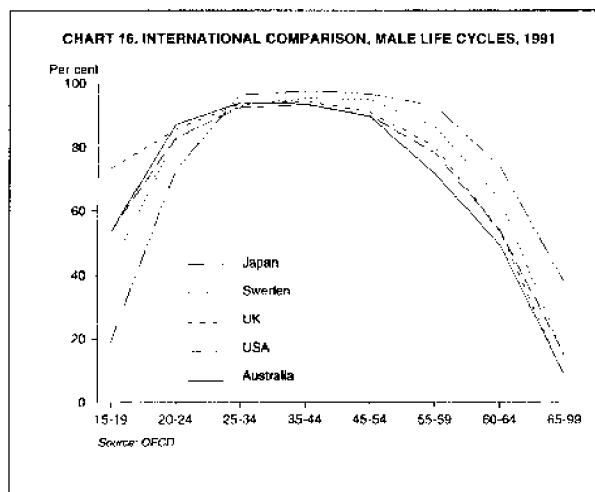
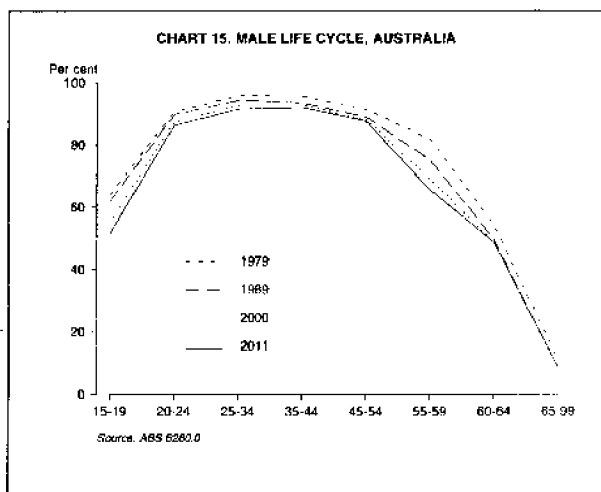
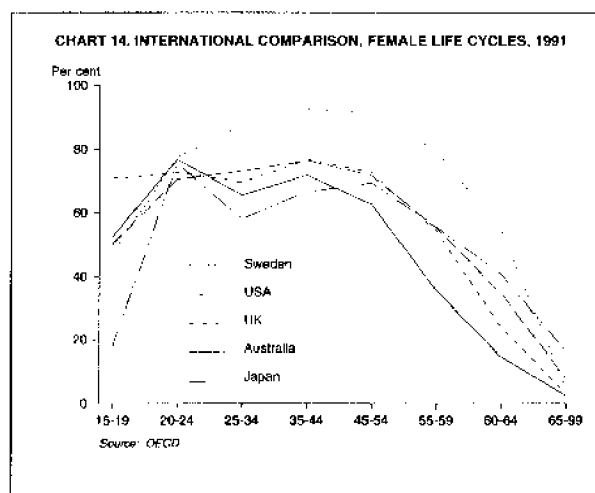
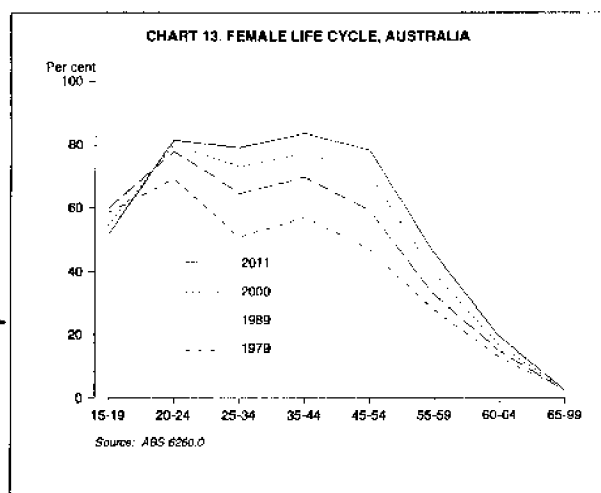
⁷ Merrilees, W.J. (1982), pp 81-94.

3.2.3 Life Cycle Features

Life-cycle profiles for males and females summarise the changes in labour force participation rates across all age-groups. Life-cycle profiles can be presented in two ways: they can follow an individual age-group (for example, all persons born in a given year) through time, or they can present a snapshot of all age-groups at a particular point in time. Both presentations are useful for evaluating the implications of these projections for lifetime labour force participation. The following discussion uses the second type of presentation.

Between 1979 and 1989, the profile of female labour force participation changed quite dramatically. Participation rates have been rising in all age-groups, except the 15-19 age-group where there has been a small decline. The largest increases were recorded in the 25-34, 35-44, and 45-54 age-groups. This has resulted in a significant change in the female life-cycle profile. Historically, this profile has taken on an "M" shape, though this shape has been disappearing over time. This "M" shape is assumed to be the result of females leaving the work force to have children and returning to the work force at a later time. The current projections reinforce the observed disappearance of the "M" profile - leading to a female life-cycle profile which is more similar to the male profile. This evolution has already been observed in other countries. In Sweden, for example, the female profile does not have an M shape. Chart 14 shows the Australian female life cycle compared with Sweden, Japan, the USA and the UK in 1991.

International comparisons indicate that the shape of the Australian male life cycle was not unlike those of Japan, USA, UK, and Sweden in 1991 (see Chart 16).



In contrast to the female life cycle profile, the male profile has undergone very little change in recent times. Between 1979 to 1989, participation rates for all male age-groups fell, with the most significant changes being observed in the 15-19 and 55-59 age-groups. The projections have tended to moderate the falls in these age-groups, resulting in a life-cycle profile in 2011 which is not unlike the 1989 profile. The greatest difference between the 1989 and 2011 male profiles is observed in the 55-59 age-group. Despite moderating the implied linear decline in participation rates for this age-group, the 2011 profile contains a small kink which can be attributed to a continuation of the move towards early retirement amongst males (see Chart 15).

Age-group Ratios

Participation rate projections were also assessed by examining age-group ratios. They reveal similar information to the life cycle graphs, indicating the relative levels of participation in consecutive age-groups. Age-group ratio charts differ from life cycle charts in that they reveal this information continuously over time. Charts 17 and 18 present the age-group ratios for males and females, respectively. Each line represents the ratio of consecutive age-groups' data (comprising both historical data and future projections). A line marked 25-34/20-24 in Charts 17 and 18 represents the ratio of the 25-34 age-group data to the 20-24 age-group data; other age-group ratios are represented similarly.

The ordering of the male age-group ratios reflects the male life cycle profile. That is, groups at either end of the age distribution have lower participation rates than those in the middle of the age distribution (see Chart 17). The only departure from the rule is the relationship between the 55-59/45-54 and 60-64/55-59 age-group ratios, which reflects the downward kink in the projected male life cycle profile discussed earlier.

The relative positions of the female age-group ratios (especially the 25-34/20-24 ratio) reflect the "M" shape of the female life cycle profile. As the M shape is projected to disappear, the relative positions of the age-group ratios shift (see Chart 18). The slopes of the 25-34/20-24 and 35-44/25-34 age-group ratios, in particular, reflect the changing shape of the female life cycle profile - as participation in the 25-34 female age-group is projected to increase relative to other prime age-groups.

- Inevitably, there will be a slight discontinuity in each ratio series at the point where the historical data meet the projected data. This discontinuity is most prominent in the case of the female 45-54/35-44 ratio, which may be attributed to the divergent behaviour between the 45-54 age-group and other prime age-groups - that is, this group's participation did not decline during the recent recession (see Chart 8).

CHART 17: Male Age-group Ratios

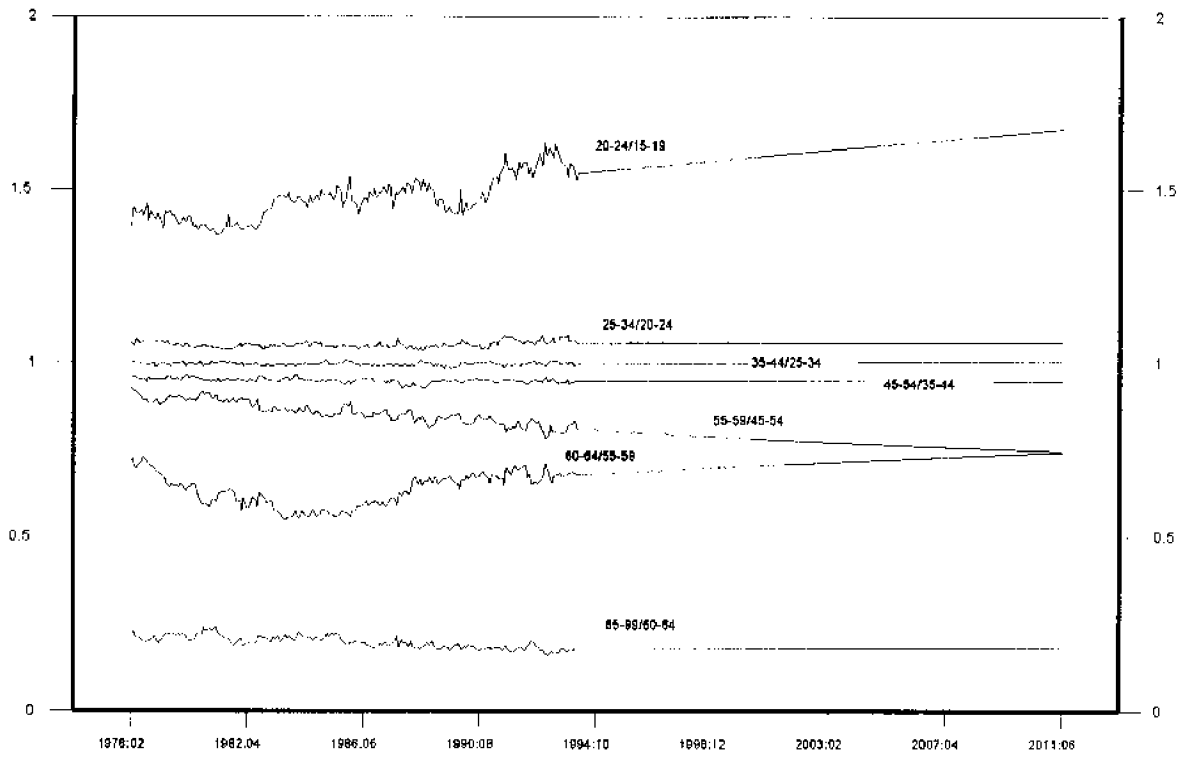
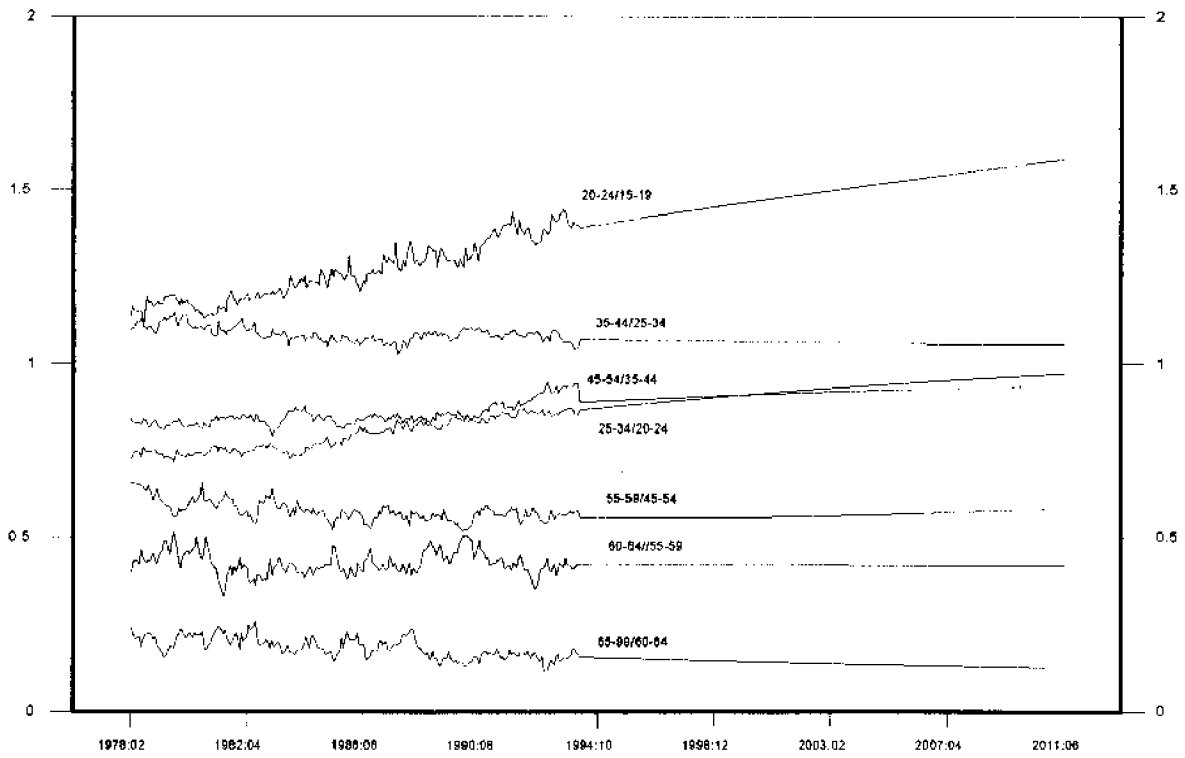


CHART18: Female Age-group Ratios



4. Labour Force Projections

4.1 The Size of the Labour Force

Table 2: Labour Force Estimates and Projections

	Levels (Numbers in Thousands)			Percentage Change		Average Annual Increase (%)		Distribution (Percent)		
	1979	1993	2011	1979- 1993	1993- 2011	1979- 1993	1993- 2011	1979	1993	2011
Males	4,146.5	4,994.6	5,761.2 (A) 5,902.7 (D)	20.4	15.3 (A) 18.2 (D)	1.3	0.8 (A) 0.9 (D)	64	58	54
Females	2,372.6	3,624.2	4,870.7 (A) 5,005.0 (D)	52.8	34.4 (A) 38.1 (D)	3.1	1.7 (A) 1.8 (D)	36	42	46
Persons	6519.0	8,618.8	10,631.9 (A) 10,907.7 (D)	32.2	23.4 (A) 26.6 (D)	2.2	1.2 (A) 1.3 (D)	100	100	100

(A) denotes labour force projections constructed by applying participation rate projections to Series A population projections.

(D) denotes labour force projections constructed by applying participation rate projections to Series D population projections.

The Labour Force 1979-1993

- The labour force grew by 2.1 million to 8.6 million. The average annual rate of increase was 2.2 per cent.⁸
- The annual rate of increase slowed from 2.7 per cent in 1979-80 to 0.7 per cent in 1992-93.⁹
- The male labour force grew by 0.8 million to 5.0 million. The average annual rate of increase was 1.3 per cent.
- The female labour force grew by 1.3 million to 3.6 million. The average annual rate of increase was 3.1 per cent.

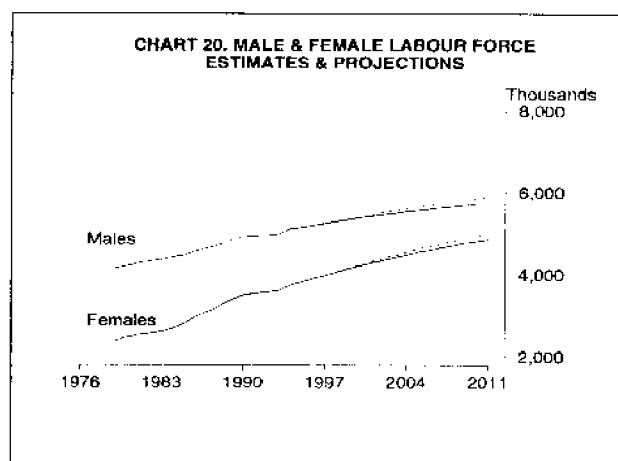
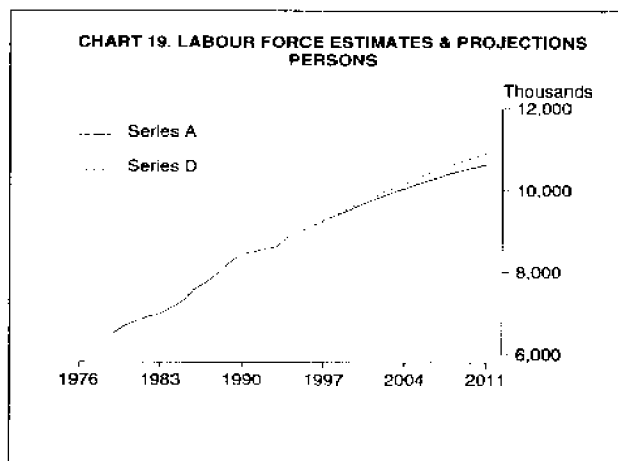
The Projected Labour Force 1993-2011

- Applying projected participation rates to Series A population projections, the labour force is projected to grow by 2.0 million to 10.6 million, at an average annual rate of increase of 1.2 per cent¹⁰ (see Chart 19).
- Applying projected participation rates to Series D population projections, the labour force is projected to grow by 2.3 million to 10.9 million, at an average annual rate of increase of 1.3 per cent.
- The annual rate of increase for labour force projections (Series A) is projected to slow gradually from 1.4 per cent in 1994-95 to 0.6 per cent in 2010-11.

⁸ The quoted average annual rates of increase are calculated by summing together the growth rates for all years and dividing by the number of annual increases.

⁹ The increase of 0.66% in 1992-93 partly reflects the influences of the recent recession upon labour force participation. Although the growth rate will probably increase as the economy continues to move out of recession, the longer term general decline is projected to continue.

¹⁰ Comparisons between 1993 and 2011 compare the projected 2011 value and the actual 1993 value. The actual data for 1993 are comprised of short term influences as well as the projected underlying trend. Therefore, when comparing 1993- and 2011 data it is important to note that the change over this period will be comprised of a short term movement back to the projected underlying trend as well as change in the projected underlying trend.



- The annual rate of increase for labour force projections (Series D) is projected to slow from 1.4 per cent in 1994-95 to 0.8 per cent in 2010-11.
- For labour force projections (Series A), the male labour force is projected to grow by 0.8 million to 5.8 million, at an average annual increase of 0.8 per cent (see Chart 20).
- For labour force projections (Series D), the male labour force is projected to grow by 0.9 million to 5.9 million, at an average annual increase of 0.9 per cent - noticeably less than the projected average annual increase of the entire labour force.
- The female labour force (Series A) is projected to grow by 1.2 million to 4.9 million, at an average annual increase of 1.7 per cent.
- The female labour force (Series D) is projected to grow by 1.4 million to 5.0 million, at an average annual increase of 1.8 per cent - a significantly higher rate of increase than that for males, but less than that observed for females over the last fifteen years.

4.2 Changes in the Composition of the Labour Force

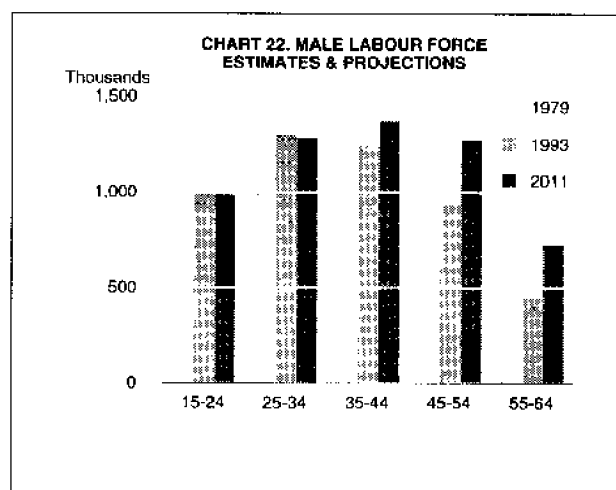
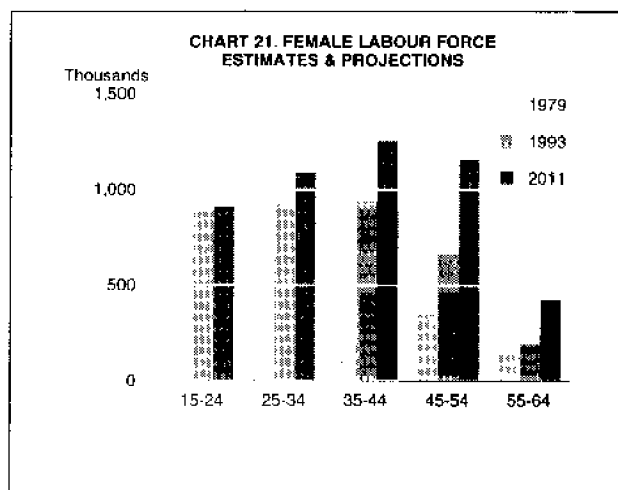
Changes in the Sex Composition of the Labour Force

- In 1979, the labour force comprised 36 per cent females and 64 per cent males.
- By 1993, the proportion of females in the labour force had risen to 42 per cent.
- By 2011, the proportion of females is projected to rise to 46 per cent.

Changes in the Age Structure of the Labour Force

Older age-groups are projected to make up an increasingly large percentage of the male labour force. The number of males in the labour force aged 15-34 as a percentage of the total male labour force is projected to fall from 46 per cent in 1993 to 39 per cent in 2011. The number of males in the labour force aged 35-99 is projected to increase by 29 per cent. (The most dramatic increase is predicted for the 45-54 age-group, which is projected to increase by 36 per cent over the period 1993 to 2011).

Older age-groups are also projected to make up an increasingly large percentage of the female labour force. The number of females in the labour force aged 15-34 as a percentage of the total female labour force is projected to fall from 50 per cent in 1993 to 41 per cent in 2011. The number of females in the labour force aged 35-99 is projected to increase by 58 per cent. (The number of females in the labour force is projected to rise in all age-groups except the 15-19 age-group where a small reduction is projected. The 35-44 and 45-54 age-groups will undergo the largest projected



increases, accounting for 25 per cent and 40 per cent respectively of the total female labour force increase in the period 1993 to 2011.)

Charts 21 and 22 illustrate the size of the labour force in 1979, 1993 and 2011 for females and males respectively. The labour force in these charts is disaggregated by sex and ten year age-groups for persons aged 15 to 64.

In 1979, the age-groups containing the largest proportion of the labour force were:

- for females, the 15-24 age-group and
- for males, the 25-34 age-group.

By 1993, the largest age-groups were:

- for females, the 35-44 age-group and
- for males, the 25-34 age-group.

According to our projections, in 2011 the largest age-groups will be:

- for females, the 35-44 age-groups and
- for males, the 35-44 age-group.

In 1979, the distribution of ages within the labour force was heavily skewed towards the younger age-groups - especially for females. By 1993, the dominance of younger age-groups had diminished significantly. Older age-groups are projected to contain an increasing proportion of the 15-64 labour force. In particular, the 35-44 and 45-54 age-groups are projected to become increasingly important. It follows that the average age of the female and male labour forces will increase as the peaks of the distributions move towards the older age-groups.

The following sections examine the projected changes to the Australian labour force from slightly different perspectives. In Section 4.3, Tornqvist indices are used to identify the contributions to aggregate labour force growth arising from both the participation rate projections and the population projections, with the contributions from the sixteen age-sex groups separately highlighted. In Section 4.4, the separate effects of the age-by-sex participation rate projections and population projections upon the aggregate participation rate are examined.

4.3 Contributions to Aggregate Labour Force Growth

The following analysis seeks to identify the key contributors to aggregate labour force growth during both the historical period (1979 to 1993) and the projected period (1993 to 2011). Charts 23 to 28 present the contributions (in percentage points) to labour force growth in the historical period, while Charts 29 to 34 analyse the projections. The vertical scales on the charts can be interpreted as approximate percentage point contributions to the overall growth in the labour force.

Growth in the Labour Force, 1979 to 1993

The Australian labour force increased by 32 per cent between 1979 and 1993. 27 percentage points of this growth resulted from population increases, while 4 percentage points may be attributed to changes in participation rates.

Higher female participation rates (especially in the 25-54 age-group) contributed almost 7 percentage points of growth (see Chart 24), but this was offset by negative contributions to growth from falling participation rates in all male age-groups (see Chart 23).

The strongest contribution to labour force growth came from population growth in the 35-44 age group - for both males and females. Population growth in the 25-34 and 45-54 age-groups also contributed significantly (see Charts 25 and 26).

Growth in the Labour Force, 1993 to 2011¹¹

The Australian labour force is projected to grow by 23 per cent between 1993 and 2011. 17 percentage points of this growth result from projected increases in the population, and 6 percentage points arise from projected changes to participation rates.

The pattern of contributions arising from the participation rate projections is quite similar to that observed in the historical period (compare Charts 23 and 24 with Charts 29 and 30). This is not surprising since the participation rate projections are generally extrapolated from past behaviour. The female 25-34, 35-44 and 45-54 age-groups contribute strongly to aggregate labour force growth (see Chart 30), while all male participation rate changes contribute negatively (see Chart 29).

The strongest contribution to labour force growth will come from population growth in the 45-54 age group - for both males and females (see Charts 31 and 32). Population increases in the younger age-groups are projected to contribute much less to labour force growth than in the historical period, while population increases in the older age-groups are projected to be a more important. The low (and sometimes negative) contributions to aggregate labour force growth from the younger age-groups and the generally large contributions from older age-groups reflect the ageing of the population - as illustrated in Charts 21 and 22.

The pattern of specific age-groups' contributions to projected labour force growth has been largely pre-determined by historical events. Australia experienced very high birth rates between the late 1940's and the mid-1960's, and also in the early 1970's. As these relatively large population groups age, they will have a significant impact upon the composition of the labour force. Between 1979 and 1993, this demographic effect had its greatest impact on the 20-54 age groups, while between 1993 and 2011, the effect will be most evident on the 35-64 age groups.

¹¹ Note, for the purposes of comparison, that the historical period - ie. 1979 to 1993 (14 years) - is shorter than the projected period - 1993 to 2011 (18 years).

Contributions to Aggregate Labour Force Growth, 1979 to 1993

CHART 23: MALE PARTICIPATION 1979-1993

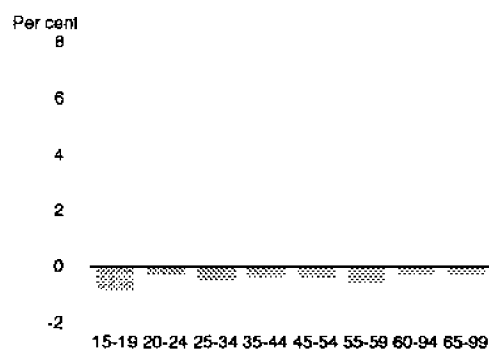


CHART 24: FEMALE PARTICIPATION 1979-1993

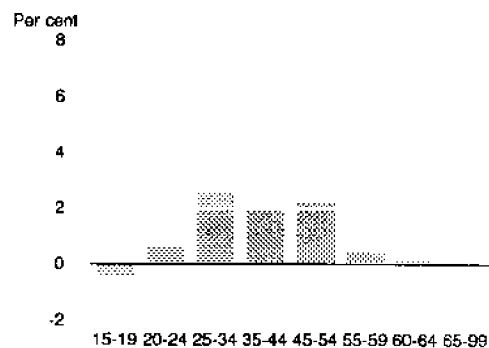


CHART 25: MALE POPULATION 1979-1993

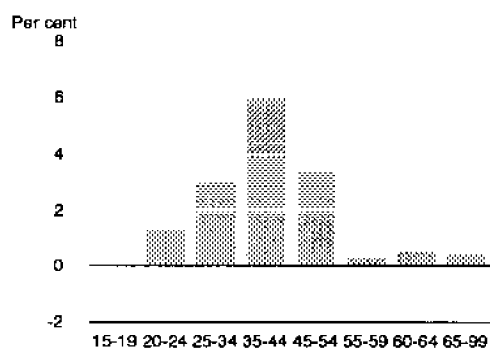


CHART 26: FEMALE POPULATION 1979-1993

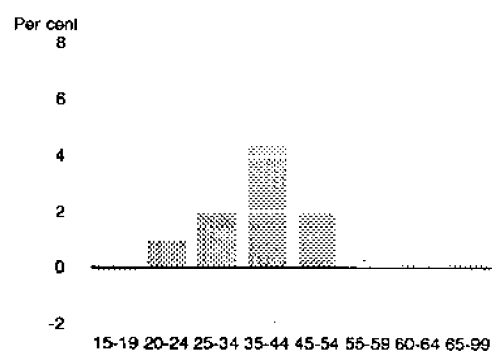


CHART 27: MALE LABOUR FORCE 1979-1993

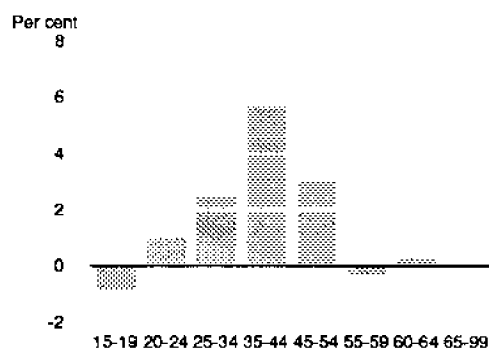
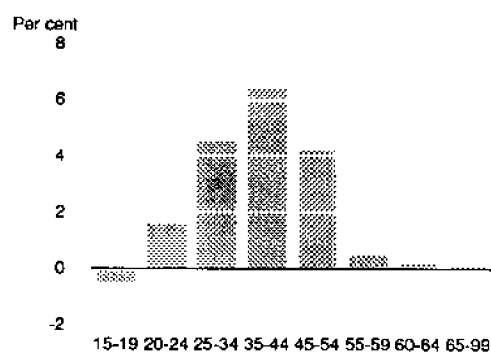


CHART 28: FEMALE LABOUR FORCE 1979-1993



Contributions to Aggregate Labour Force Growth, 1993 to 2011

CHART 29: MALE PARTICIPATION 1993-2011

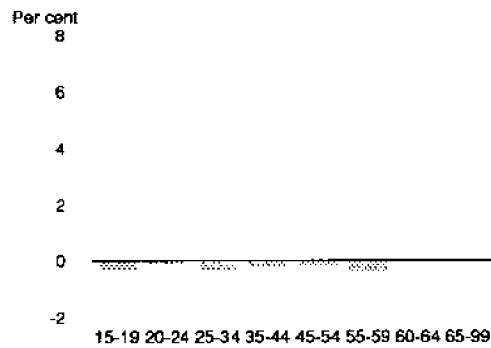


CHART 30: FEMALE PARTICIPATION 1993-2011

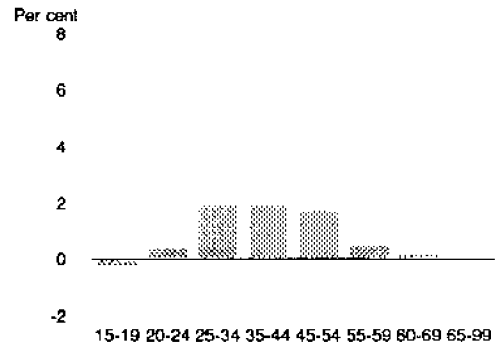


CHART 31: MALE POPULATION 1993-2011

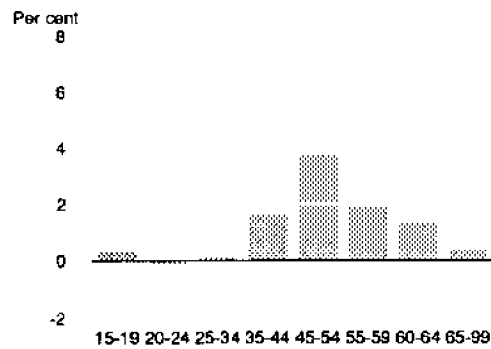


CHART 32: FEMALE POPULATION 1993-2011

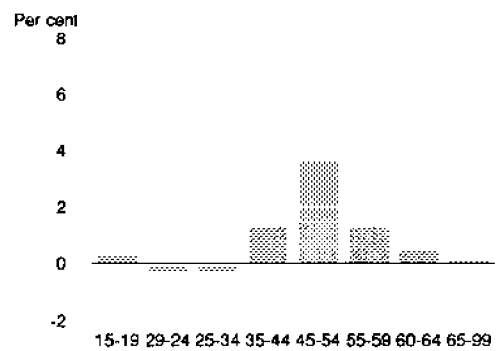


CHART 33: MALE LABOUR FORCE 1993-2011

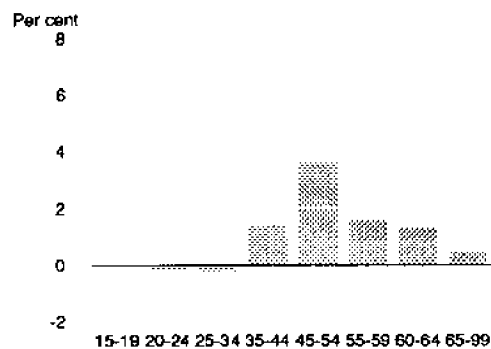
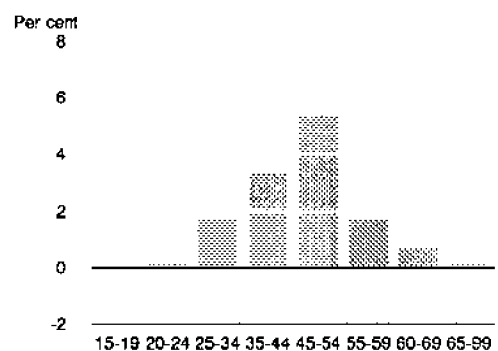


CHART 34: FEMALE LABOUR FORCE 1993-2011

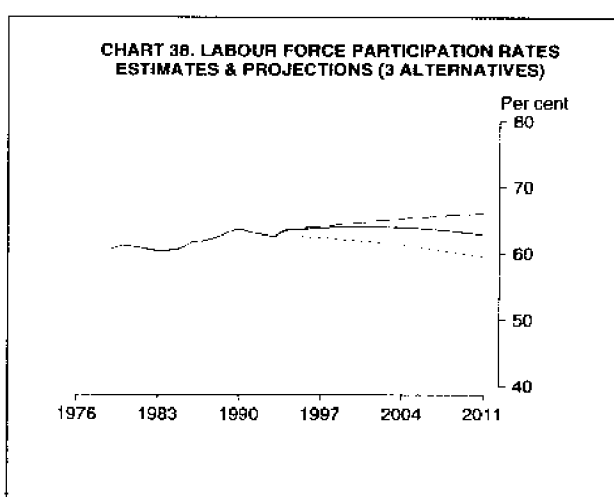
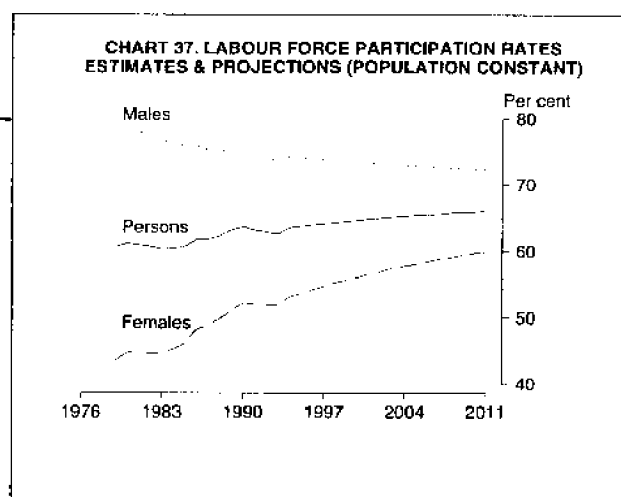
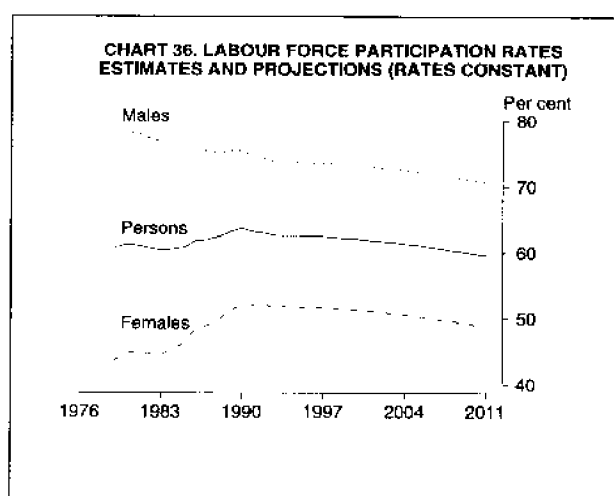
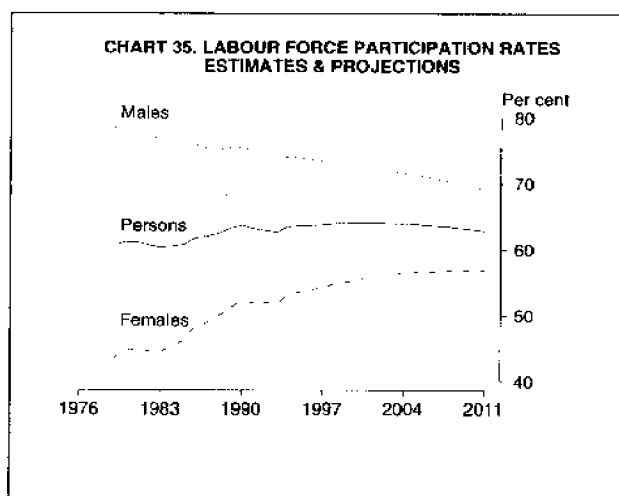


4.4 Aggregate Participation Rates

The aggregate participation rate summarises the *combined* effects of changes in age-group participation rates and changes in age-group populations.

Chart 35 shows that male participation rates declined during the period 1979 to 1993, and that this decline is projected to continue till 2011 (the end of the projection period). Female participation rates, which rose strongly during the period 1979 to 1993, are projected to continue to rise (though at a slower rate) until 2010, and then decline. The major cause of the projected turning point in female participation rates is projected demographic change. A subsidiary cause is the tapering of the projected participation rates, imposed on most female age-groups by the projection methodology employed.

For males and females combined, labour force participation rose only modestly between 1979 and 1993. This aggregate participation rate is predicted to peak in 2001, and then to fall slowly.



One method of distinguishing the effects of population projections and participation rate projections upon the aggregate rates is to hypothetically hold one constant while allowing the other to vary.

- When age-group participation rates are held constant at their 1993 levels and applied to age-group population projections, the projected aggregate participation rates for males, females and persons all immediately fall (see Chart 36). The demographic effects of an ageing population are causing the aggregate rates to fall, despite participation rates being held constant for all the separate age-groups.
- When the age-group populations are held constant at 1993 levels and combined with the projected age-group participation rates, the aggregate participation rate increases

monotonically (see Chart 37), as the increase in the aggregate female participation rate dominates the decline in the aggregate male rate.

Charts 36 and 37 suggest that the turning points observed in the aggregate participation rates for females and persons are a demographic phenomenon - the overall participation rate effect being positive but the demographic effect being more strongly negative. Chart 38 shows the projected aggregate participation rate relative to the other two scenarios: age-group participation rates constant and age-group populations constant.

5. Future Research

An obvious way of improving the current methodology might be to decompose participation rates into full-time and part-time components when estimating trends and projecting rates. The advantage of disaggregating the total participation rate is that separate judgements concerning the full-time and part-time levels could be reflected in the aggregate. This is likely to be particularly important if the relationship between the full-time and part-time rates is observed (or expected) to undergo an abrupt or dramatic change. This disaggregation could possibly improve the projections for the 15-19 and the 20-24 age-groups where full-time and part-time participation rates have been moving in different directions, although the changes have been gradual. The more detailed compositional analysis allowed by this disaggregated approach would no doubt prove useful for some users of the current projections.

Other means of disaggregating the data could also be explored. For example, separately modelling the participation rates for married and unmarried females might also prove useful for identifying the sources of compositional change. Assuming that the different Australian states have different demographic characteristics, labour force projections by state might be valuable in highlighting the reasons for differences in sizes and growth rates between the state labour forces.

Other research issues to be assessed include:

- investigating the feasibility of directly modelling life cycle participation rates;
- investigating methods for producing confidence regions for participation rate projections, and hence labour force projections;
- analysing the effect of correlated errors upon the estimated trends; and
- examining the time series characteristics and properties of the participation rate data.

6. Conclusion

This paper has sought to assist analysts in assessing the latest ABS labour force projections. The simple time-trend techniques used to project participation rates in the 1991 study have been modified to allow the data to play a greater role in determining projection paths and to allow simultaneous estimation of convergent male and female trends. The process of projecting participation rates has afforded the opportunity to examine features of the labour force participation rate data at a disaggregated level. The examination of changes in the life-cycle profiles of female and male labour force participation proved useful when evaluating the broader implications of the component projections. In particular, increases in the prime age female participation rates have resulted in the gradual disappearance of the distinctive "M" shape from the female life cycle profile. The moderate decline in male participation rates across all age-groups is reflected in the relatively stable male life cycle profile.

The size and composition of the historical and projected labour force have also been compared and analysed. This analysis has been presented in three ways: firstly, by disaggregating the labour force by sex and ten year age-groups to examine the changing relative importance of different groups over time; secondly, by using Tornqvist indices to dissect contributions to aggregate labour force growth over the historical and projected time periods; and thirdly, by examining the separate effects of population and participation rate projections upon aggregate participation rates. A robust conclusion, supported by all three forms of assessment, is that the labour force is ageing. The contributions to growth analysis proved particularly informative in isolating the effects of population growth and participation rate changes at the sex-by-age-group level. This analysis showed that, for both males and females, growth of the population in the 35-44 age-group was the single biggest contributor to labour force growth in the period 1979 to 1993. Likewise, growth of the population in the 45-54 age-group was found to be the largest contributor to labour force growth in the projection period, 1993 to 2011.

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Appendix 1

Modelling the Female 25-34 Age-group

As noted in Section 3.2.2 the four prime age female age-groups display participation rate characteristics which seem to bear some relationship to the business cycle. That is, participation appears to rise and fall in line with rises and falls in economic activity. As the level of unemployment rises people are discouraged from seeking work and choose not to participate in the labour force. In the longer term the discouraged worker effect may average out to zero if unemployment fluctuates around some long term level and this long term level is stable.

Observing what appears to be a discouraged worker effect in the 25-34 female age-group, an attempt was made to model this effect and ascertain if the derived logistic trend and projection were greatly affected by this short run behaviour. The attempt to model short run movements were conducted within the general NLLS logistic frame work, set up to ensure female projections and male projections approach a common limiting value.

Deviation from the average level of unemployment over the last 15 years was used as an additional explanatory variable. This variable was incorporated in the simultaneous estimation in two ways. An OLS equation was estimated for participation using a time trend, deviations from unemployment and lags of the same, and a constant. Once this equation was estimated the amount of variation explained by unemployment was subtracted from the participation rate series. This adjusted series was then used in the simultaneous NLLS logistic estimation. Deviations in unemployment from its average seemed to explain some of the movements in the participation series. Various lags on deviations in average unemployment were tried the most successful being the series itself and the series lagged 6 periods. The resulting long term female trend was slightly higher than that obtained from the original estimation.

Another method of incorporating unemployment in the simultaneous NLLS estimation of males and females was to include unemployment in the logistic equation specification. When projecting it was assumed that deviations from average unemployment would be zero thus abstracting from the short run movements.

The resulting long term female trends from both modelling exercises were slightly higher than that obtained from the original NLLS trend estimation. Clearly drawing any conclusions from this very preliminary modelling exercise is fraught with danger. The modelling exercise does indicate that it is possible to incorporate short run explanatory variables into constrained long run outcomes without imposing undue complication upon the simple trend analyses. Further research into modelling possibilities and the time series characteristics of the participation rate data is likely to be conducted when the ABS next produces labour force projections.

Appendix 2

A Comparison of the 1991 and 1994 Labour Force Projections

The two-stage methodology employed to produce labour force projections determines the need to examine variations to both participation rate projections and demographic projections when comparing the 1991 and 1994 labour force projections.

In 1991, the projected labour force for the year 2005 was 10,918,300. In 1994, the projected labour force for the year 2005 is 10,170,600 - a reduction of 6.9 per cent. This fall is comprised of both a lowering of the projected population and a reduction in the projected average participation rate. Approximately two-thirds of the reduction in the labour force figure may be attributed to the downward revision in population numbers and the remainder is due to modifications to the participation rate projections.

For a full discussion of the population projections, please refer to the publication *Projections of the Populations of Australia, States and Territories 1993 to 2041* (ABS Catalogue No. 3222.0).

Revised female participation rates account for almost all of the decline in projected average participation. The age-groups contributing most to the revision are females 25-34 years old and 35-44 years old. For these age-groups, the principal reason for the downward revision is the change in the projection methodology.

In 1991 it was anticipated, somewhat arbitrarily, that 85 per cent of females within these age-groups would participate in the labour force in 2005. The gap between the current participation rate and this pre-determined end-point was then interpolated, using a steadily declining growth rate. The present methodology simultaneously fits logistic trends to male and female participation rates, constraining both trends to converge to a common limiting rate. This approach lends support to the choice of 85 per cent as a plausible upper bound for the female participation rate, but suggests a slower rate of growth towards the limit.

This is seen most clearly in the case of females 25-34 years old. In 1991 this age-group had a significantly lower rate of participation than females 20-24 years old and 35-44 years old. The 1991 methodology therefore required that growth in the participation rate should be greater and more sustained for this age-group, in order to attain the target of 85 per cent in 2005. The present methodology, which is more strongly based upon the data, suggests that this required growth rate is unlikely to be achieved.

The change in methodology is effectively illustrated by the life-cycle profiles for the female labour force constructed from the two sets of projections. The female life-cycle of labour force participation in the early 1990's shows a characteristic "M" shape arising from the lower participation of females aged 25-34. The 1991 projections predicted that the "M" shape would completely disappear by 2005. The 1994 projections, while confirming this tendency, indicate a less dramatic change to the profile by 2005.

The use of logistic trends in preference to linear trends, and the simultaneous estimation of male and female trends within certain age-groups, have resulted in male participation rate projections which are generally higher than those produced in 1991. However, because the historical data are so stable, the differences are very small.

The largest difference occurs in the 55-59 year old age-group, where the decision was made to replace the linear trend used in 1991 with a logistic trend. The tapering trend not only produces a better statistical fit to the data, but also is more consistent with recent conjecture that further declines in labour force participation by older males are unlikely.

The 1991 projections were produced at the end of a period of strong employment growth. Between 1991 and 1994, participation rates generally fell, or their rates of growth moderated. It might be

expected that the inclusion of the more recent data would therefore have a significant impact on projected average participation rates.

Clearly it is difficult to measure this effect due to the more substantial impact of the methodological changes. However, for the purpose of comparison, the present methodology was applied to the data truncated at August 1990. Some differences in trends were observed within particular age-groups, most notably perhaps for persons 15-19 years old. Interestingly, some age-groups experienced increases in participation in 1991-1994 which raised the 1994 trend projections - in particular, females 55-59 and 60-64 years old. Overall, however, the impact of the additional three years of data was minimal.

In conclusion, it is the revised treatment of the prime age female age-groups which represents the most substantial difference between the 1991 and 1994 projections. In most other respects, the 1994 projections confirm the judgement shown in the previous study.



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