

Research Paper

Comparison of Methods for Measuring the Age of Withdrawal from the Labour Force

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Analytical Services Branch

AUSTRALIAN BUREAU OF STATISTICS

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COMPARISON OF METHODS FOR MEASURING THE AGE OF WITHDRAWAL FROM THE LABOUR FORCE

Terry Rawnsley and Joanne Baker
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ABSTRACT

In Australia, the men and women of the baby boom cohort are beginning to withdraw from the labour force and retire. Their withdrawal from the labour force will have significant repercussions for the Australian labour force and the economy. The age at which people are withdrawing from the labour force and starting their retirement is a matter of increasing interest in Australia and other developed countries.

At what age do Australians withdraw from the labour force? How should this age be measured? We investigate three methods of calculating the age of withdrawal from the labour force for people aged 45–84 years using Labour Force Survey data from 1981–2003.

Two of the methods produce estimates of the ‘expected age of withdrawal’. The third method estimates the ‘average age’ of people withdrawing from the labour force in each year. The ‘expected age’ is closely linked to participation rates, while the ‘average age’ shows a strong relationship between withdrawal age and labour market conditions.

The ‘expected age’ is based on changes in the probability of remaining in the labour force for a given period, while the ‘average age’ is based on the number of people who have left the labour force over a given period. Because it is relatively simple to calculate and to interpret, we prefer the use of the ‘average age of withdrawal’. However, depending on the research question being addressed and data available, the ‘expected age’ measures may be more appropriate.

The three methods give broadly similar results:

- The age of withdrawal from the labour force has risen over the past five years and is currently around the highest levels seen since 1981. Good labour market conditions have contributed to this.
- Men withdraw at an older age than women. However, the gap has decreased since 1981.
- The age of withdrawal from full-time participation has fallen relative to the age of withdrawal from the labour force as a whole. It seems that people are increasingly withdrawing from full-time work but continuing their contact with the labour force through part-time work.

1. INTRODUCTION AND BACKGROUND

1.1 Introduction

The Australian ‘baby boomers’¹ are beginning to withdraw from the labour force and retire. ‘Baby boomers’ currently account for almost a third of the labour force. Their withdrawal will have a significant impact on the nature of the labour force, the wider economy and public and private finances.

Trends in the age at which people are withdrawing from the labour force and starting their retirement are a matter of great interest in Australia and in many other countries. For instance, policy makers are particularly concerned about the combination of rising life expectancy and the relative constancy of the age of withdrawal from the labour force.

Life expectancy at birth for Australian men increased from 71.2 years in 1981 to 77.4 years in 2002, the age of withdrawal from the labour force has remained steady over the same period (*Year Book, Australia, 2001; Deaths, Australia, 2002; Scherer, 2002*). Women withdraw from the labour force at a younger age than men, and their life expectancy in 2002 was 82.6 years – five years greater than for men.

Both factors have contributed to raising the average length of retirement since the 1960s. Lengthening periods of retirement are also being observed in the United States and most of the European Union (Scherer, 2002; Gendell, 1998; Latulippe, 1996).

A common method of measuring withdrawal is to observe how participation rates decrease with increasing age. However, participation rates can be influenced by many factors. Examining the participation rates of specific cohorts over their working lives may be more informative – but as there are many cohorts, all at different stages of their working life, distilling information on the age of withdrawal is very difficult.

We begin by discussing some of the conceptual, data and methodological issues underlying three alternative measures of the age of withdrawal. The first two purport to be measures of the ‘expected age of withdrawal’ and the third is a measure of the ‘average age of withdrawal’. We illustrate the three measures by applying them to Australian Bureau of Statistics Labour Force Survey data for the period 1981–2003.

In the remainder of this introductory section, we provide some background to trends in labour force participation in Australia, and discuss the data. In Section 2, we describe the three methods of calculating the age of withdrawal, identifying their advantages and disadvantages. Section 3 presents the empirical results for the three methods and Section 4 provides some concluding remarks.

1 Those people born between 1946 and 1965.

1.2 Labour force participation in Australia

Population and labour force ageing in Australia

Over the past two decades there have been major changes in the size, structure and, in particular, age of the Australian labour force. The number of people aged 45–84 years in the labour force has doubled from 1.7 million in 1983 to 3.4 million in 2003.² Moreover, the labour force aged 45–84 years has grown at a faster rate than the labour force in general, with workers in this age group now accounting for 34% of the labour force compared with 25% in 1983.

Declining fertility rates and increasing life expectancy in recent decades have resulted in an ageing population. In 1983 people aged 45–84 years made up 28% of the population. By 2003 people aged 45–84 years made up 35% of the population. This trend is projected to continue with 45% of the population projected to be aged 45–84 years in 2033. While the Australian population as a whole is growing older, there have been changes in the average age of the population aged 45–84. Figure 1.1 shows the average age of the population aged 45–84 years has actually decreased since members of the baby boom cohort started to reach the age of 45 years in the late 1980s.

1.1 Average age of the population aged 45–84 years

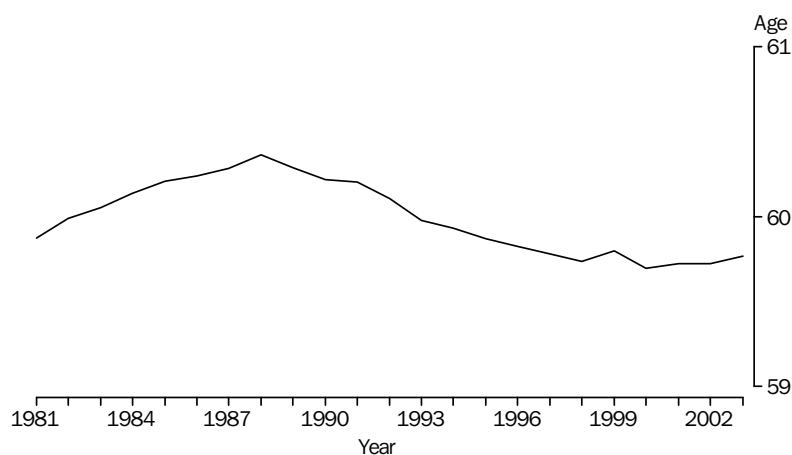
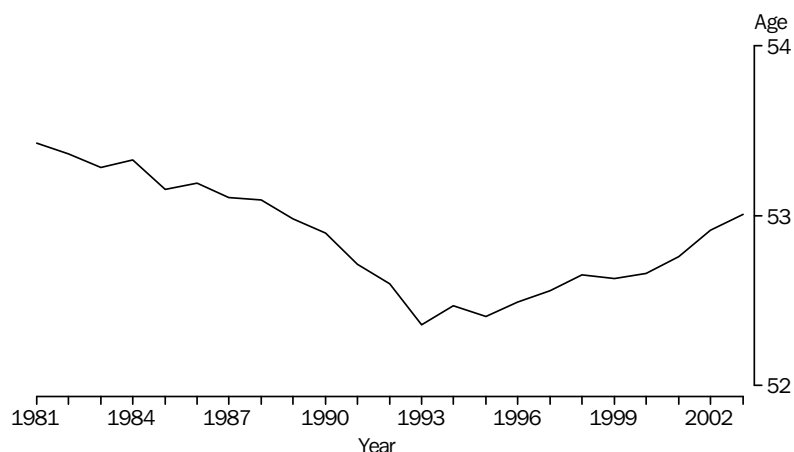


Figure 1.2 shows that the average age of the 45–84 years age group in the labour force fell during the 1980s and early 1990s. However, since 1993 the average age of this group has actually been increasing. In 1981 the average age of people aged 45–84 years in the labour force was 53.4 years. This average fell steadily to 52.3 years in 1993, and subsequently increased steadily to 53.0 years in 2003.

² The 45–84 years age group was chosen for a number of reasons. Withdrawal from the labour force is more likely to be permanent above the age of 45 than at younger ages, and a number of international studies on labour force withdrawal have used a minimum age of 45 (for example, Scherer, Gendel and Latulippe). A maximum age of 84 years is used in this paper because of the very small numbers of people above this age who participate in the labour force.

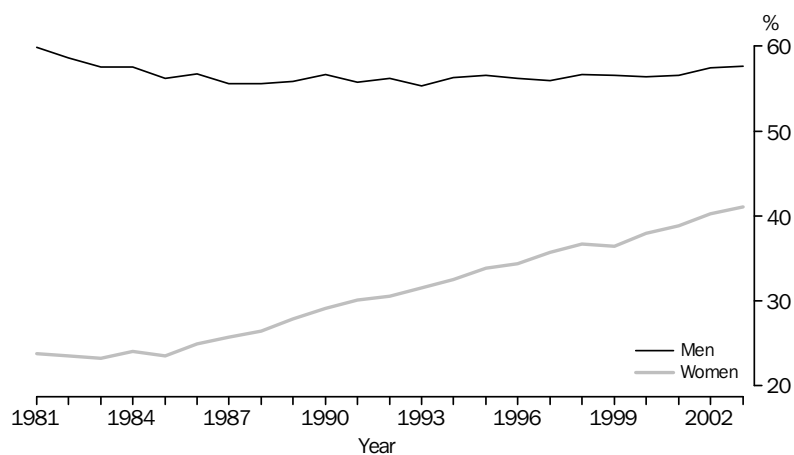
1.2 Average age of the labour force aged 45–84 years



Labour force participation rates

Figure 1.3 shows the labour force participation rates of men and women aged 45–84 years from 1981 to 2003.³ The participation rate for men aged 45–84 years declined from almost 60% in 1981 to 56% in 1985 and remained relatively steady for the next 15 years. Since 2000 the male participation rate has risen to 58% in 2003 – the highest rate recorded since 1982. It is likely that this recent rise in participation is related to Australia’s good labour market conditions and relatively low unemployment rate over the past few years.

1.3 Labour force participation rates of people aged 45–84 years



Although the participation rate for men remained steady over the last 20 years, figure 1.3 shows that the participation rate of women aged 45–84 years has almost doubled – from 23% in 1983 to 41% in 2003. Consequently, the gap between male and female participation rates has narrowed considerably. In 1983 female participation in the

³ Labour force participation rates are calculated as the number of people in the labour force as a percentage of the total population.

45–84 age range was only 40% of the male participation rate. By 2003 this figure had risen to 70%.

Although there is little difference between the recorded participation rates for men aged 45–84 years in 1983 and 2003, some interesting trends emerge from examination of the five-year age groups. Table 1.4 shows that the reduction in participation rates between 1983 and 1993 was driven by declining participation of men aged 50–59 years. Between 1993 and 2003 the participation rate for men returned to 58% as a result of rising participation of men aged 55–84 years.

1.4 Labour force participation rates of people aged 45–84 years (percent)

Age group	Men			Women		
	1983	1993	2003	1983	1993	2003
45–49	92	91	90	55	70	78
50–54	90	87	86	42	59	69
55–59	79	71	73	28	37	53
60–64	45	49	51	12	15	28
65–84	9	9	11	2	3	4
Total 45–84	58	55	58	23	31	41

Age at July 1983, June 1993 and June 2003.

Table 1.4 highlights just how much the participation rates for women have increased since 1983. Clearly, much of this growth is due to large increases in participation in the younger age groups. In the 45–49 years age group, for example, labour force participation rose from 55% in 1983 to 78% in 2003 – just 12 percentage points lower than the participation rate for men of the same age. Strong increases in female participation are apparent in all age groups.

Part-time participation

Another major change to the Australian labour force over the past two decades has been the increasing proportion of people participating in the part-time (rather than full-time) labour force. Table 1.5 shows how part-time participation has grown since 1983.⁴

⁴ The part-time participation rate is calculated in a similar way to total labour force participation. The part-time participation rate is calculated as the number of people working part-time plus the number of unemployed people looking for part-time work, as a proportion of the civilian population aged 15 years and over. Subtracting the part-time participation rate in table 1.5 from the corresponding labour force participation rate in table 1.4 will yield the full-time participation rate.

1.5 Part-time labour force participation rates of people aged 45–84 years (percent)

Age group	Men			Women		
	1983	1993	2003	1983	1993	2003
45–49	3	4	8	23	27	33
50–54	4	5	8	17	24	31
55–59	5	6	10	11	17	27
60–64	4	7	12	5	7	17
65–84	3	3	5	1	2	3
Total 45–84	4	5	8	10	13	19

Age at July 1983, June 1993 and June 2003.

The part-time participation rate for women aged 45–84 years almost doubled between 1983 and 2003. Changes within five-year age groups, shows that this increase is largely due to increasing part-time participation in the younger age groups. Part-time participation for women 55–59 years old has almost tripled. More than half the women in this age group who were participating in the labour force were participating part-time.

While men's total labour force participation rate fell between 1983 and 1993, their part-time participation increased over the period. The five-year age groups show that as age increases so does the propensity to work part-time. Men aged 55–64 years have the highest male part-time participation rate.

The relatively high rates of part-time participation for people aged 55 and over suggests that part-time employment provides an opportunity for people to 'retire' from full-time work, but continue to work part-time.

This is supported by table 1.6 which is based on data from *Underemployed Workers, Australia* (ABS cat. no. 6265.0). Table 1.6 shows the percentage of part-time workers who want to work more hours. There is a significant fall between the 55–59 and 60–64 age groups in men wanting to work more hours.

1.6 Proportion of part-time workers wanting more hours, 2003 (percent)

Age group	Men	Women	Total
45–49	39	19	23
50–54	35	16	19
55–59	30	13	18
60–64	11	10	10
65+	7	3	6
Total 45+	24	15	18

1.3 Data and assumptions

Retirement or withdrawal from the labour force?

We often think of retirement as the event that occurs when a person leaves their job and withdraws from the labour force with no intention of returning. However, a person who retires from a full-time job may continue to work part-time, or may withdraw temporarily from the labour force and return to full-time or part-time employment in the future. This lack of finality in the work to retirement transition creates difficulties in defining and measuring the ‘age of withdrawal from the labour force’.

One definition that captures some of the dynamic characteristics of retirement is that used in the General Social Survey (GSS) conducted by the Australian Bureau of Statistics (ABS) in 2002.⁵ The GSS defines a retired person to be one “who does not intend to or does not know if they will look for or take up work in the future and has not worked in the last year”. The GSS is able to provide useful information on those people who are defined as retired. Unfortunately this survey by itself does not enable a time series on average retirement age to be produced.⁶

Information on the labour force participation of the resident population of Australia has been collected in the ABS Labour Force Survey (LFS) each month since 1978. The survey is updated regularly to ensure the accuracy and appropriateness of the series. This provides us with a long and reliable time series from which we can estimate the age of withdrawal.

In our empirical analysis, we derived several estimates of the age of withdrawal using LFS data for the period 1981–2003. We acknowledge that there are many factors which may influence withdrawal from the labour force. Factors such as health, education, access to government benefits, wealth and superannuation effects, home ownership or even delayed family formation. However, information on these factors is not collected by the LFS.

Assumptions

In Section 2, we describe three methods of estimating the age of withdrawal. For each of these methods, we make a number of assumptions on the nature of withdrawal:

- If there are more people aged $a+n$ in the labour force in year $y+n$ than there were people aged a in the labour force in year y , we observe that the labour

5 For further information, see *Labour Statistics: Concepts Sources and Methods 2001*, ABS cat. no. 6102.0.55.001.

6 The 1997 Retirement and Retirement Intentions Survey (*Retirement and Retirement Intentions, Australia, 1997*, ABS cat. no. 6238.0) uses a similar definition. In the survey, a person was classed as fully retired from the labour force if they were at least 45 years old and “had retired from work or looking for work of no more than 10 hours per week, and did not intend to work at any time in the future.”

force has experienced net entry (rather than withdrawal).⁷ In such cases, we set net withdrawal to zero. This assumption is discussed further in Appendix B.

- Withdrawal from the labour force begins at age 45. This assumption means that the participation rates of the age group 40–44 can be used as a proxy for the pre-retirement participation rate. This assumption is discussed further in Appendix C. For the ages 85 and over we assume that no one is in the labour force and the participation rate is set to zero.
- Within each age group, the distribution of people participating in the labour force is uniform across ages. That is we assume that birthdays are spread evenly over the year.
- Withdrawal occurs at a uniform rate over the time period.
- These two assumptions lead to the third: for five-year age groups, on average withdrawal occurs at ages 45, 50, 55, ... , 85. For example, for a cohort aged 45–49 years in 1995, all withdrawal between ages 45–49 and 50–54, over the next 5 years will on average occur at age 50. For the age group 55–59, all withdrawal over the next 5 years will occur at age 60 on average. For single year age groups, denoted by age a , we assume that, on average, withdrawal within the following year occurs at age $a + 1$. This assumption is discussed further in Appendix F.

⁷ When five-year age groups are used, n will take the value of 5. When single-year age groups are used, n will take the value of 1.

2. MEASURES OF THE AGE OF WITHDRAWAL

In this section we outline three distinct methods of measuring the age of withdrawal from the labour force. The first two methods were used by Scherer (2002) in his Organisation for Economic Co-operation and Development (OECD) study of age of withdrawal in OECD countries. These two methods estimate the expected age of withdrawal based on changes in the participation rates of men and women aged 45–84 years. The third method produces estimates of the average age of withdrawal.

To avoid any confusion between the two terms, ‘expected age’ and ‘average age’ are defined below.

Expected age

This is the expected age at which a person aged 45 years in the reference period will withdraw from the labour force. This measure assumes that the age-specific withdrawal rates observed in the reference period will persist throughout the person’s working life. It is calculated similarly to life expectancy.

Average age

The average age is obtained by summing the ages of all people who withdraw from the labour force within the reference period, and dividing by the total number of people withdrawing. As such, the ‘average age of withdrawal’ is an historical fact rather than a hypothetical construct.

2.1 The ‘static’ estimate of the expected age of withdrawal

Scherer (2002) used two methods to estimate the age of withdrawal in OECD countries, of which the simplest is the ‘static’ estimate.

The static estimate compares the participation rates of younger and older age groups with one another at one point in time (e.g. June 1998). This tells us how fast labour force participation reduces after age 45. The reduction in participation rates between successively older age groups can be used to compute the probability of withdrawing from the labour force at specified ages (greater than 45 years). These probabilities are then used to construct a weighted sum of the specified ages, giving the ‘expected age of withdrawal’.

The static estimate is conceptually similar to life expectancy at birth. An estimate of 62 for 2003 means that we expect people aged 45 years in 2003 will on average withdraw from the labour force at age 62. Our expectation will be realised if the age-specific rates of withdrawal in 2003 continue unchanged into the future.

An example of this method is shown in Box 1, while the mathematical formulation and a more detailed example are provided in Appendix A.

BOX 1

CALCULATION OF THE STATIC ESTIMATE

Consider a labour force in which we know that no one retires before the age of 55, and everyone retires at either age 55, 60 or 65.

.....

<i>Participation rates</i>		
<i>Age group</i>	<i>1998</i>	<i>2003</i>
50–54	100%	100%
55–59	50%	60%
60–64	10%	10%
65 and over	0%	0%

.....

To calculate the static estimate of expected age of withdrawal we compare the participation rates of each five-year age group to find the rate of decline in the participation rates.

In 1998:

Step 1: Calculate the change in participation rates

$$P(50-54) - P(55-59) = 100 - 50 = 50\% \text{ of people withdraw at age 55}$$

$$P(55-59) - P(60-64) = 50 - 10 = 40\% \text{ of people withdraw at age 60}$$

$$P(60-64) - P(65-69) = 10 - 0 = 10\% \text{ of people withdraw at age 65}$$

Step 2: Multiply change in participation rates by age

$$\text{Expected age of withdrawal} = (50\% \times 55) + (40\% \times 60) + (10\% \times 65) = 58$$

Similarly, in 2003:

$$\text{Expected age of withdrawal} = (40\% \times 55) + (50\% \times 60) + (10\% \times 65) = 58.5$$

Advantages

- The method only requires age-specific participation rates in a single year.
- Using participation rates controls for the increasing size of the labour force.

Disadvantages

- The static estimate will only be a reasonable measure of age of withdrawal if trends in labour force participation are fairly stable over time or when changes affect all cohorts or age groups in a similar way. Age-specific participation rates have changed significantly for Australian women over the past three decades.

These changes have been driven by younger cohorts rather than older ones. As a result, the static measure will tend to measure the age of withdrawal poorly.

- The static estimate is an ‘expected age’ and is not technically a measure of withdrawal today.
- The concept of ‘expected age’ is not simple. The results of an ‘expected age of withdrawal’ could easily be misinterpreted by users and could potentially be confused with an ‘average age of withdrawal’, which is a different concept.

When might this method be used?

- This method only requires data for a single year. In that case it would be a useful method to apply to the Census or a one-off sample survey. The Census would also allow estimates for different population groups. For example, estimates could be made by education level, country of birth or occupation. In the case of a sample survey, say for example a health survey, estimates can be produced by self-assessed health status.

2.2 The ‘dynamic’ estimate of the expected age of withdrawal

In recent times, younger cohorts of women in particular have had higher rates of labour force participation than their predecessors. But the static estimate does not take account of this shift in labour force participation. Scherer developed a second measure called the dynamic estimate. The dynamic estimate uses changes in the labour force participation rates of cohorts over five-year periods.

The dynamic estimate tracks the reduction in participation over a five-year reference period for cohorts defined by five-year age ranges. For example, the participation rates of the cohort born in 1938–1942 in 1998 and 2003, can be used to define the change in participation over the period for this cohort. The method proceeds by assuming that the cohort born in 1938–1942 will experience the same *proportional change* in participation between 2003 and 2008 as the cohort born in 1933–1937 experienced between 1998–2003.

Thus, instead of assuming that age-specific participation rates remain constant over time for all cohorts (as in the static estimate), the dynamic estimate assumes that all cohorts will experience the same *proportional* decline in participation between specified ages. The dynamic estimate may represent a marginal conceptual improvement on the static estimate, but is perhaps harder to understand.

A simple example of this method is shown in Box 2. The mathematical formulation and a more complex example can be found in Appendix A.

BOX 2

CALCULATION OF THE DYNAMIC ESTIMATE

Consider a labour force in which we know that everyone works and no one retires before the age of 55. Everyone in this labour force retires at either age 55, 60 or 65. No one works beyond age 65.

Age group	Participation rates		% leaving between 1998 and 2003	% staying between 1998 and 2003
	1998	2003		
50–54	100%	100%	0%	100%
55–59	50%	60%	40%	60%
60–64	10%	10%	80%	20%
65 and over	0%	0%	100%	0%

Step 1: Calculate what proportion of the cohort withdrew between 1998 and 2003:

Between 1998 and 2003, 40% of the cohort aged 50–54 in 1998 withdrew by the time they were aged 55–59 in 2003:

$$((100 - 60) \div 100) \times 100 = 40\%$$

Between 1998 and 2003, 80% of the cohort aged 55–59 in 1998 withdrew by the time they were aged 60–64 in 2003:

$$((50 - 10) \div 50) \times 100 = 80\%$$

Between 1998 and 2003, 100% of the cohort aged 60–64 in 1998 withdrew by the time they were aged 65–69 in 2003.

$$((10 - 0) \div 10) \times 100 = 100\%$$

Step 2: Calculate the percentage of each cohort which did not withdraw from the labour force between 1998 and 2003

Percent of cohort staying = participation rate in 2003 ÷ participation rate in 1998

$$60\% = 60\% \div 100\% \quad \text{of the cohort aged 50–54 stayed}$$

$$20\% = 10\% \div 50\% \quad \text{of the cohort aged 55–59 stayed}$$

$$0\% = 0\% \div 10\% \quad \text{of the cohort aged 60–64 stayed}$$

Step 3: For the cohort aged 50–54 years in 2003, calculate the probability of withdrawal from the labour force at each age, and compute the expected age of withdrawal

$$\begin{aligned}
 &= 55 \times 40\% \quad \{\text{leave at age 55}\} + \\
 &\quad 60 \times 80\% \quad (\text{of the 60\% still remaining at age 55}) \{\text{leave at age 60}\} + \\
 &\quad 65 \times 100\% \quad (\text{of 20\% remaining of the 60\% remaining after 55}) \{\text{leave at age 65}\} \\
 &= 55 \times 40\% + 60 \times 80\% \times 60\% + 65 \times 100\% \times 60\% \times 20\% \\
 &= 58.6 \text{ years}
 \end{aligned}$$

Advantages

- The dynamic estimate takes into account changing participation rates over time.

Disadvantages

- The dynamic estimate requires at least two time points.
- The dynamic estimate is conceptually difficult to understand and it is not easy to explain exactly how this measure is calculated or what the results really mean.
- The dynamic estimate takes changing participation rates into account. However, rapid change in participation rates (due to economic conditions or cohort effects), may be atypical of changes in subsequent periods. As a result, in periods of unusual changes in participation rates the dynamic estimates could be misleading.
- The dynamic estimate does not produce a present-day measure of withdrawal from the labour force. It is a measure of typical withdrawal over the past five years.

When might this method be used?

- The dynamic estimate of expected age of withdrawal should be used with caution. It may be an appropriate measure when one knows that age-specific participation rates differ between cohorts. However, if these changes cannot be extrapolated into the future, then the measure may be misleading.

2.3 The average age of withdrawal

Given the problems associated with the static and dynamic estimates of ‘expected age of withdrawal’, we decided to investigate a method for calculating an ‘average age of withdrawal’.⁸

The average age of withdrawal method uses changes in the number of people in the labour force at each age in each year. With single year age groups there can be a large amount of fluctuation in numbers between one year and the next. Some of this variation is due to sampling variability, and so we have smoothed the withdrawal rates over three-year periods to reduce variation in our results.⁹ With three-year averaging, we interpret an ‘average age of withdrawal’ of 62 years for 2001–03 as indicating that

8 Currently, the OECD is experimenting with this measure for updates of the OECD country reports (Keese 2003). Because of data restrictions in some countries, the OECD assumes that “the population is constant both over time and for each age group” which allows them to use participation rates rather than the size of the labour force to calculate the average age of withdrawal. Otherwise the new OECD method is almost identical to the one used here.

9 An example of the method of smoothing over three years is described in Appendix A, Box 6. Estimates were also made using no smoothing and five-yearly smoothing. All three methods produced broadly similar results as shown in Appendix D.

the average age of all people withdrawing from the labour force during the three years from 2001 to 2003 was 62 years.

Box 3 illustrates a method of calculating the average age of people who withdraw over a year. The mathematical formulation and a more complex example can be found in Appendix A.

BOX 3			
CALCULATION OF THE AVERAGE AGE AT WITHDRAWAL			
In this labour force no one withdraws before the age of 55, and everyone is retired by age 60.			
.....			
	<i>Size of labour force</i>		
		
<i>Age group</i>	2002	2003	<i>Withdrawal</i>
.....			
55	1,000	1,000	
56	700	600	400
57	500	450	250
58	200	175	325
59	50	40	160
60	0	0	50
.....			
Step 1: Calculate the amount of withdrawal between 2002 and 2003 at each age			
	400	= (1000 – 600)	people withdrew at age 56.
	250	= (700 – 450)	people withdrew at age 57.
	325	= (500 – 175)	people withdrew at age 58.
	160	= (200 – 40)	people withdrew at age 59.
	50	= (50 – 0)	people withdrew at age 60.
Step 2: Multiply the number withdrawing by the age of which they withdrew:			
	$(56 \times 400) + (57 \times 250) + (58 \times 325) + (59 \times 160) + (60 \times 50) = 67,940.$		
Step 3: Calculate total number of people withdrawing over the year:			
	$400 + 250 + 325 + 160 + 50 = 1,185$ people withdraw		
Step 4: The average age of people withdrawing over the year			
	$67,940 \div 1,185 = 57.3$ years		

Advantages

- Averages are commonly used and easily understood concepts.
- Estimates can be made using either the number of people in the labour force or the participation rates at each age depending on data availability.

Disadvantages

- Requires at least two time points and the ability to track a cohort over time.

When might this method be used?

- This method is most appropriate when information is required on the current state of withdrawal from the labour force. The method is best suited when there are regular snapshots of the labour force available (such as the LFS) so that trends over time can be monitored

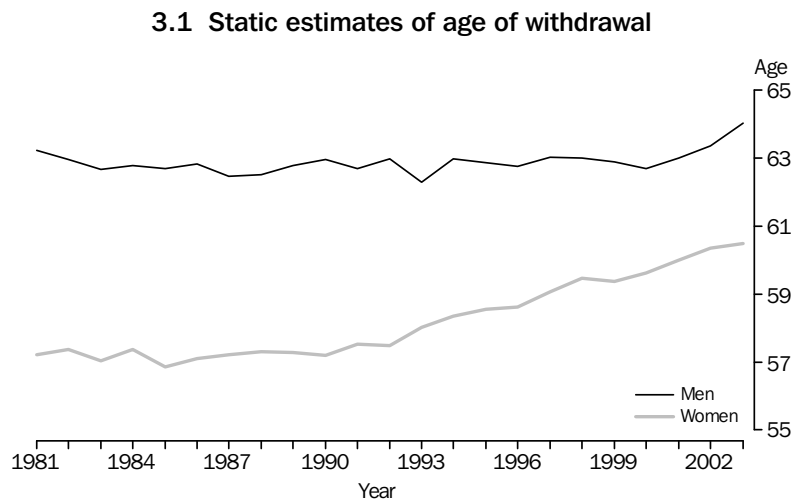
In the absence of any reliable data on the age of retirement the age of withdrawal can be used as a proxy for age of retirement. The next section will present results from the three methods.

3. RESULTS¹⁰

3.1 The static and dynamic estimates

Expected age of withdrawal from the labour force

Figure 3.1 shows the static estimates of the expected age of withdrawal for men and women from 1981–2003 using five-year age groups. From Scherer’s (2002) study we know that prior to 1981 the expected age of men withdrawing fell from about 67 years in 1966 to around 63 years in 1980. Although we see the tail end of this fall in the early 1980s, between 1981 and 2000 there was very little change in the age of withdrawal. The series remains steady at about 63 years. Since 2001 the expected age of men withdrawing has been rising. In 2003 the expected age reached 64 years, which is the highest expected age in the series.

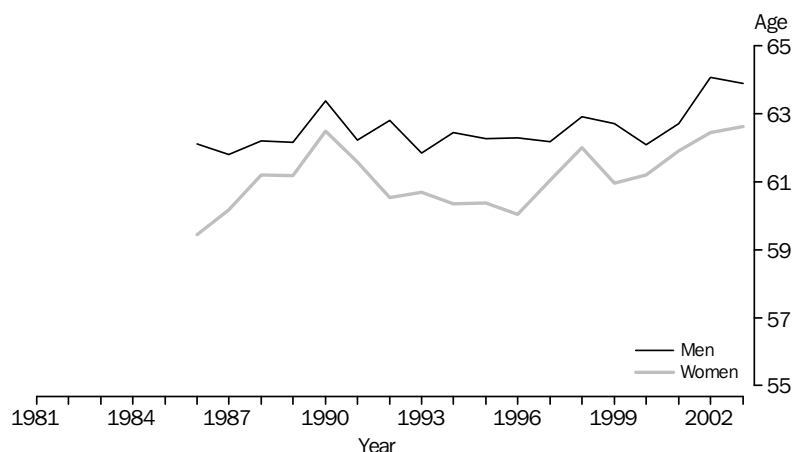


The static estimate for women clearly shows the impact of increasing participation rates of younger cohorts of women. The expected age of women withdrawing was around 57 years until the 1990s when the expected age began to rise rapidly to reach 60.5 years in 2003. By 2003 the difference between the expected age of withdrawal for men and women had decreased to 3.5 years (down from 6.0 years in 1981).

The dynamic estimates of the expected age of withdrawal are shown in figure 3.2. The expected age for men is fairly steady at just above 62 years, slightly younger than the static estimates. The dynamic estimate also shows a rise in the expected age of withdrawal in recent years. In 2002 the dynamic estimate for men reached 64 years – the highest level over the period.

¹⁰ A spreadsheet containing the calculation of results for this section is available from the authors on request.

3.2 Dynamic estimates of age of withdrawal

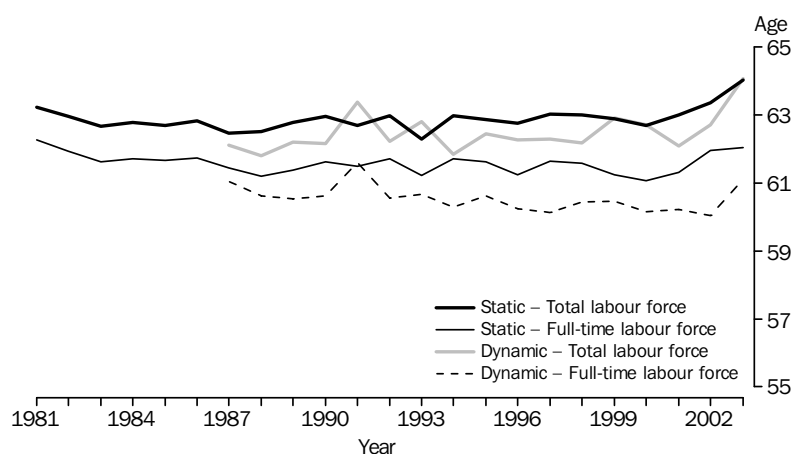


With women's participation rates rising steadily from the mid 1980s, both the static and dynamic series reached their highest levels in 2003 with a dynamic estimate of almost 63 years. Overall, there has been an upward trend in the expected age of women withdrawing between 1981 and 2003. Because the participation rates of women have been rising, the dynamic estimates are consistently higher than the static estimates.

Expected age of withdrawal from the full-time labour force

Figures 3.3 and 3.4 compare differences in age of withdrawal from the labour force and age of withdrawal from the full-time labour force for both men and women.¹¹

3.3 Age of withdrawal from the total and full-time labour force – Men



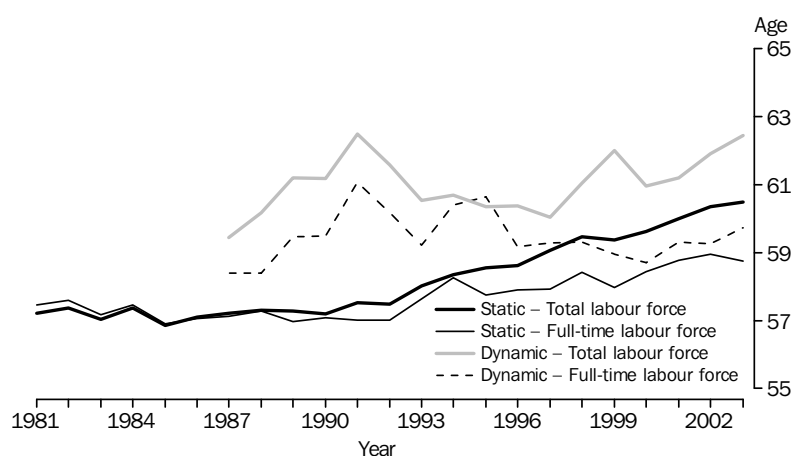
The past two decades have seen a divergence in the age of men withdrawing from the full-time labour force and the labour force as a whole. The expected age of men withdrawing from the total labour force has been fairly constant over the past two

¹¹ Part-time estimates were not calculated due to the volatile nature of the data. Rather only full-time and total labour force estimates were calculated.

decades. In contrast, until recently there has been a slow decline in the expected age of men withdrawing from the full-time labour force. In 1986 the dynamic rate shows a difference between full-time and total labour force of one year. By 2002 the difference had increased to three years. This divergence reflects the increasing number of people who retire from full-time work and then continue to work part-time.

The static estimates of age of withdrawal from the full-time and total labour force were very similar until 1994. After 1995 the difference between the two series began to increase. In 2003 the difference was almost two years.

3.4 Age of withdrawal from the total and full-time labour force – Women



Dynamic estimates of the age of women withdrawing from full-time and the whole labour force show a similar divergence over the 1990s. In 1993 the dynamic estimates show little difference between age of withdrawal from the whole and full-time labour force. The difference had grown to almost three years by 2003.

3.2 The average age of withdrawal

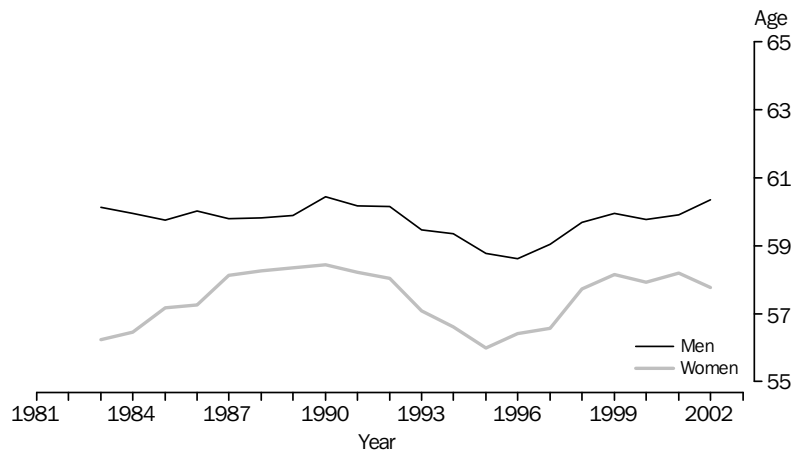
Average age of withdrawal from the labour force

Figure 3.5 shows the average age of withdrawal for men and women between 1983 and 2002.¹² Changes over time in the average age of withdrawal may be influenced by a range of social and economic factors.

In 2002, the average age of withdrawal for men was 60.3 years, the highest level since 1990. Apart from the period between 1993 and 1997, the average age of withdrawal for men has been fairly stable at around 60 years.

¹² Note that the average age of withdrawal uses three-year smoothing. The year referred to in the results is the middle year of the three years. For example 2002 uses withdrawal over 2001–2003. The smoothing is discussed further in Appendix D.

3.5 Average age of withdrawal from the labour force

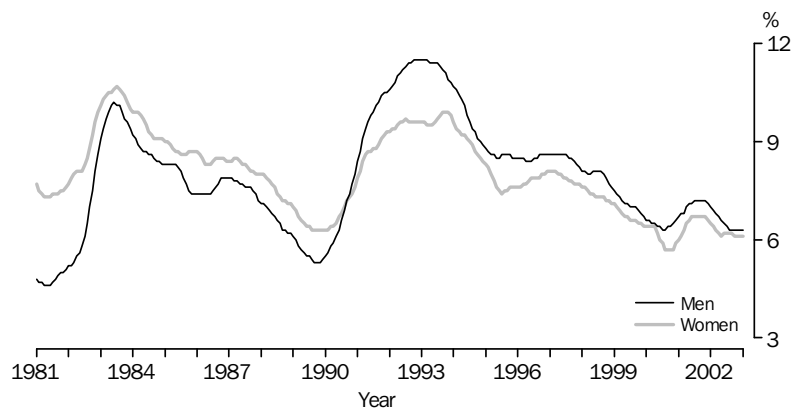


Since 1998 the average age of withdrawal for women has been relatively steady at around 58 years. Since 1987 the age of withdrawal for women shows similar patterns to men, though they appear to withdraw around two years younger than men do.

The average age of withdrawal for both men and women follows patterns seen in the unemployment rate over time. Figure 3.6 shows the unemployment rate between 1981 and 2003. During this period there were two periods of high unemployment in Australia, around 1983 and 1992.

During periods of high unemployment, the average age of withdrawal may fall as older people who lose their job may withdraw from the labour force, rather than remaining unemployed. This could be seen as involuntary withdrawal from the labour force. For example, during the period of high unemployment in the 1990s (after a short lag) there was a strong decline in the age of withdrawal for both men and women.

3.6 Unemployment rate



Trend data

During periods of low unemployment, people are less likely to withdraw involuntarily. This will lead to an increase in the average age of withdrawal as people stay in the labour force for longer.

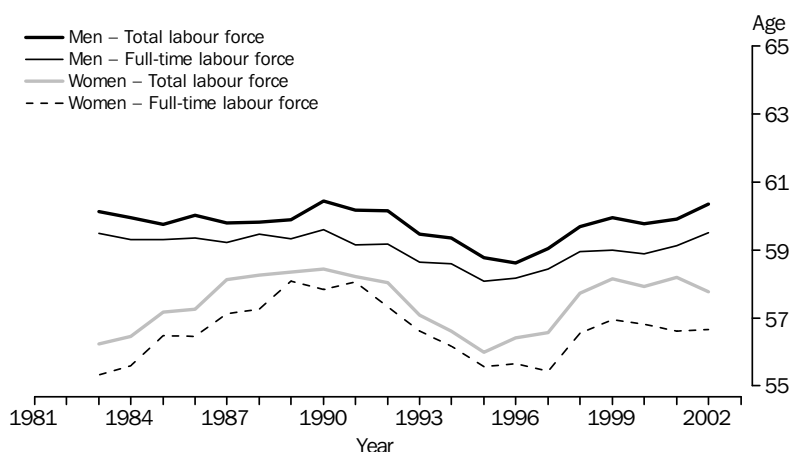
A number of other factors may also influence changes in the age of withdrawal. Social changes, such as a greater general acceptance of women in the workforce, are likely to have contributed to the increase in the participation of women in the labour force. In the 1980s, a marked rise in female labour force participation was accompanied by a rise in the average age of withdrawal for women.

From the late 1980s, the participation rate of men stabilised and the average age of withdrawal follows the trend set by the overall labour market conditions. Since then the average age of withdrawal for men and women display similar trends, with the average age of women withdrawing around 2 to 3 years younger than men.

Average age of withdrawal from the full-time labour force

Figure 3.7 compares the average age of withdrawal from the labour force as a whole with withdrawal from the full-time labour force. In general, they follow a similar pattern. As with the static and dynamic estimates there is evidence of rising participation in part-time work.

3.7 Average age of withdrawal from the total and full-time labour force



In 1983 the gap between the average age of men withdrawing from the labour force and those withdrawing from the full-time labour force was 0.6 years. It widened to a gap of 1.0 years in 1991, then narrowed to a difference of 0.5 years in 1996. In 2002 the gap was 0.9 years.

The gap between withdrawal from the full-time labour force and withdrawal from the labour force indicates that after withdrawing from the full-time labour force, men are

continuing to participate part-time in increasing numbers before finally retiring from the labour force.¹³

As with men, women withdraw from the full-time labour force earlier than they withdraw from the part-time labour force. The average ages of withdrawal of women from the full-time labour force and the labour force as a whole are very similar, particularly from the mid 1980s to the early 1990s.

The gap between withdrawal from the full-time labour force and the whole labour force is more variable for women than for men. In 1983, the difference in the average age of women withdrawing from the whole labour force and the full-time labour force was 0.9 years, but between 1989 and 1995 the difference narrowed considerably to 0.2 years in 1991. Since 1996 the gap has increased to 1.6 years.

¹³ This is supported by the data presented in tables 1.5 and 1.6 on page 6.

4. CONCLUSION

Ageing of the Australian population and its labour force has become a major policy issue in recent years. Understanding the age at which people withdraw from the labour force and retire is an important aspect of the ageing population.

In this paper we have investigated three distinct methods of calculating the age of withdrawal from the labour force. The methods are all conceptually different and so when interpreting estimates derived from any of the three methods, the underlying concept being measured must be considered.

The average age of withdrawal is based on the number of people who have left the labour force over a given period. The static and dynamic estimates of expected age are based on changes in the probability of remaining in the labour force for a given period. Because it is relatively simple to calculate and to interpret, we prefer the use of the average age of withdrawal. However, depending on the research question being addressed and data available the static and dynamic measures may be more appropriate.

Each method shows that the age of withdrawal has risen over the last five years. We know that, in part, this is due to higher participation rates that are influenced by low unemployment. However, there may be other factors that we cannot account for using LFS data, such as access to government benefits, health and wealth effects.

All three methods suggest that the age of withdrawal from full-time participation is falling relative to the age of withdrawal from the labour force as a whole. It may be that people are looking at part-time work to supplement their income during retirement. Alternatively people may simply enjoy working, but no longer wish to work full-time. This could be a serendipitous outcome for an ageing labour force.

ACKNOWLEDGEMENTS

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The content and presentation of the paper are much improved as a result of their input. The authors would also like to thank Craig Blair for his assistance in obtaining the relevant labour force survey data.

Responsibility for any errors or omissions remains solely with the authors.

BIBLIOGRAPHY

- Australian Bureau of Labour Market Research (1983) *Retired, unemployed or at risk : changes in the Australian labour market for older workers*, AGPS, Canberra.
- Australian Bureau of Statistics (1998) *Retirement and Retirement Intentions, Australia*, cat. no. 6238.0, ABS, Canberra.
- (2001) *Labour Statistics: Concepts, Sources and Methods*, cat. no. 6102.0.55.001, ABS, Canberra.
- (2001) *Year Book, Australia, 2001*, cat. no. 1301.0, ABS, Canberra.
- (2003) *Deaths, Australia, 2002*, cat. no. 3302.0, ABS, Canberra.
- (2003) *General Social Survey: Summary Results, Australia, 2002*, cat. no. 4159.0, ABS, Canberra.
- (2003) *Underemployed Workers, Australia*, cat. no. 6265.0, ABS, Canberra.
- Bacon, B. (1997) “Work, retirement and dependency”, *People and Place*, 5(2), pp. 5–12.
- Carey, D. (1999) *Coping with population ageing in Australia*, Economics Department Working Paper, No. 217, OECD.
- Economic Planning Advisory Commission (1996) *The Changing Australian Labour Market*, EPAC Commission Paper No. 11, AGPS, Canberra.
- Gendell, M. (1998) “Trends in retirement age in four countries, 1965–95”, *Monthly Labor Review*, 121(8), pp. 20–30.
- (2001) “Retirement age declines again in 1990s”, *Monthly Labor Review*, 124(10) pp. 12–21.
- and Siegel, J. (1992) “Trends in retirement age by sex, 1950–2005”, *Monthly Labor Review*, 115 (7), pp. 22–29.
- Korpela, T. and Ranne, A. (2002) *Measuring the Average Retirement Age*, Paper presented to the 27th ICA Conference, Cancun.
- Keese, M. (2003) *A method for calculating the average effective age of retirement*, OECD.
- Latulippe, D. (1996) *Effective retirement age and duration of retirement in the industrial countries between 1950 and 1990*, Issues in Social Protection, Discussion Paper 2, ILO: Geneva.

Ravindiran, R., Rawnsley, T. and Jose, A. (2002) *A Cohort Analysis of Unemployment Rates for Australia*, Paper presented to the 31st Annual Conference of Economists, Adelaide.

Scherer, P. (2002) *Age of withdrawal from the labour force in OECD countries*, Labour Market and Social Policy Occasional Papers, No. 49, OECD.

APPENDIXES

A. FORMULATION OF METHODS AND EXAMPLES OF CALCULATIONS

A.1 Calculation of the static estimate of age of withdrawal

Both the static and dynamic estimates are based on changes in labour force participation rates between younger and older age groups. The participation rate, P , for each five-year age group is calculated as:

$${}_5P_a^y = \frac{{}_5L_a^y}{{}_5N_a^y}$$

where

${}_5L_a^y$ is the number of people in the labour force aged a to $a+4$ in year y ;

${}_5N_a^y$ is the number of people in the population aged a to $a+4$ in year y ; and

the subscript 5 in front of the P , L and N indicates that a five-year age group is used.

The basis of the static estimate is the difference between the participation rates of consecutive age groups at the one point in time. In year y , the difference in the participation rates for each five-age group from 40–44 through to 80–84 are calculated as:

$${}_5P_{a-5}^y - {}_5P_a^y \quad a = 45, 50, \dots, 75, 85.$$

The proportion of total withdrawal in year y which can be attributed to each age group, k , is calculated by dividing these differences by the pre-withdrawal participation rate, ${}_5P_{40}^y$:

$$r_k^y = \frac{{}_5P_{a-5}^y - {}_5P_a^y}{{}_5P_{40}^y} \quad a = 45, 50, \dots, 75, 85.$$

For each age group, k , this proportion is multiplied by a , the age at which withdrawal is assumed to occur and summed (over the nine age groups) to give the expected age of withdrawal, W^y :

$$W^y = \sum_{k=9} r_k^y \times a$$

BOX 4

EXAMPLE OF CALCULATION OF THE EXPECTED AGE OF WITHDRAWAL – STATIC ESTIMATE

Age group in year y	Age at which withdrawal is assumed to occur	Participation rate	Unconditional probability of withdrawing at age a	Contribution to expected age of withdrawal
{1}	{2}	{3}	{4}	{5}
k	a	$P(a,y)$	$\frac{P(a-5,y)-P(a,y)}{P(40,y)}$	{2} × {4}
40–44	40	80
45–49	45	75	0.0625	2.8125
50–54	50	60	0.1875	9.3750
55–59	55	40	0.2500	13.7500
60–64	60	20	0.2500	15.0000
65–69	65	10	0.1250	8.1250
70–74	70	5	0.0625	4.3750
75–79	75	2	0.0375	2.8125
80–84	80	1	0.0125	1.0000
85	85	0	0.0125	1.0625
Sum			1.0000	58.3125

Based on a table in Scherer (2002, page 10).

If there is an age group with a participation rate higher than the 40–44 year age group (most likely the 45–49 year age group) then that participation rate is used as the base for the calculations for the static estimates.

A.2 Calculation of the dynamic estimate of age of withdrawal

The dynamic estimate calculates changes in the labour force participation rates of cohorts over five-year periods. Between year $y-5$ and year y , the proportion of the each five-year cohort not withdrawing from the labour force is calculated from the participation rate, P , as:

$$\frac{{}_5P_a^y}{{}_5P_{a-5}^{y-5}} \quad a = 45, 50, \dots, 75, 85.$$

We then calculate a geometric weight for each age:

$$s_{40} = 1$$

$$s_a = \prod_{k=9}^{a/5} \frac{{}_5P_{5k}^y}{{}_5P_{5k-5}^{y-5}} \quad a = 45, 50, \dots, 75, 85.$$

We then calculate how much withdrawal over each five-year period, can be attributed to each cohort using the following formula:

$$r_k^y = \left[1 - \frac{{}_5P_a^y}{{}_5P_{a-5}^y} \right] s_{a-5}$$

Finally, this is summed over each age group, k :

$$W^y = \sum_{k=9} r_k^y \times a \quad a = 45, 50, \dots, 75, 85.$$

BOX 5								
EXAMPLE OF CALCULATION OF THE EXPECTED AGE OF WITHDRAWAL – DYNAMIC ESTIMATE								
Age group	Participation rates			Probability of not withdrawing at this age		Probability of withdrawing at this age		Contribution to expected age of withdrawal
	Age	1998	2003	Conditional	Unconditional	Conditional	Unconditional	
k	a	$P(a,y-5)$	$P(a,y)$	$\frac{P(a,y)}{P(a-5,y-5)}$	$s(a)=\Pi\{4\}$	$1-\{4\}$	$s(a-5)\times\{6\}$	$\{1\}\times\{7\}$
40-44	40	80	70.000	1.000	1.000	0.000
45-49	45	75	65.625	0.820	0.820	0.180	0.180	8.086
50-54	50	60	52.500	0.700	0.574	0.300	0.246	12.305
55-59	55	40	35.000	0.583	0.335	0.417	0.239	13.159
60-64	60	20	17.500	0.438	0.147	0.563	0.188	11.305
65-69	65	10	8.750	0.438	0.064	0.563	0.082	5.358
70-74	70	5	4.375	0.438	0.028	0.563	0.036	2.524
75-79	75	2	1.750	0.350	0.010	0.650	0.018	1.367
80-84	80	1	0.875	0.438	0.004	0.563	0.006	0.442
85	85	0	0.000	0.000	0.000	1.000	0.004	0.365
Sum							1.000	54.912

Based on a table in Scherer (2002, page 10).

A.3 Calculation of the average age of withdrawal

Average age of withdrawal is calculated using the difference in the estimated size of the labour force, L , aged a in year y and the size of the labour force aged $(a-1)$ in year $(y-1)$:

$$L_{a-1}^{y-1} - L_a^y$$

Then the average age of withdrawal over the year is then calculated as:

$$\frac{\text{Total age of all people withdrawing}}{\text{Total number of people withdrawing}} = \frac{\sum_a (L_{a-1}^{y-1} - L_a^y) \times a}{\sum_a (L_{a-1}^{y-1} - L_a^y)}$$

BOX 6

EXAMPLE OF CALCULATION OF THE AVERAGE AGE OF WITHDRAWAL

Consider a labour force in which we know that no one retires before the age of 45, and everyone retires by age 55. Find the number of people in the labour force at each age and then calculate the amount of withdrawal at each age from one year to the next.

Age	Number of people in the labour force				Number of people withdrawing		
	2000	2001	2002	2003	2000–2001	2001–2002	2002–2003
{1}	{2}	{3}	{4}	{5}	{6}	{7}	{8}
<i>a</i>	<i>L(a, 2000)</i>	<i>L(a, 2001)</i>	<i>L(a, 2002)</i>	<i>L(a, 2003)</i>	<i>L(a,y) – L(a+1, y+1)</i>		
45	40,000	42,000	43,000	45,000			
46	37,050	39,400	39,480	40,850	600	2,520	2,150
47	33,829	34,457	35,460	35,927	2,593	3,940	3,553
48	28,142	27,740	28,427	29,077	6,089	6,030	6,383
49	22,064	21,810	20,805	22,031	6,332	6,935	6,396
50	20,002	21,733	20,501	19,764	331	1,309	1,041
51	16,167	16,402	17,930	16,811	3,600	3,803	3,690
52	14,286	13,742	13,449	14,792	2,425	2,953	3,138
53	13,288	13,286	12,643	12,239	1,000	1,099	1,210
54	12,000	12,500	12,000	11,758	788	1,286	885
55	0	0	0	0	12,000	12,500	12,000
Sum	236,828	243,070	243,695	248,249	35,758	4,237	40,446

Use the withdrawal from three years to smooth the data and then calculate the average age of withdrawal

Age	Number of people withdrawing between 2000 and 2003	Total age of people withdrawing between 2000 and 2003	Average Age of Withdrawal
{1}	{9}	{10}	{11}
<i>a</i>	{6}+{7}+{8}	{1} × {9}	Sum{10} ÷ Sum{9}
45			
46	5,270	242,420	
47	10,086	474,042	
48	18,502	888,096	
49	19,663	963,487	
50	2,681	134,050	
51	11,093	565,743	
52	8,516	442,832	
53	3,309	175,377	
54	2,959	159,786	
55	118,579	2,007,500	
Sum	118,579	6,053,333	51.0

A.4 Estimating the size of the labour force

For the average age of withdrawal method we estimate the size of the labour force using a simple average number of people in the labour force at each age in that year. The estimated size of the labour force aged 45 in an example year is calculated in Box 7.

BOX 7	
EXAMPLE OF CALCULATION OF ANNUAL LABOUR FORCE ESTIMATES	
<i>Month</i>	<i>Size of the labour force</i>
January	128,000
February	132,000
March	133,500
April	131,000
May	132,000
June	132,500
July	132,250
August	132,000
September	131,500
October	132,000
November	131,000
December	120,000
Average size	130,646

In some years, data for all twelve months is unavailable. In those years the size of the labour force is taken to be the average of available months.

B. EFFECT OF NET ENTRIES

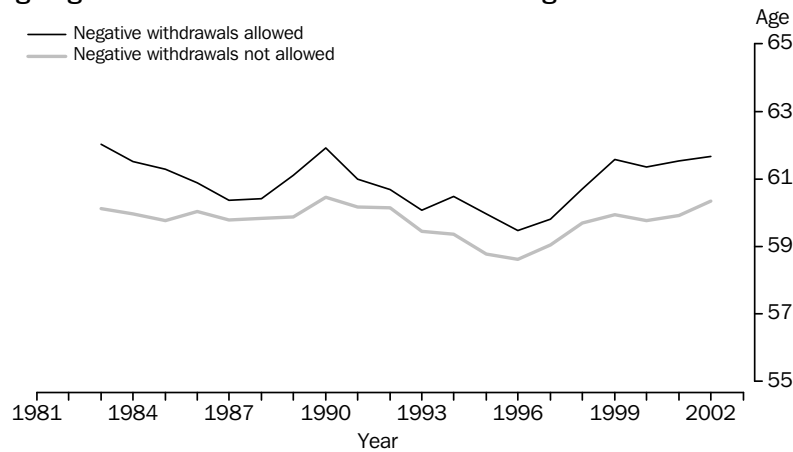
In Section 1.3 it was noted that the results in this paper have been calculated using the assumption that there are no net entries (or negative withdrawals) into to the labour force. If more people are entering than are withdrawing from the labour force, net withdrawal is set to zero.

Algebraically, if $L_{a-1}^{y-1} - L_a^y < 0$

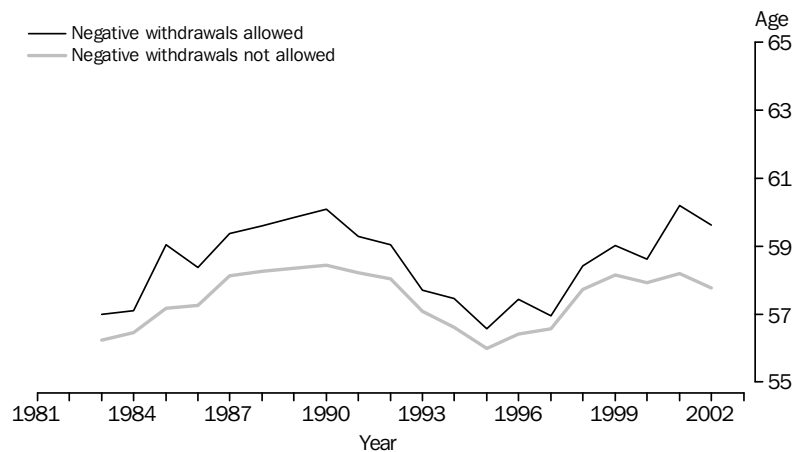
then we set $L_{a-1}^{y-1} - L_a^y = 0$

Figures B.1 and B.2 illustrate the sensitivity of lifting this assumption on the average age of withdrawal for women and men respectively. Of the three methods, the average age of withdrawal is the most sensitive to this assumption.

B.1 Average age of withdrawal – Men: Effect of ‘no negative withdrawals’ assumption



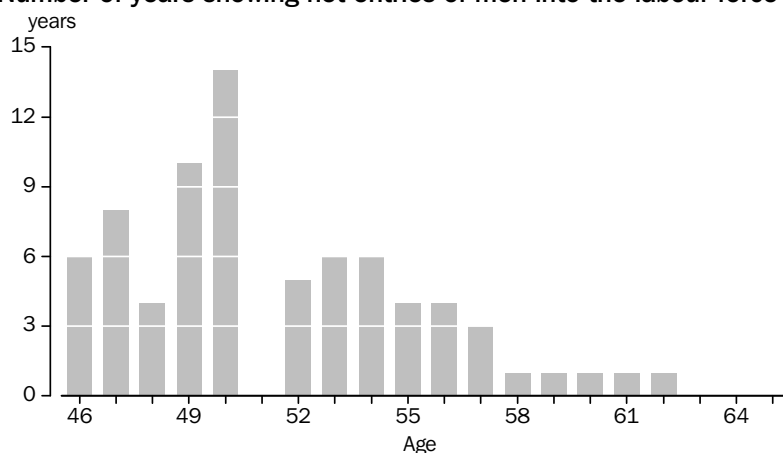
B.2 Average age of withdrawal – Women: Effect of ‘no negative withdrawals’ assumption



In each case, removing the assumption raises the average age of withdrawal. The two series labelled ‘Negative withdrawals not allowed’ are identical to those which appear in the main body of this paper, while the two series labelled ‘Negative withdrawals allowed’ allow net entries to occur.

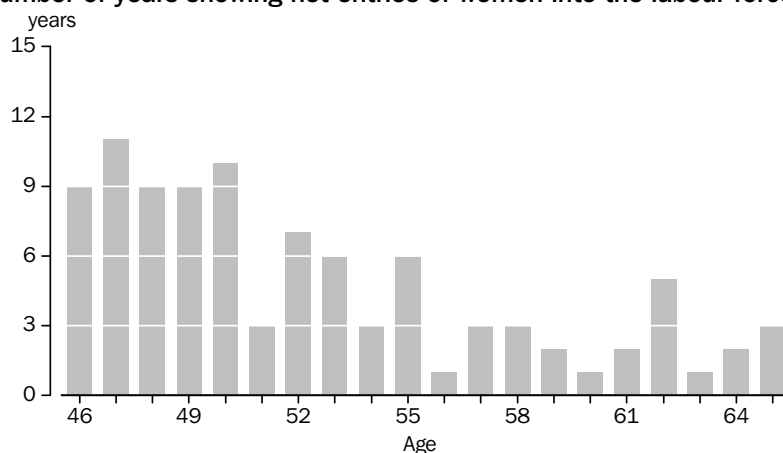
To delve deeper into the phenomenon of negative withdrawal, a matrix was created showing which ages and which years had net entries. In figure B.3 the height of each bar shows the number of years in which there were net entries for that age. For example, 46 refers to the number of net entries between age 45 and 46.

B.3 Number of years showing net entries of men into the labour force by age



In almost every year, men aged 58–66 had few, or no, net entries into the labour force. As these are around the traditional retirement ages of 60 and 65, it is expected that men would be withdrawing at these ages. Another notable feature is the high number of net entries at age 50 and zero net entries at age 51. It is interesting to note that the number of net entries build up after age 51, suggesting that men are leaving for a period and are then gradually returning to some form of work.

B.4 Number of years showing net entries of women into the labour force by age



These graphs have excluded the older ages as there are only a small number of them in the labour force.

There is some evidence of women entering the labour force after childbearing with at least nine years showing net entry at each age between ages 46 and 50.

C. EFFECT OF HAVING 50 AS THE STARTING AGE

The 45–84 years age group was chosen for a number of reasons. Withdrawal from the labour force is more likely to be permanent above the age of 45 than at younger ages, and a number of international studies on labour force withdrawal have used a minimum age of 45 (for example, Scherer, Gendel and Latulippe). A maximum age of 84 years is used in this paper because of the very small numbers of people above this age who participate in the labour force.

Since there are a relatively high number of net entries into the labour between for the age 45–49 for both men and women additional sensitivity analysis was undertaken. The starting age for calculating the average age of withdrawal was lifted from 45 to 50.

Figure C.1 shows that increasing the starting age the analysis from 45 to 50 has a relatively small effect on the average age of withdrawal for men. The largest different between the two estimates is 1.9 years in 1995.

C.1 Average age of withdrawal – Men: Effect of selecting 50 as the starting age

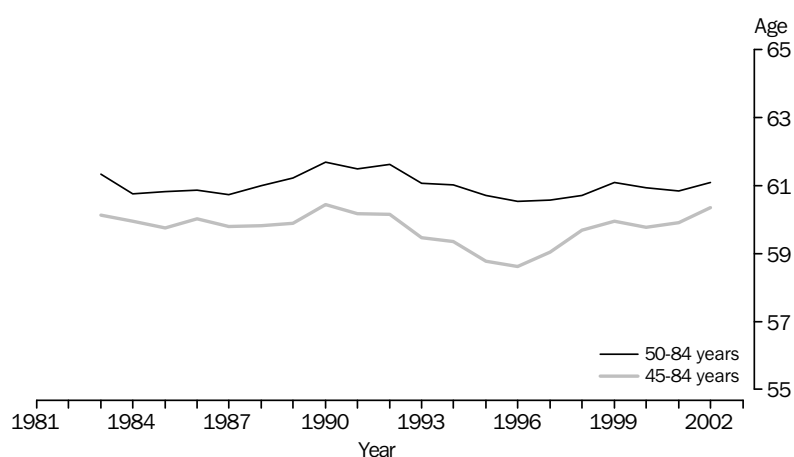
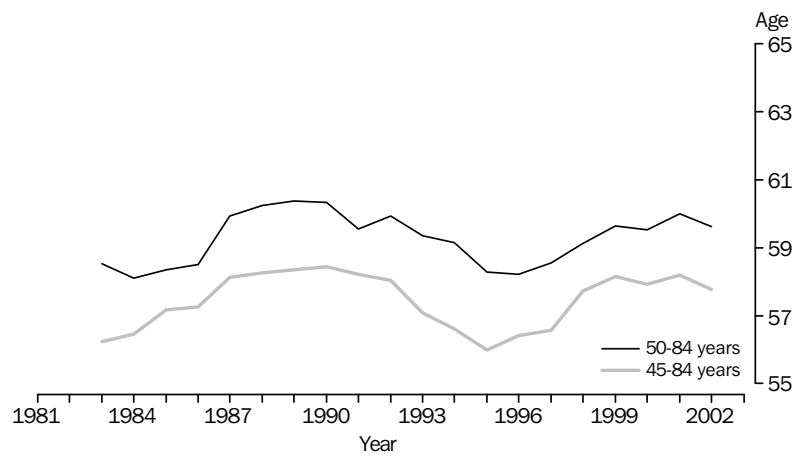


Figure C.2 shows that increasing the starting age of the analysis from 45 to 50 has a larger effect on the average age of withdrawal for women than men. The largest different between the two estimates is 2.5 years in 1994. Overall, increasing the starting age of the analysis from 45 to 50 does not alter the underlying trend in the estimates of the age of withdrawal.

C.2 Average age of withdrawal – Women: Effect of selecting 50 as the starting age

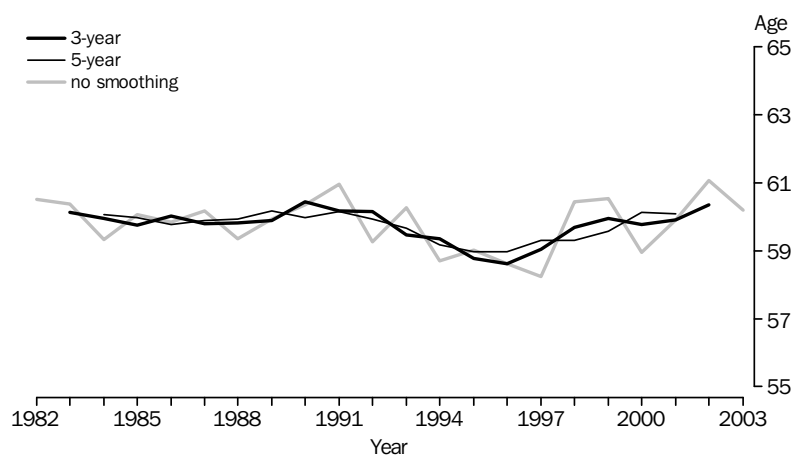


D. EFFECT OF SMOOTHING ACROSS YEARS

Throughout this paper, all estimates of the average age of withdrawal were smoothed over three-year periods. An example of how the data was smoothed over three years was shown in Appendix A, Box 6. In this Appendix, we show the estimates of the average age of withdrawal using no smoothing and smoothing using a five-year moving average.

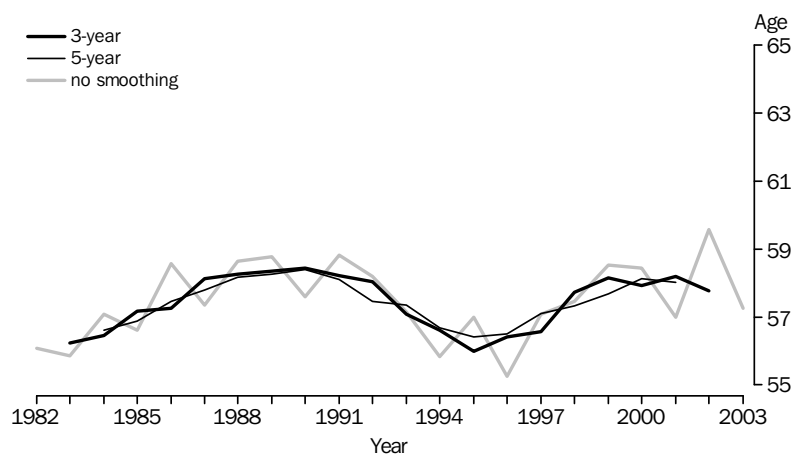
Figures D.1 and D.2 show the results of the three levels of smoothing on the average age of withdrawal from the labour force for men and women respectively. The three- and five-year moving averages show more of the trend in average age of withdrawal rather than year to year fluctuations.

D.1 Average age of men withdrawing from the labour force: Effect of smoothing



As we are most interested in trends over time, the smoothed results are most desirable. Although we do want to look at trends over time, higher levels of smoothing tend to hide some details in the series.

D.2 Average age of women withdrawing from the labour force: Effect of smoothing



Since the five-year moving average does not greatly change the level of smoothing in comparison to the three-year moving average, the three-year moving average is preferred.

E. THE MEDIAN AGE OF WITHDRAWAL

The average age of withdrawal is calculated using the mean age, which is one of the basic measures of central tendency used in statistics. Another measure of central tendency is the median. In this section we investigate the 'median age of withdrawal'. The 'median age of withdrawal' is the middle age of all people withdrawing over the period. For example, if five people aged 55, 57, 60, 62 and 65 withdraw from the labour force between 2002 and 2003, the median age of withdrawal for 2003 is 60.

E.1 Median age of man and women withdrawing from the labour force

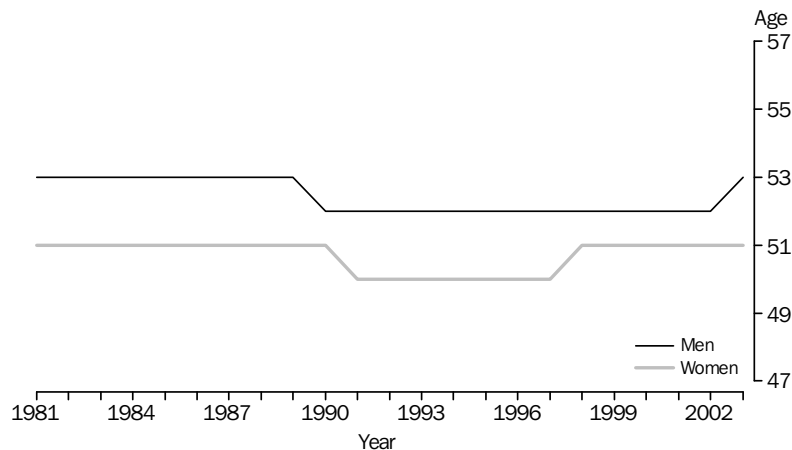
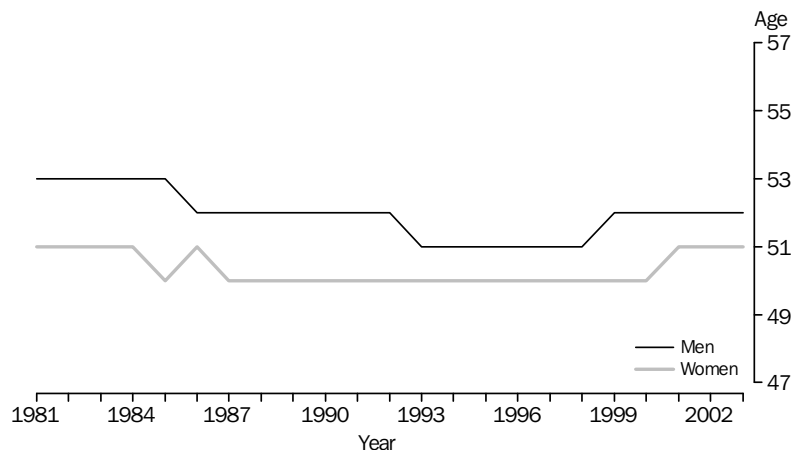


Figure E.1 shows the median age of withdrawal from the labour force for men and women. The median age of withdrawal for men was 53 years between 1981 and 1989. In 1990 the median age of withdrawal for men fell to 52 years and remained at this level until 2003 when it rose to 53 years. Apart from the seven year period from 1991–1997, the median age of withdrawal for women has been at 51 years. Between 1991–1997 the median age of withdrawal for women fell to 50 years.

E.2 Median age of men and women withdrawing from the full-time labour force



In figure E.2, the median age of withdrawal from the full-time labour force shows more variation than age of withdrawal from the total labour force.

Between 1981 and 1985 the median age of withdrawal from the full-time labour force for men was 53 years. In 1986 the median age of withdrawal from the full-time labour force for men fell to 52 years and remained at this level until 1992 when it fell to 51 years. It remained at this level until 1999 when it increased to 52 years.

The median age of withdrawal for women from the full-time labour force was 51 years in 1981. Between 1987 and 2000 the median age of withdrawal for women from the full-time labour was 50 years. In 2001 the median age of withdrawal for women from the full-time labour force increased to 51 years.

F. UNIFORM WITHDRAWAL ASSUMPTION

The methods of calculating the age of withdrawal from the labour force described in this paper make use of the assumption that on average all withdrawal between two age groups a and $(a+n)$ will occur at exact age $(a+n)$. For both single- and five-year age groups a is the minimum of the age group. For single-year age groups n takes the value of 1 and for five-year age groups n takes the value of 5.

Although it is preferable to use single-year data, data restrictions may mean that the age of withdrawal needs to be calculated using five-year age groups rather than single year age groups. A simple example in Box 8 shows that aggregating the data can have a large effect on the estimated age of withdrawal.

BOX 8

EXAMPLE OF CALCULATING AGE OF WITHDRAWAL USING SINGLE YEARS OR FIVE-YEAR AGE GROUPS

Consider a labour force in which we know that no one retires before the age of 50, and everyone retires by age 55.

42% of withdrawal in this labour force occurs between age 50 and age 51.

9% of withdrawal in this labour force occurs between age 51 and age 52.

12% of withdrawal in this labour force occurs between age 52 and age 53.

18% of withdrawal in this labour force occurs between age 53 and age 54.

19% of withdrawal in this labour force occurs between age 54 and age 55.

The total number of people withdrawing is 100.

Using single years of age:

The total age of all people withdrawing is

$$(51 \times 42) + (52 \times 9) + (53 \times 12) + (54 \times 18) + (55 \times 19) = 5,263 \text{ years}$$

The average age of withdrawal is $(5,263 \div 100) = 52.63$ years.

Using five year age groups:

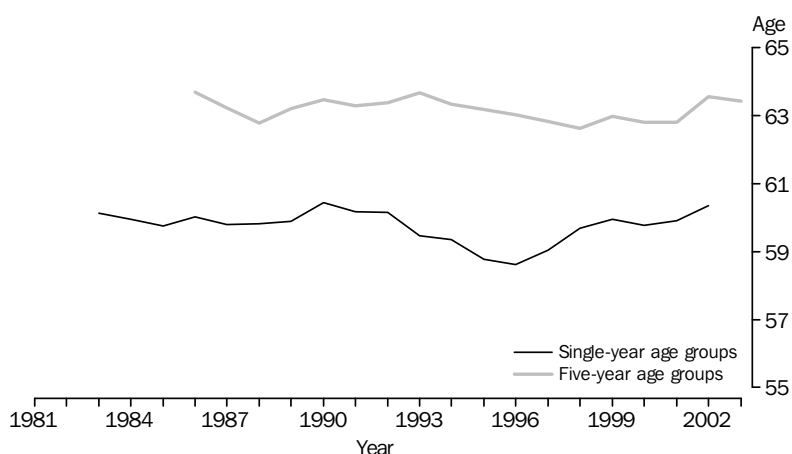
100 people are in the labour force at age 50–54

0 people are in the labour force at age 55–59

It is assumed that the average age of withdrawal is 55 years

The analysis in this paper used data with single-year age groups. To aid comparison with other research the average age of withdrawal was also calculated using five-year age groups. Using the five-year age groups produced a consistently higher average age. Figure F.1 shows the average age of withdrawal from the labour force for men using both the single-year (three-year smoothed) and five-year estimates. Using data with five-year age groups produces estimates which are consistently three or four years higher than the estimates from data using single-year age groups.

F.1 Average age of withdrawal from the total labour force – Men



The five-year age group estimates are made using the assumptions that withdrawal is uniform over the age groups and on average people will withdraw at exact age $(a+5)$.¹⁴ An example of these assumptions is that all withdrawal between the age groups 55-59 and 60-64 will occur at age 60. However, it is known that people tend to withdraw at some ages more than others. This may be because of tradition, legal requirements or because of financial systems.

To test the assumption of uniform withdrawal in five-year age groups, LFS data from 1985 to 2003 was used to find the average number of men withdrawing at each single year of age over the period. For example, table F.2 shows that an average of 17,065 men aged 50–55 withdrew each year between 1985 and 2003. The table also shows that withdrawal within this age group was not uniform. On average, 49% of the age group withdrew between ages 50 and 51 and only 9% between ages 51 and 52.

¹⁴ See section 1.3 for more details on the assumptions.

F.2 Average withdrawal of men in single year ages for men aged 50–55 years from 1985 to 2003

<i>Age of withdrawal</i>	<i>Average withdrawal</i>	<i>Percent of withdrawal</i>
51	7,167	42%
52	1,501	9%
53	2,064	12%
54	3,130	18%
55	3,203	19%
Sum	17,065	100%

Table F.3 shows that this lack of uniform withdrawal occurs in most of the five-year age groups. Net withdrawal disproportionately occurs at the younger ages. Only in the 55–59 and 60–64 age groups does more withdrawal occur at older ages. This means that the assumption of uniform withdrawal within five-year age groups tends to push estimates of the age of withdrawal upwards.

F.3 Average withdrawal of men aged 45-84 within five year age groups from 1985 to 2005

<i>Age of withdrawal</i>	<i>45–49</i>	<i>50–54</i>	<i>55–59</i>	<i>60–64</i>	<i>65–69</i>	<i>70–74</i>	<i>75–79</i>	<i>80–84</i>
1st age	24%	42%	18%	21%	39%	29%	30%	27%
2nd age	20%	9%	17%	13%	16%	17%	16%	19%
3rd age	34%	12%	19%	15%	11%	16%	22%	23%
4th age	19%	18%	18%	17%	22%	24%	12%	20%
5th age	3%	19%	28%	35%	11%	14%	19%	11%
Average withdrawal	8,400	17,000	21,200	26,800	8,600	2,850	2,100	800

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