Demographic change and population ageing: implications for labour supply and economic growth in a city State - South Australia

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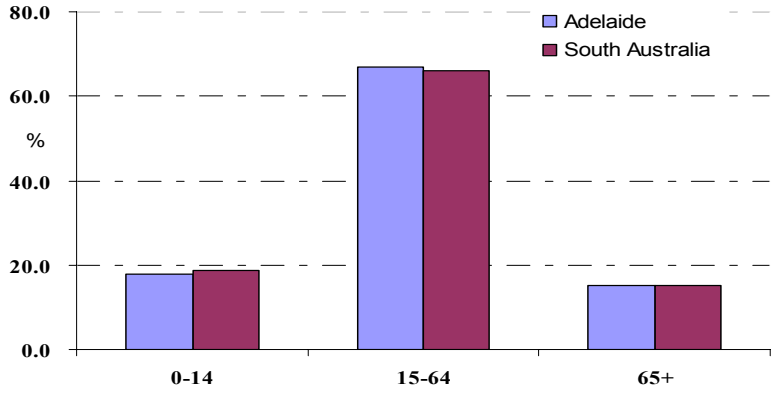
Abstract: South Australia is a city-State with the oldest demographic age structure of all the States and Territories in Australia. Its population is ageing at a faster rate than the nation as a whole. The older age structure and rapid ageing process implies a more substantial policy challenge for Adelaide and South Australia. The paper explores the effects of demographic change and population ageing on labour force participation rates and economic growth for South Australia and the nation as a whole. Through detailed examination of the evolution of the age structure, this paper aims to identify the nature and direction of the changes of labour supply that are likely to flow from population ageing. Secondly, the implications of demographic change and associated changes in labour supply for economic growth are also explored.

1 Introduction

South Australia is experiencing significant population ageing which is set to accelerate over the next two decades. This will have a major bearing on future rates of economic growth and labour force participation. This paper seeks to better quantify the dimensions of these changes to help inform measured policy responses.

The proportion of the population aged 65 and over has risen from 10.6 percent in 1981 to 15.2 percent in 2005. According to the population projection (series B) prepared by Australian Bureau of Statistics (ABS, 2003) this proportion will increase to 21.9 percent in 2021 and further to 29.9 percent in 2051. Compared with the nation and other States and Territories, South Australia has the oldest population structure. The proportion of elderly in South Australia was 16 percent higher than the nation in 2005 and will be 17 percent higher in 2021.[1] Factors accounting for this difference include the relatively slow natural growth of population, a net loss from interstate migration, especially the out-migration of young adults and low immigration intake (Hugo, 2006). Since the participation rate of the elderly population is much lower than that of the prime-age population, ageing of the population will reduce the aggregate labour force participation rate (ALFPR). Low growth of the working age population driven by the low fertility rate and net interstate migration, combined with the declining ALFPR, will put downward pressure on labour supply, which has significant implications for sustained economic growth in South Australia and Adelaide in particular.

Figure 1: The age structure of Adelaide and South Australia in 2006



Source: ABS, cat. No. 2003.0 (2007)

An analysis of aggregate data for South Australia is of special significance for the State's capital city. South Australia's population is overwhelmingly concentrated in Adelaide. Around three quarters (73 per cent) of the State's population resided in the Adelaide Statistical Division (SD) in June 2006. This proportion has remained relatively static since June 1996. The age structure of Adelaide is very similar to that of the State. As Figure 1 shows, in 2006, the proportion of the young population aged 0-14 in Adelaide is 18 percent, while it is just 0.69 percent higher for the State as a whole. Though the

[1] The proportion of elderly was 13.1 percent in 2005 in Australia and it will increase to 18.7 per cent in 2021 and 25.8 percent in 2051(ABS, 2003 and 2006).

proportion of the working age population in Adelaide (66.92 percent) is slightly higher that that of State proportion (66.2 percent), there is almost no difference in the proportion of the old population (the proportion of old population in Adelaide is 15.12 per cent, while it is 15.19 per cent for South Australia. The difference is only 0.07 percent).

The process of population ageing in Adelaide has shown a very similar pattern to the State's. Table 1 shows that both Adelaide and South Australia have experienced a declining proportion of the young population and increasing proportion of the old population during the last ten years. As a city state, the evolutional pattern of the age structure of South Australia in the next four decades will also be dominated by the changes taking place in the age structure in Adelaide. As a consequence the implications for the State's labour supply and economic growth of demographic change and population ageing in South Australia are principally implications for Adelaide. For ease of comparison the quantitative analysis in this paper focuses on South Australia compared to the nation.

Over the past two decades, emerged a robust body of literature examining the implications of population ageing for labour markets, public sector budgets and macroeconomic growth.[2] The "Economic implications of an ageing Australia" released by the Productivity Commission provided insights into the challenges and opportunities arising from an ageing Australia. Cohort analysis was used to project the age and sex specific labour force participation rates for Australia over the period of 2005-2045. The findings of the report reflect not only the impact of demographic change on participation rates but also the effects of cultural, educational and technological factors.

Table 1: the Change of age structure in Adelaide and South Australia

	1996	2001	2006
0-14			
Adelaide	19.7	18.9	18
South Australia	20.7	19.7	18.7
15-64			
Adelaide	66.2	66.5	66.9
South Australia	65.5	65.8	66.2
65+			
Adelaide	14.1	14.6	15.12
South Australia	13.9	14.5	15.19

Source: ABS, cat. No. 2003.0 (2007)

Building on this body of work, this paper will pay particular attention to the effect of demographic change on labour force participation rates, and therefore on the growth of labour supply in Australia and South Australia. Through a detailed examination of the evolution of the age structure, this paper aims to identify the nature and direction of the changes in labour supply that are likely to flow from population ageing. Secondly, the implications of a demographic shift and associated change of in labour supply for economic growth will also be explored.

The paper is divided into six sections including this introduction. Section 2 provides an overview of the demographic shift and changing age structure change over the past 40 years (1961 to 2001). The projected demographic change over the period of 2001 to 2051 is also addressed. Section three explores the contribution of demographic change to economic growth during the 1961 to 2005 period. Projections on the potential impact of future changes in age structure on economic growth are provided. The effects of a demographic shift on labour force participation rates and future labour supply are investigated in section four. The induced loss of economic growth from demographic forces over the period of 2001 to 2051 is estimated in section five. Section 5 outlines a number of broad conclusions.

2 Demographic shifts and age structure changes in South Australia and Australia

Population ageing will have profound implications for both the supply of and the demand for labour over the next two decades. In the absence of appropriate policy responses a labour market mismatch is likely to arise. Changes in age structure affect labour supply in two ways. First, the declining share of working age population will directly reduce the total size of the labour supply. Second, it will indirectly affect the supply of the labour force through its effect on the labour force participation rate.

[2] Masson and Tryon, 1990; Turner et al. 1998; OECD 1997, 1998a; McMorrow and Roeger, 1999, Börsch-Supan, 2002, Chapman and Kapuscinski,2003, Dixon, 2003 and Fougère, Mérette and Zhu, 2006 and etc.

This section provides an overview of changes in the age structure of South Australia and Australia for the period of 1961-2001. Projections for the 2001 to 2051 are also examined.

2.1 The evolution of the age structure in Australia and South Australia

Australia's total fertility rate (TFR) has declined since 1962 when it peaked at 3.5 during the post Second World War 'baby boom'. Since the mid-1970s the total fertility rate has been well below the replacement rate. According to the 2001 population census, the TFR is 1.73 in Australia and 1.68 in South Australia.

The high fertility rate during the 'baby boom' period increased the proportion of the young population aged 0-14 to 30.3 percent and reduced the share of the working age population to 61.2 percent in 1961 in Australia (Table 1).[3] The proportion of elderly experienced a slight increase during the 'baby boom' period. South Australia displays a similar trend to the nation as a whole.

When the population bulge of the 'baby boom' progressed to the working age, the share of working age population increased. Table 2 shows that the proportion of the working age population increased from 61.2 per cent in 1961 to 63 per cent in 1971. This trend has continued during last 40 years and is set to reach a peak of 67.1 per cent in 2011 in Australia. The proportion of the working age population will then begin to decline when the 'baby boom' generation begins to enter retirement age. In 2051, the proportion will decline to less than 60 per cent in both Australia and South Australia.

The rising share of the working age population during 1961 to 2011 is accompanied by a declining share of the young population aged 0-14. Table 1 shows that the proportion of young population aged 0-14 has declined from 30.3 per cent in 1961 to 20.5 per cent in 2001 in the nation as a whole. In South Australia, it has declined to less than 20 per cent. The share of the young population will continue to declining to 18 per cent in 2011 and 15 per cent in 2051 for the nation, while it will fall to less than 14 per cent in South Australia.

Table 2: Changing age structure in Australia and South Australia (Per cent)

Year	Proportion of 0-14 years old population		Proportion of 15-64 years old population		Proportion of 65 and over population	
	Australia	SA*	Australia	SA*	Australia	SA*
1951	27.2	28.9	64.8	62.2	8.1	8.9
1961	30.3	31.1	61.2	60.1	8.5	8.8
1971	28.7	28.8	63.0	62.7	8.3	8.5
1981	24.9	23.6	65.3	65.8	9.8	10.6
1991	21.9	20.7	66.8	66.4	11.3	12.9
1996	21.4	20.3	66.6	65.7	12.0	14.0
2001	20.5	19.3	66.9	66.1	12.6	14.6
2011	18.3	17.0	67.1	66.1	14.6	16.9
2021	16.9	15.6	64.4	62.5	18.7	21.9
2031	16.1	14.9	61.5	58.6	22.4	26.5
2041	15.5	14.2	59.9	56.9	24.6	28.9
2051	15.1	13.8	59.1	56.3	25.8	29.9

Source: ABS (2006) for historical data (1951 to 2001) and ABS (2003) for future data (2001 to 2051)
* SA represents South Australia

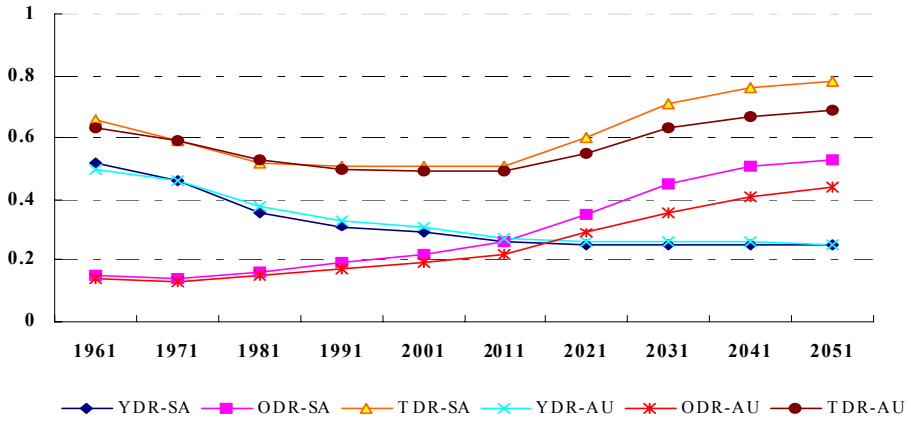
The opposite movement of the shares of the working age population and of the young population, combines with the relatively small rise in the share of the elderly population to drive the total dependency ratio down.[4] Figure 2 shows that the total dependency ratio declined to less than 0.6 in 1971 and is set to reach its lowest point at around 2001 to 2011. After that, it will increase to around 0.69 percent in 2026 in Australia and 0.78 in South Australia in 2051 as a result of the accelerated rise

[3] The proportion of the population aged 0-14 was 24.2 percent and the share of working age population was 68.4 percent in 1941.

[4] Total size of population aged 0-14 divided by the total size of working age population aged 15-64 gives the result of the youth dependency ratio. Total size of population aged 65 and over divided by the total size of working age population gives the result of the old dependency ratio. Total dependency ratio is the sum of youth dependency ratio and older dependency ratio.

of the old dependency ratio.[5]. The relatively low total dependency ratio (of less than 0.6) will last for around fifty years in South Australia (1971 to 2021) and about fifty-five years in Australia (1971 to 2026). This period of low total dependency ratio is called the 'demographic dividend' or 'demographic window' because it provides an opportunity for an accelerated pace of economic growth.[6] But the 'demographic dividend' is time limited and the sharp increase of the total dependency ratio will turn the "demographic dividend" into the "demographic burden". For Australia, there will be approximately 20 years before the total dependency ratio surpasses 0.6, while for South Australia there will be only 15 years.

Figure 2: Old and total dependency ratio in Australia and South Australia



Source: Authors calculation based on the data from ABS (2006) and ABS (2003).

2.2 Comparison between Australia and South Australia

The pattern of demographic shift in South Australia is consistent with the nation as a whole (Table 2and Figure 2). However, the share of the working age population in South Australia has been consistently lower than the nation since 1961 (the only exception is in the year 1981) and the gap has gradually widened since the beginning of this century. By 2051, the share of working age population in South Australia will be 5 per cent lower than in the nation as a whole. Meanwhile, the proportion of the elderly has been higher in South Australia than in the nation and the process of ageing in South Australia has been slightly faster. For example, from 1981 to 2001, South Australia experienced a 38 per cent increase in the proportion of its elderly population, while the proportion of the elderly in the nation only increased by 29 percent. By 2051 the share of the elderly population in South Australia will reach 30 per cent, which will be four percentage points higher than for the nation as a whole.

The higher share of the elderly population combined with the lower share of the working age population will create a higher old dependency ratio in South Australia (Figure 2). The old dependency ratio was 22 percent in South Australia in 2001 and 19 percent for the nation. With a faster process of ageing in South Australia, the differential will expand to 17 percent in 2051. According to ABS population projection series B, the old dependency ratio will surpass the youth dependency ratio in South Australia around 2010, however, the nation as a whole will experience this crossover about five years late. Since the difference between the youth dependency ratio for South Australia and the nation is very small, the higher total dependency ratio mainly reflects the higher old dependency ratio in South Australia. By 2051, the total dependency ratio will nearly reach 0.8 in South Australia while it will be less than 0.7 for the nation. The older age structure and relatively fast

[5] The youth dependency ratio has kept declining over the historical period and will keep declining to 0.25 in 2051, which is only around half of the level in 1961. The old dependency ratio has kept increasing but at a very low rate over the period of 1961 to 2011. But after 2011, rise of the old dependency ratio will accelerate because of the 'baby boom' generation entering retirement age.

[6] In the developing countries, especially in East and South East Asian countries, rapid demographic shift caused by a dramatic fertility decline within a very short time create a 'demographic window' or 'demographic dividend' with the features of total dependency ratio below 0.5. For example, the 'demographic widow' in China opens at 1990 and will expect to shut at around 2020s. The lowest total dependency ratio is 0.38 according to the United Nations' medium variant population projection. The empirical analysis conduced by Bloom and Williamson (1998) indicates that demographic transition has contributed substantially to East-Asia's so-called economic miracle. Population dynamics account for somewhere between 1.4 and 1.9 percentage points of East Asia's annual growth in GDP per capita from 1965-1990, or as much as one-third of observed economic growth during this period.

ageing imply that South Australia will face a more severe challenge for its sustained economic growth in the near future.

3 Economic implications of the demographic shift

South Australia like Australia as a whole is experiencing changes in its age structure. The share of its population concentrated in the working ages has been rising since 1961 (Table 2 and Figure 2). According to the theory of population economics, this development has a direct, favourable effect on per capita income. Given fixed output per worker, labour force participation rates and unemployment rates, a rise in the share of the working age population will lead, as a matter of simple algebra, to an increase in output per capita.[7] Similarly, when this favourable age structure disappears around 2010s, a decline in the share of working age population will exert negative impact on output per capita. A series of empirical studies based on aggregate level panel data has provided support for the above hypothesis (Bloom and Williamson, 1998, Bloom and Canning, 2001 and Bloom, Canning and Sevilla, 2003). Applying the empirical findings of Bloom and Williamson (1998) we can estimate the contribution of favourable age structure change to economic growth during the 1961 to 2001 period and project the impact of population ageing over the period of 2001 to 2051 on economic growth for both South Australia and Australia.

Based on a conventional Solow-Swan model of economic growth (Barro and Sala-i-Martin, 1995), Bloom and Williamson (1998) developed an econometric model and used seventy-eight countries' data covering the quarter century from 1965-1990 to explore the effect of population growth and age structure change on economic growth. Their empirical study finds that the growth of the working age population has a powerful, positive impact on GDP per capita: an increase of one per cent in the growth rate of the working age population is associated with an increase of 1.2 to 2.0 per cent in the growth rate of GDP per capita. While the coefficient of the growth rate of the total population is negative, statistically significant and almost as large: an increase of one per cent in the growth rate of the overall population is associated with a decrease of 0.78 to 1.88 per cent in the growth rate of GDP per capita. Based on the empirical findings, their conclusion regarding the economic impact of the demographic transition is that economic growth is more rapid when the growth rate of the working age population exceeds that of the population as a whole (for example East Asia's rapid economic growth during the 1960s to the 1990s); and economic growth is somewhat less rapid when the growth rate of the working-age population falls short of that of the entire population (For example Japan's stagnant growth in recent years).

Table 3: Annual growth rates of population and working age population in South Australia and Australia (per cent)

Period	Australia			South Australia		
	Population	Working age population	Dependent population	Population	Working age population	Dependent population
1961-1971	2.20	2.50	1.72	2.16	2.58	1.49
1971-1981	1.34	1.70	0.69	0.95	1.44	0.07
1981-1991	1.48	1.71	1.02	0.93	1.02	0.75
1991-2001	1.17	1.18	1.14	0.44	0.40	0.54
2001-2011	1.12	1.15	1.05	0.42	0.42	0.41
2011-2021	0.96	0.53	1.78	0.31	-0.26	1.33
2021-2031	0.77	0.31	1.56	0.15	-0.49	1.14
2031-2041	0.53	0.27	0.93	-0.12	-0.41	0.28
2041-2051	0.36	0.23	0.56	-0.30	-0.42	-0.16
1961-2001	**1.55**	**1.77**	**1.14**	**1.12**	**1.36**	**0.71**
2001-2051	**0.75**	**0.20**	**1.18**	**0.09**	**-0.23**	**0.60**

Source: Authors calculation based on the data from ABS (2006) and ABS (2003).

Table 3 displays the annual average growth rates of the total population, the working age population and the total dependent population from 1961 to 2051 in South Australia and Australia. We found that:

- The growth rate of the working age population has been and will keep exceeding that of the total population till 2011 in both Australia and South Australia (except 1991 to 2001 in South Australia). After 2011 the growth of the working age population will be slower than that of the total population. This reverse reflects accelerated ageing.

[7] This is called 'Demographic dividend' as we discussed in section two.

- Secondly, the nation's population and working age population will keep increasing, though at a very low rate, during the first fifty years of this century. However, in South Australia the working age population will begin to decline after 2011 and the total population will begin to shrink after 2031.
- Thirdly, the growth of South Australia's total population and the working age population is much slower than that of the nation, especially in the 1990s when the growth of the working age population is only slightly more than one third of the nation's growth.

Table 4 displays the results of the estimated contribution of age structure change to economic growth for the 1961 to 2001 period and the projected effect of population ageing on economic growth for the 2001 to 2051 period. From 1961 to 2001, the favourable evolution of the age structure (rise in the share of the working age population and the higher growth rate of the working age population) has contributed 0.38 -1.00 percentage points of the annual growth of per capita GDP in Australia. South Australia benefits less than the nation because of its relatively older age structure. Demographic change accounts for 0.40-0.83 percentage points of annual economic growth.

The growth in GDP per capita attributable to demographic influences is projected to be negative between 2001 and 2051 in both Australia and South Australia. The reason is that the growth of the working age population is slower than the growth of the total population as a result of population ageing. That is, the rising share of the elderly population and declining share of the working age population will reduce 0.04 to 0.49 percentage points of the growth of GDP per capita annual in the nation from 2001 to 2051. The demographically induced loss in growth is projected to be even larger in South Australia because of its older age structure and relatively faster ageing. If nothing happens to offset it, demographic ageing will induce a decline of 0.43 to 0.63 percentage points in the growth of GDP per capita per year in South Australia over the period of 2001 to 2051.

Table 4: Contribution of demographic change to the economic growth

	Average growth rate of population	Average growth rate of working age population	Average growth rate of dependent population	Estimated contribution			
				1a*	1b*	2a*	2b*
1961-2001							
Australia	1.55	1.77	1.14	0.57	1.00	0.45	0.38
South Australia	1.12	1.36	0.71	0.55	0.83	0.47	0.40
2001-2051							
Australia	0.75**	0.50**	1.18**	-0.43	-0.04	-0.49	-0.42
South Australia	0.09**	-0.23**	0.60**	-0.62	-0.43	-0.63	-0.54

* Bloom and Williamson (1998) develop four models to estimate the effects of growth in the population and working age population on economic growth. The difference between models 1a, 2a and 1b, 2b is that models 1b and 2b includes three additional variables: life expectancy and two economic geographic variables. The difference between models 1a, 1b and 2a, 2b is that models 1a and 1b separately estimate the coefficient of growths of working age population and the coefficient of growth of total population, but models 2a and 2b estimate the coefficient of the difference in the growth rate of working age population and of total population. Their empirical results are: coefficient of growth of working age population at models 1a, 1b, is 1.94 and 1.36, respectively. The coefficient of growth of total population at models 1a and 1b is -1.87 and -1.01, respectively. The coefficient of the difference in the growth rate of working age population and total population at models 2a and 2b is 1.97 and 1.68, respectively.

** The data are the projected growth rate based on the ABS' Population Projection Series B (ABS, 2003)

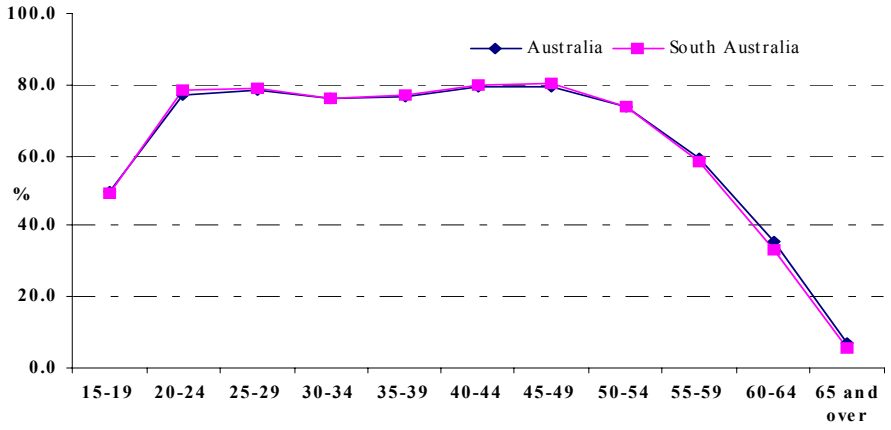
4. Effect of demographic change on labour force

Since not all of the working age population is economically involved in the labour market, the growth of the labour force (or economically active population), which is determined by the age and sex specific participation rates, is more important than that of the working age population. Bloom and Williamson (1998) did not distinguish the economically active population from the working age population in their empirical studies. If the age and sex specific labour force participation rates are kept constant every year, then the growth rate of the working age population will be the same as that of the economically active population. However, the fact is that the labour force participation rate of the elderly population is much lower than that of the prime-age population. Ageing of the population will slow down the growth of the economically active population not only directly through the declining growth of the working age population but also indirectly through reducing the aggregate labour force participation rate (ALFPR). With the negative effect of population ageing on the aggregate labour force participation rate, the growth rate of the economically active population would be lower than that of working age population. Thus, the estimation conducted in section three which ignores this effect may

under-estimate the negative impact of population ageing on economic growth over the period of 2001 to 2051. In this section we will re-project the economic implications of demographic change. First we will investigate the impact of demographic change on the labour force participation rate and estimate the growth rate of the economically active population.[8] Based on the result we will then re-project the implications of demographic shift for economic growth.

Changes in the demographic structure have been demonstrated to have important influences on a variety of labour market indicators in the OECD and some developing Asian countries. In terms of the labour force participation rates[9], the most important demographic development now under way in Australia as in other OECD countries is the rising share of the elderly population and declining share of the working age population as shown in Tables 2 and 3 and Figure 2.

Figure 3: Age-specific labour force participation rate 2001



Source: ABS (2006)

The influence of the ageing of the population on the aggregate labour force participation rate (ALFPR) arises because of the typical life-cycle patterns of labour force participation which are illustrated in Figure 3. The participation rate in 2001 for the nation as a whole rises from approximately 50 per cent for the population aged 15 to 19, to close 80 per cent for those in their twenties. Participation rates then edge down for those in their thirties and rise again to a peak in for those in the forties. From age 50, participation rates begin to drop off sharply and reach around seven percent in their middle sixties. The much lower participation rate of the elderly implies that as more of the population shifts into older age groups (population ageing), aggregate participation rates will decline. This will occur notwithstanding a continued projected rise in female age-specific participation rates and labour market involvement by older people generally (Banks, 2005).

Following Dugan and Robidoux, we use a simple accounting framework to estimate the effect of the demographic shift on the aggregate labour force participation rate in Australia and South Australia from 2001 to 2051 based on the population projection data (Series B) prepared by ABS in 2003.

The aggregate labour force participation rate in any year can be defined as the following equation:

$$PR_t = \sum_{i=1}^{j} s_{i.t} PR_{i,t} \qquad (1)$$

$$s_{i,t} = WP_{i,t} / WP_t \qquad (2)$$

Where PR_t is the ALFPR in year t, $PR_{i,t}$ is the participation rate of cohort i in year t, and $s_{i.t}$ is the share of cohort i in the total working age population aged 15 and above, WP_t, in year t. We identify ten 5-year sex-specific cohorts and one 65 and above sex specific cohorts in the analysis (i =1, 2,…11). Equation (1) shows that changes in the ALFPR reflect either changes in cohort (age and sex

[8] The labour force participation rate measures the proportion of a defined population that is in the labour force. In Australia, the common definition of aggregate labour force participation rate (ALFPR) is the proportion of the population aged 15 and over who are employed or unemployed, where 'employed' includes full-time and part-time workers. The ALFPR is the sum of the labour force participation rate of specific age- gender groups weighted by the proportion that each of those groups comprise within the aggregate population (DTF, 2005).

[9] Examples include Dugan and Robidoux, 1999, Ip, King and Verdier, 1999 and Boersch-Supan, 2001.

specific) participation rates or changes in the composition of the working age population for given cohort participation rates - the 'demographic composition effect'.

Many social, economic and cultural factors influence the cohort participation rates. In this section we ignore such changes and only calculate the demographic composition effect.

The data from the labour survey prepared by ABS show that the ALFPR was 60.5 per cent in Australia and 58.7 in South Australia in 2001. Detailed cohort and sex specific participation rates in 2001 in Australia and South Australia are shown in Tables A1 and A2 in the annex. We estimate the demographic composition effect from 2001 to 2051 by assuming that the cohort participation rates remain at their 2001 level. It is convenient to define the demographic composition effect with the following equation:

$$\overline{PR_t} = \sum_{i=1}^{j} s_{i.t} PR_{i,01} \qquad (3)$$

$\overline{PR_t}$ is the aggregate participation rate that would have been observed at time t if all cohort participation rates remain at their 2001 levels. The annual average demographic composition effect between year t and year t+k is then simply defined as:

$$dce_{t,t+k} = \left(\overline{PR_{t+k}} - \overline{PR_t}\right)/k \qquad (4)$$

A negative (positive) demographic composition effect indicates source population has moved, on average, from age cohorts with higher (lower) than average participation rates to age cohorts with lower (higher) than average participation rates over a given period (Dugan and Robidoux, 1999). Therefore, a negative demographic composition effect would reduce the aggregate structural participation rate, while a positive demographic composition effect would increase it.

4.1 Demographic composition effect in Australia

Table 5 summarizes the average annual demographic composition effect in Australia and South Australia over the period of 2001 to 2051. With the cohort participation rates remaining at their 2001 level, the overall change in the age distribution (the declining share of prime-age population and increasing share of old age population) exerts a negative effect on the aggregate labour force participation rate. For instance, demographic shift will reduce 0.22 percentage points of the aggregate labour force participation rate annually in Australia from 2001 to 2011. The largest negative impact will occur over the period of 2011 to 2031: Australia will lose 0.32 percentage points of its labour force participation rate annually.

Table 5: Average annual demographic composition effect (Percentage point)

Period	Effect		Period	Effect	
	Australia	SA		Australia	SA
2001-2011	-0.22	-0.26	2031-2041	-0.23	-0.28
2011-2021	-0.26	-0.32	2041-2051	-0.21	-0.24
2021-2031	-0.26	-0.32			

Source: Authors calculation

Tables 6 and 7 display the detailed contribution of each age group to the overall changes of ALFPR (compared with the corresponding level in 2001) in Australia and South Australia. We notice that both young population (age groups 15-19 and 20-24) and prime age population (age groups 25 to 34, 35 to 44 and 45 to 54) groups make a negative contribution to the ALFPR. This reflects the declining shares of these age groups. With the process of ageing, the negative impacts of these age groups on the ALFPR become larger. For example, the declining share of age group 35-44 will induce the ALFPR to decline by 2.34 percentage points in 2021 and 3.82 percentage points by 2051. Although the increasing share of the elderly will make a positive contribution to the ALFPR, their contributions are very small. The declining shares of prime age population groups will dominate the change in the ALFPR.

In summary, if the cohort participation rates remain at the 2001 level, the overall change of the age distribution will induce the ALFPR to decline 2.21 percentage points by 2011 (compared with the ALFPR in 2001), 5.28 percentage points by 2021, 7.9 percentage points by 2031 and 10.3 percentage points by 2051 in Australia. As a result, the aggregate labour force participation rate will decline from 60.5 per cent in 2001 to 55.2 per cent in 2031 and 50.2 per cent in 2051 (Figure 4).

Table 6: Contribution of each age group to the ALFPR in Australia (compared with 2001) (Percentage point)

Contribution of age group	2011	2021	2031	2041	2051
15-19	-0.34	-0.86	-1.07	-1.16	-1.27
20-24	-0.20	-0.79	-1.22	-1.42	-1.51
25-34	-1.49	-2.03	-3.12	-3.62	-3.80
35-44	-1.43	-2.48	-2.75	-3.51	-3.81
45-54	-0.15	-1.05	-1.67	-1.64	-2.15
55-64	1.24	1.38	1.07	0.93	1.05
65 Plus	0.15	0.48	0.77	0.95	1.04
Changes in the ALFPR	**-2.21**	**-5.28**	**-7.89**	**-9.36**	**-10.31**

Source: Authors calculation

4.2 Demographic composition effect in South Australia

Compared with the nation, the older age structure and rapid population ageing process in South Australia will exert a more severe impact on the aggregate labour force participation rate (Table 7). The negative effect of population ageing on the aggregate labour force participation rate will be 0.06 percentage points larger annually in South Australia over the period of 2011 to 2031, and 0.05 percentage larger annually from 2031 to 2041.

Table 7: Contribution of each age group to the ALFPR in South Australia (compared with 2001) (Percentage point)

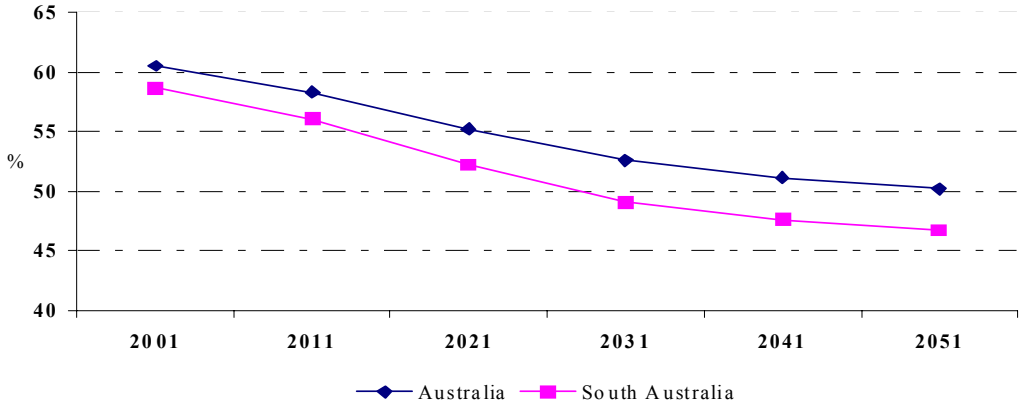
Contribution of age group	2011	2021	2031	2041	2051
15-19	-0.34	-0.90	-1.12	-1.19	-1.29
20-24	-0.10	-0.69	-1.20	-1.35	-1.42
25-34	-1.51	-2.00	-3.09	-3.64	-3.71
35-44	-2.09	-3.21	-3.43	-4.22	-4.52
45-54	-0.18	-1.73	-2.45	-2.40	-2.91
55-64	1.45	1.54	0.86	0.71	0.86
65 Plus	0.13	0.45	0.74	0.88	0.94
Changes in ALFPR	**-2.63**	**-6.45**	**-9.58**	**-11.05**	**-11.91**

Source: Authors calculation

The overall change in the age distribution in South Australia will reduce 2.63 percentage points of the aggregate labour force participation rate by 2011 (Table 7). Compared with the nation, the demographic composition effect is 0.42 percentage points larger (or 19 per cent larger) in South Australia in 2011, 1.17 percentage points larger in 2021 and 1.69 percentage points larger in 2031 and 2041.

With the negative effect of population ageing, the aggregate labour force participation rate will drop from 58.7 per cent in 2001 to 52.2 per cent in 2021, 49.1 per cent in 2030 and further to 46.8 percent in 2051 in South Australia (Figure 4). In 2001, South Australia's aggregate labour force participation rate is three per cent lower than the nation. But in 2051, the difference will increase to more than seven percent. The larger drop of the aggregate labour force participation rate in South Australia will result in a slower growth of the labour supply which implies more severe impacts on the sustained economic growth in South Australia. "Long-term, a continued decline in the participation rate because of structural factors will exert downward pressures on potential output, the employment ratio and gross domestic product per capita" (Dugan and Robidoux, 1999).

Figure 4: The trend of the ALFPR in South Australia and Australia from 2001 to 2051



Source: Authors calculation

5. The re-projection of the impact of population ageing on economic growth

Based on the estimated aggregate labour force participation rate in Figure 4 and projected growth rate of working age population from ABS (2003), we calculate the annual growth rate of the economically active population over the period of 2001 to 2051 and re-project the impacts of demographic change on economic growth by using the same coefficients as we used in Table 4. The results are shown in Table 8.

Table 8: Contribution of demographic change to the economic growth

2001-2051	Projected average growth rate of total population	Projected average growth rate of economically active population*	Projected average growth rate of dependent population	Estimated contribution			
				1a	1b	2a	2b
Australia	0.75	0.45	1.18	-0.53	-0.12	-0.59	-0.50
South Australia	0.09	-0.29	0.60	-0.73	-0.52	-0.75	-0.64

Source: Authors calculation

When we include the negative impact of population ageing on the labour force participation rate, the annual average growth rate of the economically active population will be 0.05 percentage points lower than that of the working age population (refer to Tables 3 and 4 for the annual average growth rate of working age population) in Australia and 0.06 percentage points lower in South Australia. With the slower growth of the economically active population, the impact of demographic change and population ageing on economic growth becomes more severe. For example, in Australia, the negative effect of the demographic ageing on the average annual growth of GDP per capita will rise from a range of -0.04 to -0.49 percentage points (refer to Table 3) to a range of -0.12 to -0.59 percentage points (Table 8) over the period of 2001 to 2051. In South Australia, the induced loss of economic growth will rise from a range of -0.43 to -0.63 percentage points (refer to Table 4) to a range of -0.52 to -0.75 percentage points.

6. Conclusion

This paper discusses the effects of demographic shift and population ageing on the aggregate labour force participation rate and economic growth in South Australia and Australia. The main findings of the paper are:

- Australia has experienced substantial change of its age structure. The rising share of the working age population and declining share of total dependent population over the period of 1961 to 2001 has contributed as much as one percentage point of its annual economic growth. However, because of its older age structure, South Australia benefits less from these favourable demographic changes -- at 0.4 to 0.83 percentage points of its annual economic growth.
- The declining share of working age population and rising share of the elderly population associated with population ageing over the next 50 years will exert an adverse impact on economic growth. With the relatively faster ageing process, the demographically induced loss in growth is projected to be even larger in South Australia.

- Population ageing will exert a negative effect on the aggregate labour force participation rate. The 'demographic composition effect' is larger in South Australia because of its older structure and relative faster ageing process. If the age and sex specific participation rates are constant at their 2001 level, the ageing of the population in South Australia will induce the aggregate labour force participation rate to decline more than 11 percentage points by 2051. As a result, the aggregate labour force participation rate in South Australia will be 46.8 percent, which will be 3.4 percentage points lower than that of the nation as a whole.
- The larger decline in the aggregate labour force participation rate in South Australia will result in a slower growth of the economically active population, which will generate a more severe impact on South Australia's economic growth. A loss of 0.52 to 0.75 percentage points in the annual growth of GDP per capita is projected to be caused solely by demographic forces in South Australia over the period of 2001 to 2051.

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