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The Economic Impacts of an Ageing Population in New Zealand

Background Paper for the 2021 Statement on the Long-term Fiscal Position

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1 Introduction

The world's population is getting older. In high-income countries, the ratio of people aged 80 and over relative to those aged below 20 is projected to reach 0.7 by 2100, compared to just 0.1 in 2000.[1] The ageing of the population in the developed world is a slow and relatively predictable shift that will require significant adjustments – economic, societal, at the workplace, as well as fiscal. New Zealand is no exception to these shifts.

So how will an ageing population affect society? The objective of this paper is to analyse the economic implications of an ageing population at a global level, with a particular focus on New Zealand. In this paper, we aim to provide a neutral assessment of the various channels through which an ageing population structure can affect the economy. We do this by investigating the available literature and where relevant adding further analyses to gain more insight into the specific situation in New Zealand. This paper is not intended to be solutions-based; instead, the focus is on exploring all the ways in which an ageing population structure could affect the economy, essentially in a 'no policy change' environment.

An ageing population structure can affect the economy in a number of broad areas:

1 An ageing population will change the labour supply in the economy due to the fact that older people usually have lower labour force participation rates and/or work fewer hours. Participation rates, however, have been shifting over time and further changes cannot be ruled out.

2 Labour productivity levels can change directly because of differences in the productivity levels of workers in different age groups, or indirectly via a change in the capital/labour ratio or multifactor productivity.

3 A relatively older population will demand different types of goods and services; for example, more healthcare, less education, and less housing. These demand trends can also have other effects on the economy, such as on consumer price inflation and the government's fiscal position. In this paper, we only assess the indirect fiscal impacts on the economy.

4 An ageing population will affect savings and investment decisions, which in turn will have an impact on the economy's capital stock as well as asset prices.

This paper is structured as follows. Section 2 outlines the drivers of population trends in New Zealand. Section 3 then compares New Zealand's demographic profile with other developed countries, including some case studies. In Sections 4 and 5, we explore in detail how New Zealand's labour supply and labour productivity might be affected by an ageing population structure. This is followed in Section 6 by an assessment of the impact on aggregate savings and capital markets. Next, Section 7 considers demand-side impacts. In Section 8, we consider the indirect fiscal effects on the economy and then Section 9 presents an assessment of the overall GDP growth impact. Concluding remarks are provided in Section 10.

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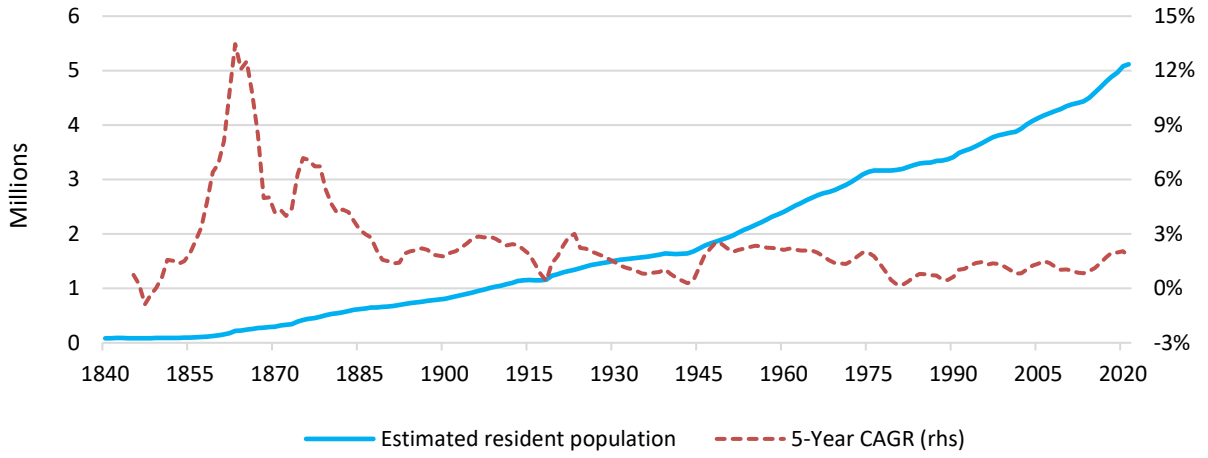
[1] This data is from the United Nations Population Division's World Population Prospects 2019. High-income countries are classified as all countries with a GNI per capita higher than US$12,055 according to the World Bank's June 2018 GNI per capita data.

2 Drivers of population trends in New Zealand

In this section, we look at the key drivers of population growth in New Zealand, namely fertility rates, life expectancy, and net migration. Figure 1 shows the historical trend in New Zealand's population along with the 5-year compound annual growth rate (CAGR) on the right-hand axis. A significant decline in fertility rates since the 1960s has resulted in a slowdown in population growth, which has been offset by net migration inflows as well as an increase in life expectancy.

Figure 1 – Estimated resident population at the end of March



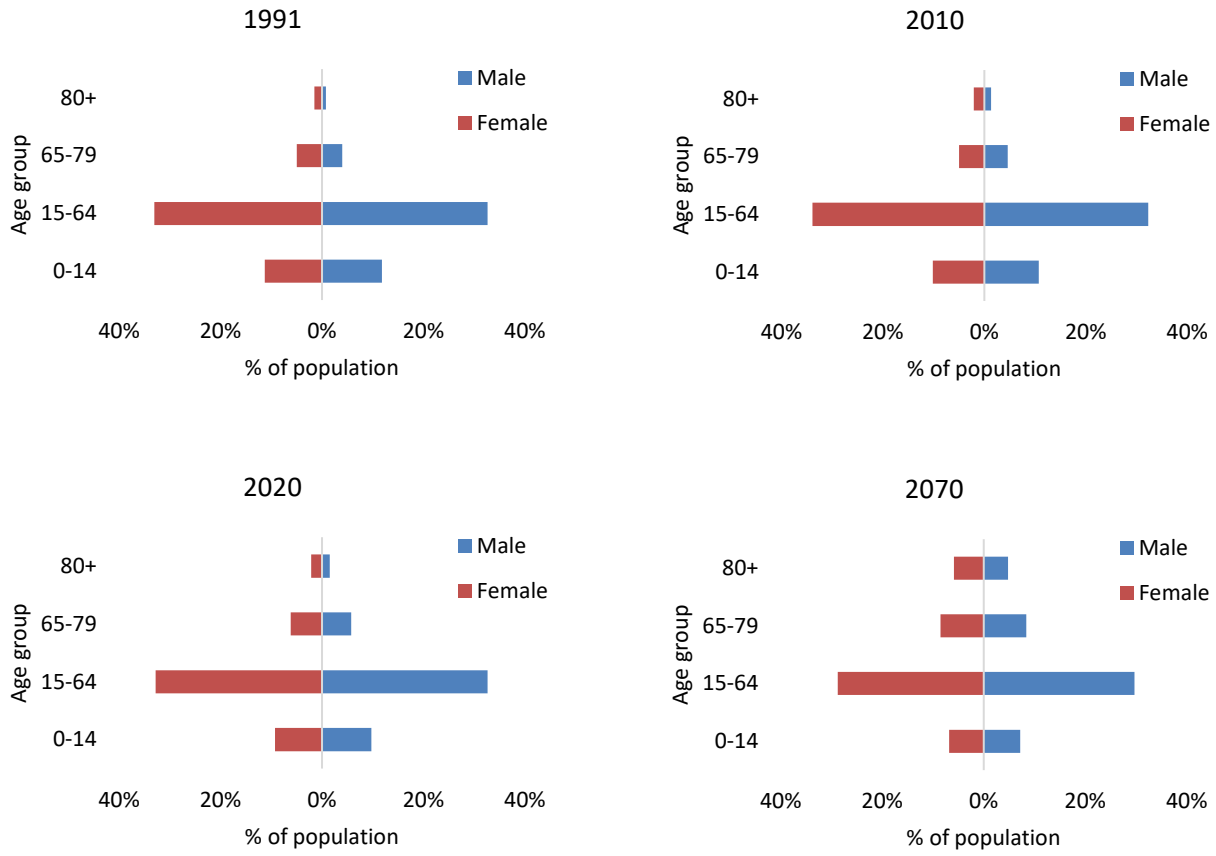
Source: Stats NZ

Like in the rest of the developed world, New Zealand's population structure is currently undergoing a major shift. People aged 65 and over are projected to account for more than a quarter of the total population by 2070, compared to 15.6% in 2020. New Zealand's population pyramids are shown in Figure 2 for three historic periods, 1991, 2010 and 2020. The projected population in 2070 is also shown. This projection is sourced from Stats NZ's National Population Projections, which were last updated in 2020. The key assumptions underpinning their median projection are as follows:

- the total fertility rate is 1.65 births per woman from 2021 onwards
- life expectancy at birth increases over time reaching 87.5 years for males and 90.2 years for females in 2073, and
- annual net migration is 25,000 from 2023 onwards.

Furthermore, it is worth noting that Stats NZ has in the past tended to underestimate the increase in NZ's population given higher-than-expected net migration (Figure 15 refers).

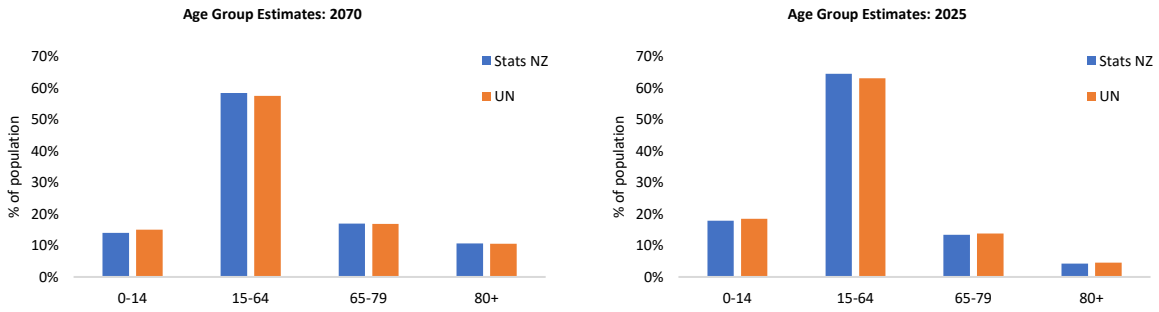
Figure 2 – New Zealand population pyramids, 1991, 2010, 2020, 2070



Source: Stats NZ

An alternative source of reliable long-term population projections is the United Nations (UN), which produces its World Population Prospects every two years, most recently on 17 June 2019. Figure 3 compares Stats NZ's 2020 projections for 2025 and 2070 with that of the UN's 2019 projections. There are some small differences in the projections, particularly in the long term. For instance, the relative projections for those aged 15-64 in 2070 are 57.5% of the population for the UN compared with Stats NZ's projection of 58.4% of the population.[2]

Figure 3 – New Zealand population projections by age group and data source



Sources: Stats NZ, United Nations Population Division

2 The cut-off point for which years to include in the working-age population is somewhat arbitrary, but here we use the often-quoted age bracket of 15-64. In reality, a lot of people choose to work beyond the age of 65.

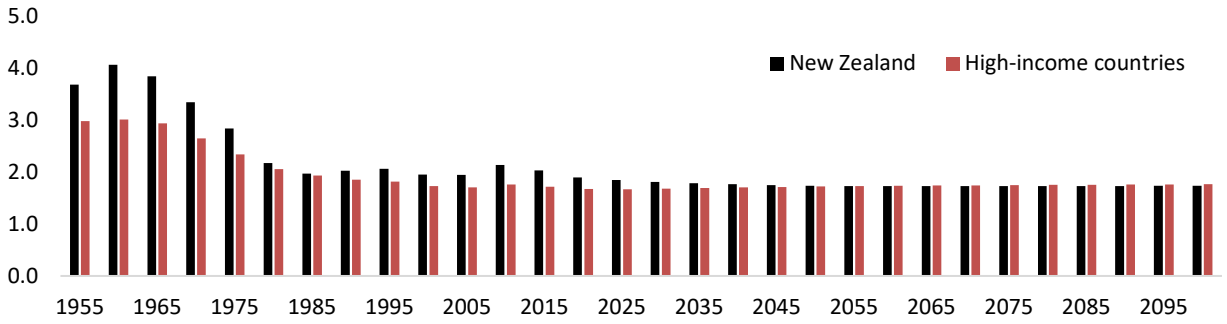
The ageing of New Zealand's population is driven mainly by two factors: women are on average having fewer children and people are living longer. As a result, the relative shares of both the youth and working populations are declining, while the share of people aged 65 and above is rising. The retiring of the so-called baby boomers between 2011 and 2030, while temporarily accentuating these trends, does not change the overall picture. The combination of a decline in fertility and an increase in life expectancy will continue to lead to a gradual ageing of the population, even after the death of the baby boomer generation around 2035 to 2060.

With health improving, the share of the elderly population is also shifting, resulting in the so-called 'ageing of the aged'. Inflows of migrants, who tend to be relatively younger, partially offsets the ageing of the population structure; however, net annual migration inflows are too small as a percentage of the total population to have a significant impact.

2.1 Fertility

The total fertility rate measures the average number of children a woman will theoretically have over her lifetime, based on current birth trends. This indicator is therefore influenced by both age-specific fertility rates as well as the relative population sizes of the different age cohorts. In the period following the Second World War, New Zealand's fertility rate increased sharply with the birth of the baby boomers, reaching a peak of 4.3 in 1961. At this time, New Zealand's fertility rate was one of the highest among high-income countries, as can be seen Figure 4.

Figure 4 – Total fertility rate, New Zealand and high-income country average



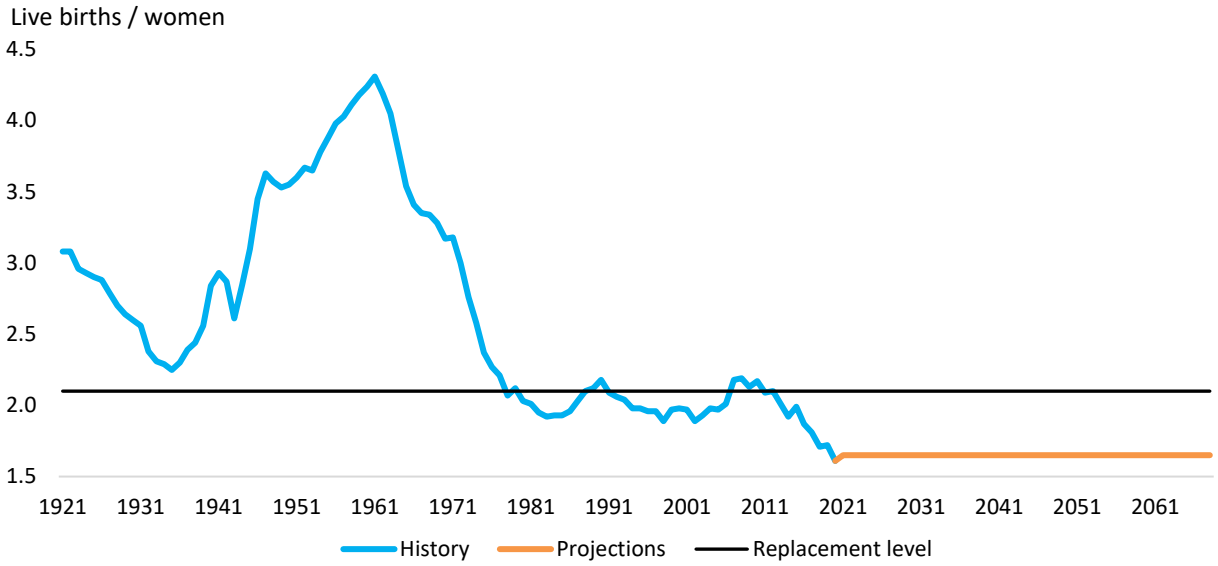
Source: United Nations Population Division

Note: Estimates for 1950-2020, projections from 2021 onwards.

New Zealand's fertility rate started to fall in the 1960s and fell below the replacement level of 2.1 for the first time in 1978.[3] It hovered at around this level for the next few decades, before starting to decline from 2013 onwards. Stats NZ predicts that the fertility rate will reach a steady-state of 1.65 in 2021.

3 Replacement level fertility is the average number of children every woman must have in order for there to be the same number of children in the next generation. Assuming a 50/50 sex ratio, the replacement fertility level would be 2, but since not everyone will survive to child-bearing age, it has to be higher than 2. In most countries the replacement fertility level is 2.1, although the exact number depends on sex ratios at birth as well as infant and child mortality rates. Migration trends are not taken into account.

Figure 5 – New Zealand's live births per woman over time



Source: Stats NZ

Note. Stats NZ's projections were last updated in 2020, while actual births and deaths data is produced on a quarterly basis. As a result, there is a slight jump in the time series in 2021. This suggests that Stats NZ has slightly overestimated fertility rates and that population growth might therefore be slightly lower than current projections suggest.

2.2 Why has there been a decline in fertility rates in New Zealand and elsewhere?

There tends to be a very strong correlation between fertility rates and overall per capita income growth; that is, as people's incomes rise they tend to have fewer children. In turn, this reflects higher education levels, a decline in infant mortality rates, as well as increased female labour force participation. Other factors that may have contributed to the decline in fertility in New Zealand specifically include the fact that the contraceptive pill became more widely available, the liberalisation of abortion law in Australia in 1969, and the decriminalisation of abortion in New Zealand under certain conditions in 1977.

In Figure 6, New Zealand's average age-specific fertility rates are shown for three time periods. Two trends are clear from this: women are having fewer children, especially at younger ages, and the average age when women have children has increased. The interaction of these two trends have resulted in an overall lower fertility rate as the increase in fertility in women aged 30 and up has been more than offset by the decline in fertility in the 10-29 age group.

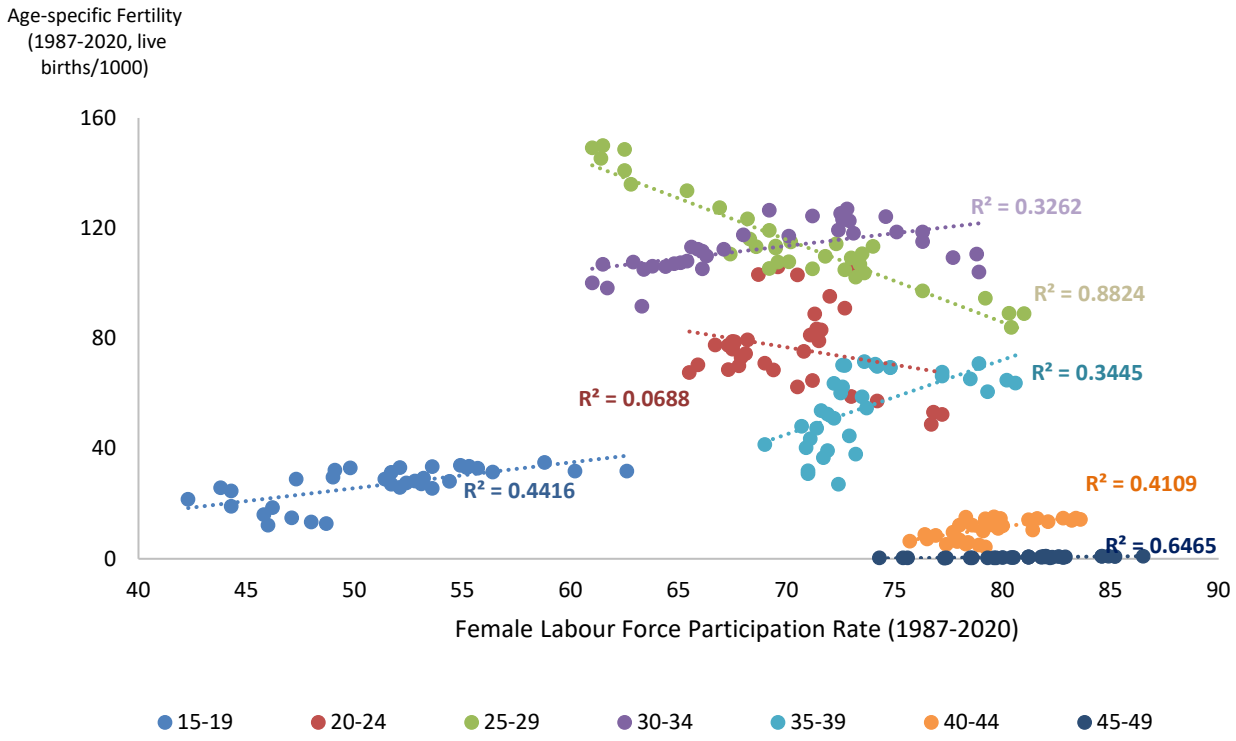
Figure 6 – Age-specific fertility in New Zealand

Source: Stats NZ

There tends to be a negative relationship between female labour force participation and fertility. Therefore, one would expect that the increase in female labour force participation in recent decades would be associated with a fall in fertility. Nonetheless, there are significant differences by age group, which are illustrated in Figure 7. The graph shows the trend in these variables between 1987 and 2020 for various age groups. From this we can see that for:

- Women aged 30+: There was an increase in both fertility and labour force participation, in particular for the 30-34 and 35-39 age groups.
- The 15-19 age group: There was a decline in both fertility and labour force participation, which might reflect higher levels of tertiary education enrolment rates.
- The 25-29 age group: There was an increase in labour force participation and a decline in fertility.
- The 20-24 age group: The decline in fertility came despite there being no significant increase in labour force participation.

Figure 7 – The relationship between age-specific fertility and female labour force participation over time



Source: Stats NZ

2.3 How would different fertility rates affect the population structure?

Theoretically, an increase in fertility rates would ease the impacts of population ageing. This 'solution', albeit theoretically plausible, would take a number of years before it starts bearing fruit as most people only become economically active from 20 years and onwards, and parents – especially mothers – significantly reduce their hours worked while their children are young. As people get richer they spend smaller shares of their incomes on food, clothing, and shelter, and therefore they theoretically have more money available to spend on rearing children (Bengtsson & Scott, 2010).

Grant et al. (2004), in contrast, consider that a higher fertility rate in of itself would not be sufficient. Specifically, laws and/or social norms would need to change in order to encourage the combination of parenthood and employment, to promote gender equality in childrearing activities, and move toward eliminating the gender pay gap.

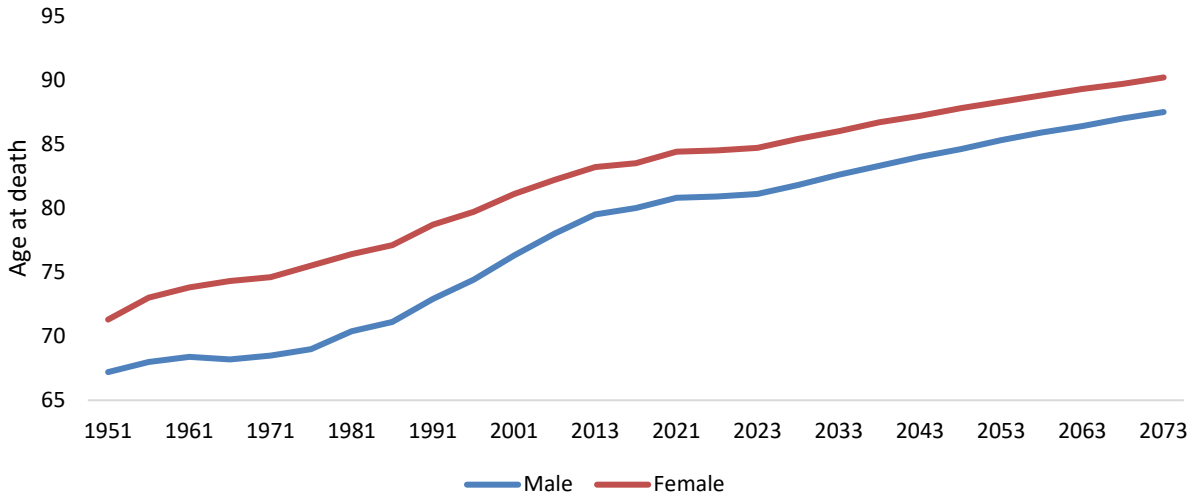
Most demographers, however, do not believe that we will (or should) see much more than a marginal increase in the fertility rate over the long term, and in any case, considering that the environment is already under pressure, increasing population growth at a global level is arguably not the best solution. Professor Sarah Harper, a British expert on population dynamics, notes that falling fertility rates should be embraced and that factors such as artificial intelligence (AI) and improved health levels lower the need for a booming population to boost the economy (The Guardian, 2018). According to Wynes and Nicholas (2017), having one fewer child will reduce annual personal emissions by an average of 58.6 tonnes CO_2-equivalent (tCO_2e) per year for developed countries. This is far more beneficial than, for example, selling your car (2.4 tCO_2e) or going meat-free (0.8 tCO_2e).

2.4 Life expectancy

The second factor that is contributing to the ageing of New Zealand's population is the increase in life expectancy, which is illustrated in Figure 8. Since the 1950s, New Zealand's life expectancy at birth has increased by around 13 years. Stats NZ projects that it will continue to increase gradually, reaching 90.2 and 87.5 years for females and males, respectively, by 2073.

As people are living longer, retirement ages may also be expected to increase in future. The fact that people are living longer and healthier lives is obviously a good thing and, provided that people save enough in preparation for their retirement, the trend of an increase in longevity can be very positive for long-run economic growth. This is what is referred to as the second demographic dividend – the first being an increase in the share of the working-age population relative to the total population.

Figure 8 – Life expectancy at birth in New Zealand



Source: Stats NZ

2.5 Net migration

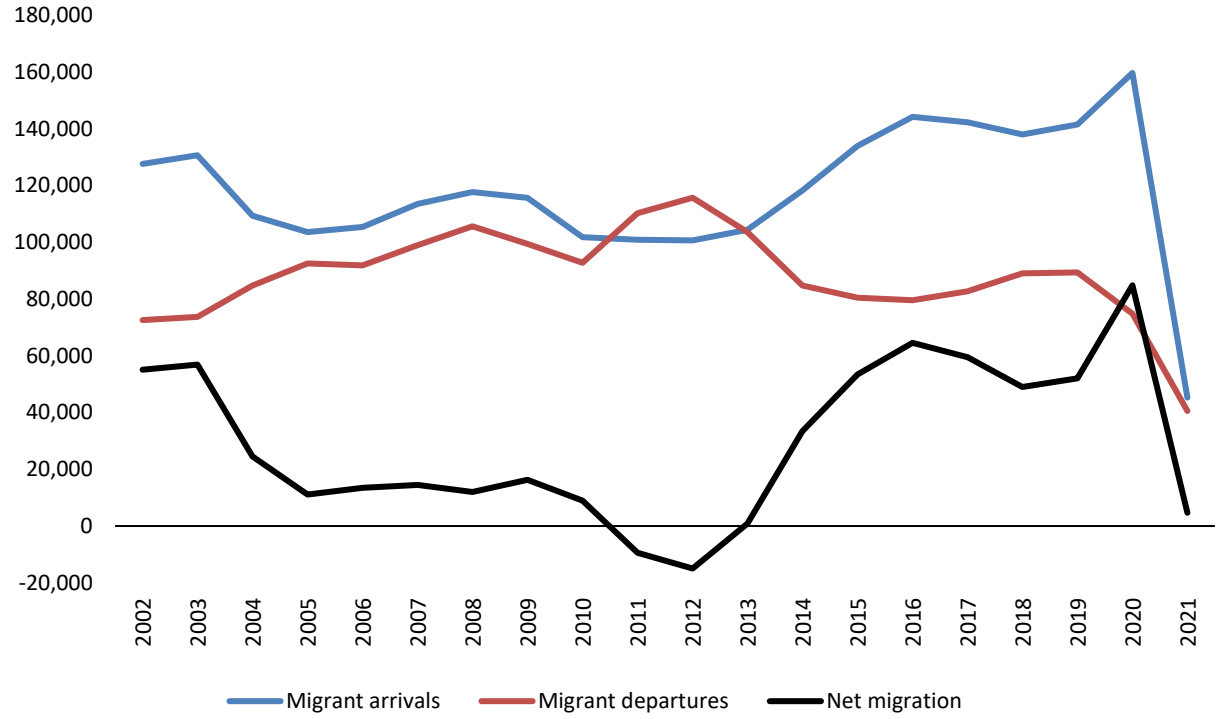
An important question is to what extent the inflow of migrants can offset the negative effect of an ageing population on labour supply. New Zealand has relatively high rates of migration. The percentage of foreign-born population in the country was 23% in 2017 compared to 15% in 1990 (Pew Research Center, 2019). This places New Zealand in the top 15 countries in the world by this metric, excluding countries where the population is less than a million.

On the other hand, since a relatively large number of New Zealand citizens also leave the country, net migration inflows are a lot lower. That being said, between 2013 and 2016 there was a noticeable uptick in net migration, resulting in an increase in New Zealand's overall population growth. In previous years, the growth in migrant arrivals was driven by the growth in the education export sector, an increase in the number of countries eligible for working holidays, and an increase in the number of categories of temporary workers (Merwood, 2013).

In late 2018/early 2019, Stats NZ changed its methodology of measuring migration, moving away from an 'intentions' to an 'outcomes' approach. While the new methodology is believed to produce more accurate numbers, there is a large lag of 17.5 months between when an estimate is first released and when it is finalised. The new methodology has revealed that net migration had peaked earlier and at a lower level than previously thought with the old methodology. Given the long lags and the substantial revisions in data, it is not yet clear whether the declining trend since 2016 will continue. In the long run, Stats NZ projects that net migration will reach a steady state of 25,000 arrivals per annum.

The border restrictions caused by COVID-19 resulted in significant shifts in migration estimates for 2019 and 2020. Stats NZ notes that COVID-19 has caused both a sharp fall in migration in the year to June 2021 and a spike in net migration in the year to June 2020 and that there could be significant revision to the migration numbers as a result of this.[4]

Figure 9 – Net migration trends in New Zealand



Source: Stats NZ

What is the likelihood that net migration will exceed Stats NZ's projection of 25,000 per annum over the long term, and to what extent can this counter the effects of population ageing? In the 2020 National Population Projections, Stats NZ has a 'high migration' scenario where net migration is 50,000 per annum instead of 25,000. This results in a total population projection of 8.5 million by 2073 compared to 6.8 million in the baseline scenario. This would also slow the ageing of the population, although not by as much as in the agency's 'high fertility' scenario which assumes a fertility rate of 2.3 compared to 1.65 in the median scenario. With a fixed annual net migration assumption, the effect on ageing attenuates over time since migrants are also ageing and their share of the population is declining.

4 The spike in early 2020 is because a number of visitors in New Zealand were unable to leave.

The Australian Productivity Commission (2005) calculated what the old-age dependency ratio in Australia would be in 2044-45 with zero net migration over the 1944-2045 period. They find that the old-age dependency ratio would be nine percentage points higher by the end of the projection period compared to the baseline scenario. They conclude that "*while past (large) net migration inflows have moderated the rise in aged dependency rates, it has not prevented (and, at present levels, will not prevent) significant ageing of the populatio*n" (Australian Productivity Commission, 2005: p.34). The Commission also considers a high migration scenario where net migrants increase to 140,000 per year over a 10-year period compared to the baseline assumption of 115,000. In this scenario, GDP per capita in 2044-45 is 1.4% higher than in the base case due to a lower dependency ratio. They note that migration could have a more significant impact if it is better targeted at highly skilled workers and/or aimed at removing skills shortages in specific sectors.

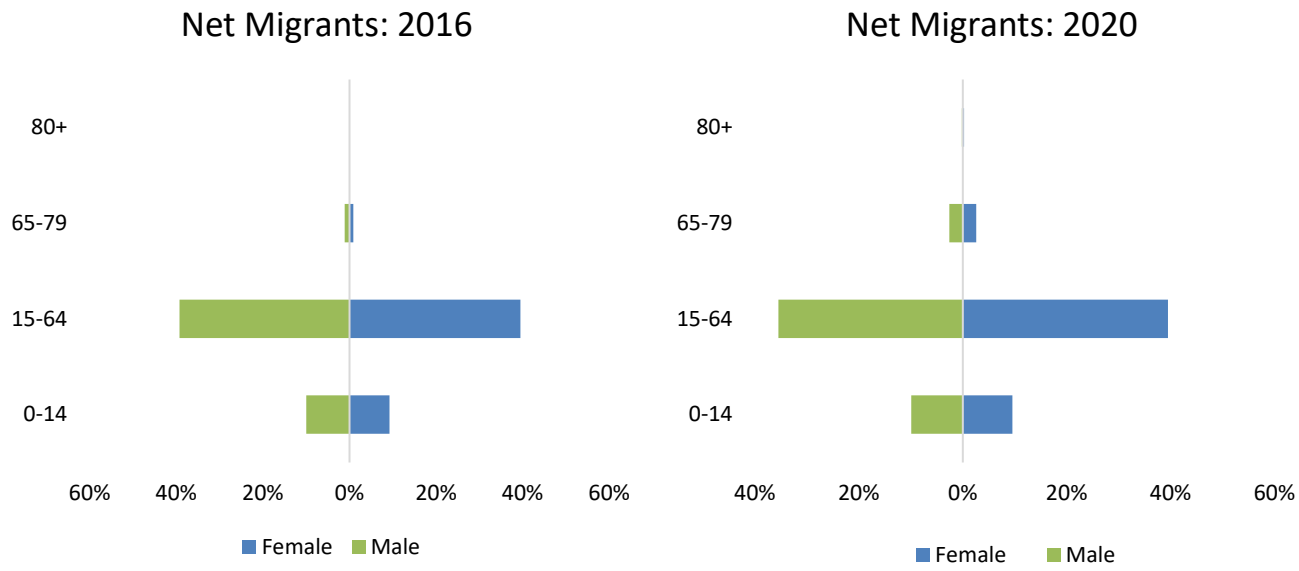
A similar exercise was done for Sweden by Bengtsson & Scott (2010). They calculate that the ratio of the 65+ population would have been 20.2% in 2003 instead of the actual ratio of 17.7% if there had been zero net migration over the 1930-2003 period, while also taking immigrant fertility rates into account. Immigration does have an impact, but perhaps not as large as one would have expected. Moreover, it is important to once again stress the fact that immigrants are also ageing "*which means that immigration must increase at an increasing rate if it is to compensate for population ageing*" (Bengtsson & Scott, 2010: p.17). Another important issue is by how much immigrants' fertility rates differ from 'native' fertility rates and if there is a tendency for immigrants to adapt to their new country's fertility rate. There is evidence from Sweden that suggests that this does in fact happen (Andersson 2004), which diminishes the benefits of immigration on a country's ageing profile.

A study focusing on European Union (EU) countries finds that immigration could potentially counter the negative effects of population ageing on labour supply and the financial sustainability of public pension schemes (Carone et al., 2005). However, in many EU countries, immigrants tend to have lower employment rates than natives and unemployment rates up to three times higher. As a result, a key challenge for the EU is to improve the integration of immigrants into the labour market.

The age structure of New Zealand's net migrants is shown in Figure 10. The selection criteria of New Zealand's immigration programmes benefit younger people and are geared towards labour market outcomes. It is therefore not surprising that the 15-64 year age group accounts for the majority of net migrants. In the 12 months ending April 2020, this age group accounted for 75% of net migrants, compared to 65% for the population as a whole.

The proportion of net migrants in the 15-64 age group has come down slightly from 2016, when it was 79%. Within the 15-64 age group, there has been a shift from the young working-age (15-39) to the older working-age (40-64). This was driven by both an increase in the relative share of young working-age people leaving New Zealand as well as fewer young working-age people arriving in New Zealand relative to other groups. Although the majority of net migrants are young, the proportion of the <40 age group declined from 83% in 2016 to 78% in 2018.

Figure 10 – Net migration population pyramids



Source: Stats NZ

Immigrants to New Zealand tend to have reasonably favourable labour market outcomes. Specifically, they tend to have relatively high levels of labour force participation as well as earnings (Merwood, 2013) and tend to be more qualified than the New Zealand-born labour force (Stillman & Maré, 2009). This suggests that the overall impact of net migration on New Zealand's labour force in the medium to long term would be to increase the aggregate labour force participation rate and to address mismatches between labour demand and supply.

The overall conclusion from the existing literature on the impact of immigration on labour markets in the context of population ageing is that, **while there may be a small positive effect, it is unlikely to be significant**. For migration to have a large enough effect, there would have to be a significant and growing increase in migration. This is, however, not realistic, especially considering that countries that are sending migrants are also ageing and older people tend to be less mobile than younger people (Zaiceva & Zimmermann 2014).

3 Cross-country comparison

3.1 Overview

The ageing of the population is occurring in all developed countries, albeit with different timing, speed, and driving factors. In this section, we compare New Zealand's ageing profile with a selection of other countries. We use the World Population Prospects from the UN Population Division in order to do the country comparison. This will reveal the global dimension of population ageing and show how the expected pace of ageing in New Zealand compares to other developed countries.

The following table shows the old-age dependency ratios for a selected group of countries, with UN medium-variant projections up to 2100. The old-age dependency ratios that are shown in the table are calculated as the proportion of people aged 65+ to the standard working-age population (15-64).[5]

New Zealand's old-age dependency ratio was 14.5 in 1950, placing New Zealand as having the fifth-highest old-age dependency ratio amongst this group of countries. By 2020, it was estimated to have the 15th highest as a number of Asian and European countries aged at a faster pace over this period. Over the following 80 years, New Zealand's population ageing process is expected to accelerate somewhat. By 2100, New Zealand is expected to have an old-age dependency ratio comparable to that of Germany and China, and to have the 10th highest old-age dependency ratio in this group of countries.

Table 1 – Old-age dependency ratio (65+/15-64) for selected countries, 1950-2100

	1950	2020	2050	2080	2100
Republic of Korea	5.25	22.03	73.16	86.92	76.85
Japan	8.22	48.01	74.32	75.99	73.81
Italy	12.41	36.57	68.78	73.15	70.25
Greece	10.44	34.79	69.46	73.25	67.77
Spain	10.90	30.44	72.22	68.20	67.49
France	17.29	33.69	49.33	56.33	60.43
Netherlands	12.15	31.18	48.59	56.64	59.59
China	7.20	17.02	43.61	55.28	58.58
Germany	14.37	33.70	53.18	54.23	57.46
New Zealand	14.47	25.50	39.69	52.23	57.29
Mexico	6.47	11.45	26.09	46.40	56.11
Belgium	16.18	30.22	46.68	51.59	54.88
UK	16.24	29.30	42.92	50.14	53.87
Malaysia	9.35	10.36	25.63	44.90	53.30
Sweden	15.32	32.76	41.45	48.56	53.09
Norway	14.45	26.87	39.56	48.64	51.91
Canada	12.21	27.38	41.31	49.40	51.48
Denmark	13.96	31.73	40.40	47.43	51.04
Australia	12.52	25.14	37.67	44.71	50.19
USA	12.64	25.59	36.60	46.26	49.07
South Africa	7.07	8.39	15.49	24.20	30.16
Nigeria	5.39	5.09	6.53	10.74	15.30

Source: United Nations Population Division

5 As previously mentioned, the choice of the cut-off age for the working-age population is arbitrary, but we choose the 15-64 group since it is an often-quoted metric and is the eligibility age for pensions in many countries.

The next table shows the *total* dependency ratio for this same group of countries, which is defined as the proportion of young (0-14) and old (65+) people relative to the working-age population (15-64). For this ratio, New Zealand's performance is slightly weaker. By 2020, New Zealand's ratio was projected to be 55.8, which is the 10th highest in this sample of countries. The ratio is expected to deteriorate in subsequent years, partly driven by the fact that New Zealand's fertility rate is relatively higher than the average of high-income countries.

Table 2 – Total dependency ratio for selected countries, 1950-2100

	1950	2020	2050	2080	2100
Republic of Korea	83.01	39.54	92.15	110.34	100.59
Japan	67.45	69.05	97.18	100.36	97.98
Italy	53.34	56.96	90.98	96.91	93.71
Spain	50.87	52.39	96.20	92.75	91.99
Greece	56.70	56.10	91.75	97.62	91.87
France	51.75	62.36	77.23	83.77	87.30
Netherlands	58.31	55.61	73.54	82.38	85.54
China	62.52	42.21	67.28	80.43	83.93
Germany	48.59	55.38	77.21	79.48	83.57
New Zealand	61.42	55.76	66.41	78.49	83.56
Belgium	47.07	56.96	73.39	78.46	81.61
Mexico	86.13	50.27	53.24	71.34	81.27
Sweden	50.39	61.17	68.59	75.58	80.14
UK	49.90	57.06	69.36	76.48	80.09
Malaysia	85.03	44.16	50.78	69.26	78.55
Denmark	54.61	57.35	66.71	74.35	78.30
Norway	51.08	53.34	65.15	74.57	77.80
Australia	53.30	55.05	65.38	71.92	77.64
Canada	59.58	51.24	64.97	74.65	77.38
USA	53.93	53.85	63.71	73.70	76.53
South Africa	73.39	52.23	47.71	52.09	56.96
Nigeria	80.87	85.96	64.85	52.56	50.92

Source: United Nations Population Division

3.2 Case studies

It is difficult to accurately assess how population ageing will play out since it is a globally unprecedented phenomenon. Nonetheless, by looking at what has happened in countries where the ageing process is relatively further along, we can, to some extent, get some clues as to how it may play out, including possible economic effects and government policy interventions. In this sub-section we provide brief overviews on the economic impact of an ageing population in Japan, Italy, and Sweden. Japan and Italy were chosen due to having some of the oldest populations in the world, whereas Sweden was selected due to having a similar demographic profile projection to New Zealand and relatively quick population aging over the 1950-2010 period. Sweden also has other similarities with New Zealand, including relatively high levels of immigration and labour force participation rates.

3.2.1 Japan

Having one of the oldest population structures in the world, Japan's experience might provide valuable insights to the rest of the world in terms of what to expect and which policy options have been tried and their degree of success. Having said that, Japan has a number of unique features which means that its experience is not directly applicable to other countries.

According to UN data, the proportion of people aged 65+ in Japan is projected to reach 38% by 2060 compared to 28% in 2020 and 12% in 1990. By 2073, there are expected to be more Japanese aged 100+ than below 1, with this ratio projected to reach 1.4 by 2100. Already there are more deaths per annum than births. As a result, the overall size of the population is shrinking, with this trend having started in 2010. Between 2010 and 2020, the total population is estimated to shrink by 2.1 million and by 2060 it is projected to decline by a further 28.2 million. In addition to the usual reasons of low fertility and high levels of life expectancy, Japan also has the added factor of having comparatively high suicide rates, particularly among males aged between 15 and 39 (Jack, 2016). Moreover, the foreign-born population in Japan is very low and popular attitudes towards immigration continue to be negative.

Since Japan is ahead of the ageing curve, so to speak, some of the sectoral effects caused by demand shifts are already visible. Over the 2009-16 period, the number of children in primary school age declined by 8%, contributing to the closure of some 2,000 primary schools (Financial Times, 2018). There has also been a sharp decline in the number of businesses and the number of houses being built, and while demographic factors are unlikely to have been responsible for all of this decline, they are arguably playing a significant role. While Japan's GDP growth has been low, its GDP per capita growth is still on par with other developed nations, suggesting that the decline – if not the ageing – in the population is contributing to weaker aggregate economic growth. Furthermore, when looking at GDP per working person instead of the total population, Japan has had the second-highest growth rate among G7 countries after Germany over the past two decades. This indicator, however, might be biased since, in countries where ageing is occurring more rapidly, older people are generally more likely to be working.

Using the International Monetary Fund's Global Integrated Monetary and Fiscal Model, Colacelli and Corugedo (2018) estimate that if no structural reforms are implemented, demographic factors will reduce Japan's real GDP by more than 25% over the next 40 years, compared to a counterfactual where population and labour productivity continue to grow at their current pace. The authors estimate that structural reforms can help to at least partially offset the effects of an ageing population, with the results depending on how credible the reforms are. These reforms include boosting labour force participation of females and the elderly, increasing immigration, removing barriers of entry in some sectors, and reducing tariff and non-tariff trade barriers.

The Japanese government is considering raising the mandatory retirement age for civil servants from 60 to 65, as well as providing incentives for the private sector to retain older workers (Bloom et al., 2018). This is expected to lead to an increase in the working-age population as a percentage of the total population back to its 2008 level by 2025. There are also policies aimed at incentivising greater female participation in the labour force. Other policy responses are focusing on making it easier and/or more attractive to have children. The New Angel Plan, introduced in 1999 and a follow-up to the original five-year Angel Plan introduced in 1994, had a number of initiatives, such as investing in day-care facilities, making the work environment more parent-friendly, and financial incentives (Centre for Public Impact, 2017). More recently, the Plus One Policy was introduced in 2009 with the objective of encouraging families to increase their size by one. The private sector has become involved too; in 2000, Japanese toy maker Bandai Corp announced that it will give a JPY1m (more than US$9,000 at current exchange rates) bonus to employees for every child they have after the first one (The New York Times, 2000). These policies seem to be working as Japan's fertility rate has been increasing since 2005. There are also government initiatives aimed at improving the quality of education in order to boost the productivity of the workers of the future. A lot of focus is also being placed on the role of technology to boost productivity, lowering the need for physical labour, and cutting down on healthcare costs (Bloom et al., 2018).

3.2.1 Italy

Italy is one of the fastest-ageing European countries and has one of the oldest population structures in the world. As with other countries, this trend is driven by both a decline in fertility and an increase in life expectancy, although the fertility trend is more pronounced in Italy with one of the lowest birth rates in the world. According to data from the World Bank, Italy's crude birth rate was only 7.6 per 1,000 people, among the lowest in the world. In 2020, the 65+ age group is estimated to account for 23% of the total population, up from 15% in 1990. By 2060, this ratio is projected to reach 36% – not much lower than that of Japan at 38%. By this time, Italy is projected to have a total dependency ratio of above 90.

Since the Global Financial Crisis there has been a structural change in Italy's fertility trends, according to Reynaud and Miccoli (2019). Whilst before the crisis fertility rates were increasing slightly, they have since started trending downward. Income pressures have resulted in lower marriage rates, while housing problems, high youth unemployment, and general job insecurity have exacerbated the issue. In the absence of policy changes, Italy will start facing significant pressures on its pension system over the next three decades (IMF, 2019).

Labour force participation levels in Italy are amongst the lowest in the EU at 48.7% in 2019 compared to the EU-28 average of 57.3%, according to International Labour Organization (ILO) data. Labour force participation among females is particularly low, especially in the south of the country. In 2019, Italy's female labour force participation rate was just 39.9% compared to the male rate of 58.1%. Increasing the labour force participation rate by making necessary reforms – including to the tax system and the labour market – has the potential to offset some of the economic and fiscal costs of population ageing. The actualisation of these benefits will however hinge on the ability of the economy to absorb an increase in the labour force.

Garau et al. (2013) use an overlapping generations (OLG) model to estimate the impact of population ageing in Italy on economic variables and energy use. They find that, in the absence of technological changes, demographic factors result in a decline in both GDP and employment. The capital/labour ratio falls initially since GDP falls by more than employment, but after four decades this trend is reversed. Specifically, from 2047 onwards, the capital/labour ratio starts increasing. Furthermore, the relative scarcity of labour increases real wages from 2037 onwards, which in turn leads to higher consumer price inflation. The multiplier effects of a reduction in GDP cause overall demand for, and investment in, energy to decline. This contrasts with partial equilibrium models that show that energy consumption rises as people age since they do not take the overall economic impact on the energy sector into account.

3.2.1 Sweden

Population ageing in Sweden was occurring relatively more rapidly than in other countries over the 1950-2010 period, but is expected to slow down in the coming decades. In 1950, 10% of the population was aged 65+. By 2010, this proportion had reached 18%, and by 2060 it is projected to be 27%.

Bengtsson & Scott (2010) investigate the consequences and possible policy responses to population ageing in Sweden. The authors note that during the first phase of population ageing (a drop in fertility), the economic cost of population ageing is more than offset by the decline in the cost of having children. The next stage of population ageing though, caused by a decline in adult mortality, will lead to an unprecedented increase in the old-age dependency ratio. According to Bengtsson & Scott, significant immigration since the 1950s has not had a significant impact on the pace of population ageing and is not expected to have much effect in the future either. Meanwhile, while (theoretically) an increase in fertility will help, it will take around 30 years before it has an impact. The authors further note that labour productivity will have to be 0.3% higher per annum in order to offset the impact of population ageing. However, since labour productivity tends to have a bigger impact on consumption rather than production – the elasticity of consumer demand relative to the higher incomes that result from an increase in labour productivity is higher than the elasticity of production relative to increases in labour productivity – it cannot solve the ageing problem on its own. One solution hypothesised is to increase the tax base by raising the number of hours worked. Specifically, they calculate that the minimum retirement age would need to increase by five years by 2050. Regardless, an increase in labour supply would be futile if the economy is unable to absorb this increase in labour; therefore, there should also be a focus on increasing labour demand.

In terms of addressing the fiscal costs of population ageing, Sweden has been at the forefront. In particular, the Swedish government enacted a number of reforms to the public pension system in the 1990s due to population ageing and low economic growth calling the financial viability of the old system into question (Sweden Ministry of Health and Social Affairs, 2016). The largest part of the pension system is the Notional-Defined-Contribution system, which is financed on a pay-as-you-go basis, with the overall contribution rate at 18.5% of pensionable income split equally between employers and employees. All contributions and benefits are reported outside of the national budget. There is also a buffer fund that pays out when contributions in a particular year are lower than benefit payments.

3.3 Conclusion

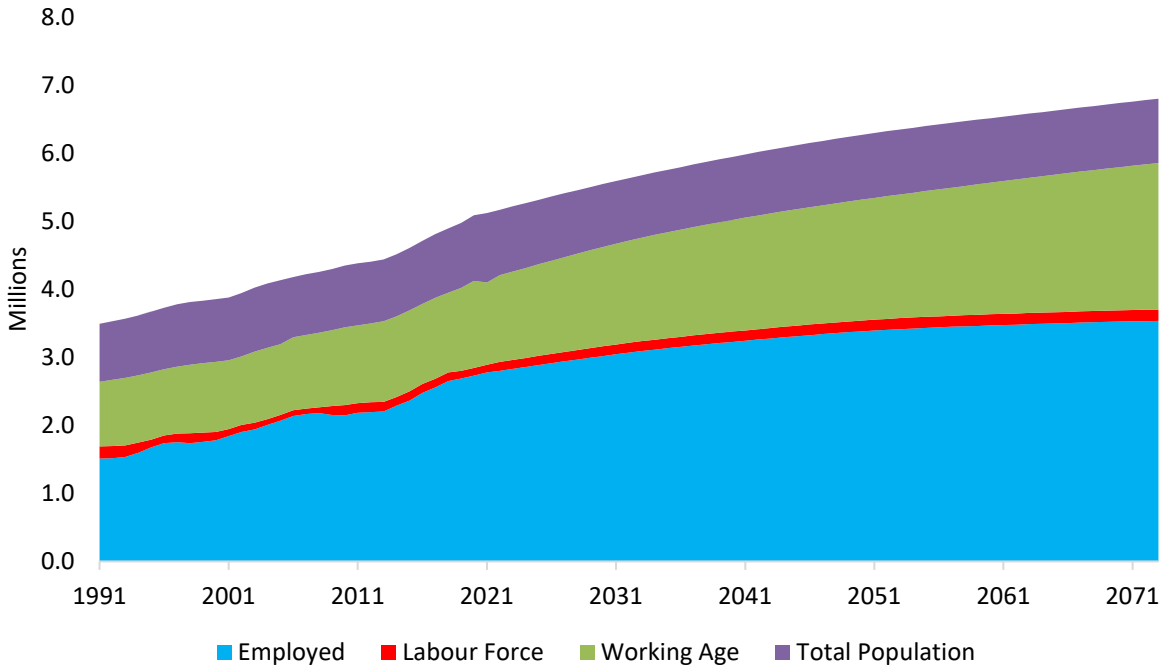
The ageing process in New Zealand is not a severe as in Japan or in a number of European countries. This is mostly because of the combination of relatively high immigration levels and higher-than-average fertility rates ensuring that the working-age population is still growing in absolute terms, even though its share of the population is declining. In addition, New Zealand's situation is improved by the fact that labour force participation is generally quite high in aggregate, and for women and the elderly in particular. New Zealand's public debt-to-GDP ratio is also lower than average, which places the government in a better position to respond to the challenges posed by demographic shifts.

4 Labour supply

Figure 11 shows the composition of New Zealand's population. Estimates are up to 2021, after which projections are provided up to 2073. As at June 2021, there were 2.78 million employed people in New Zealand. When we add to this the 117,000 unemployed, we get the total labour force of 2.89 million.

Adding to the labour force all people above the age of 15 but who are not economically active, we get the total working-age population of 4.11 million. That means that as of June 2021 there were 1.21 million people who were over the age of 15, but not in the labour force. They are either studying, retired, or are unable or unwilling to work. When we add to this everyone below the age of 15, we get the total population of 5.1 million.

Figure 11 – New Zealand resident population composition (as at June)



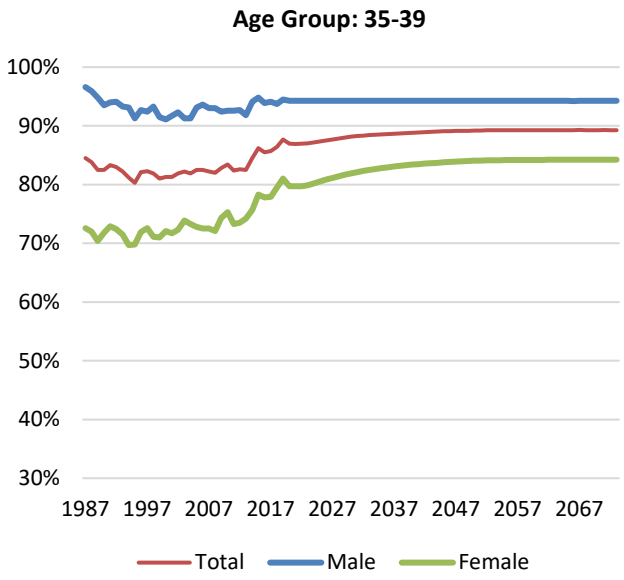
Source: Stats NZ

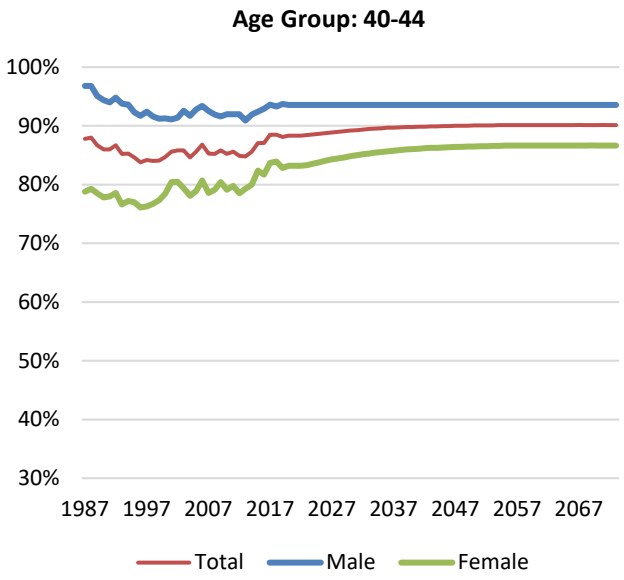
Note: Estimates up to 2021, projections from 2021. From 2021, we assume an unemployment rate of 4.5% of the labour force.

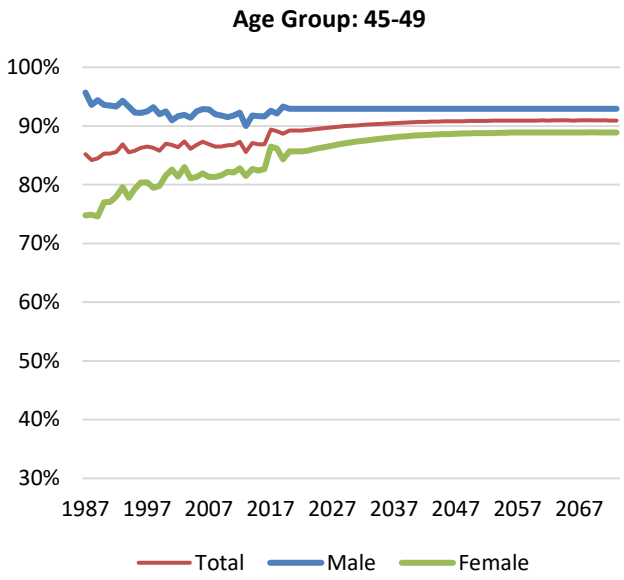
4.1 Demographic trends in labour force participation

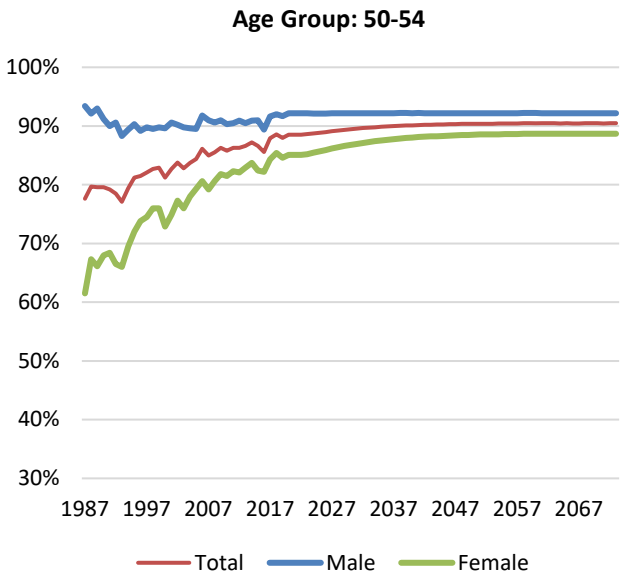
Figure 12 show the labour force participation rates by five-year age groups for males, females, as well as the combined rates for both sexes. The historical data from 1987 as well as the projections up to 2073 are from Stats NZ's national labour force (median) projections.

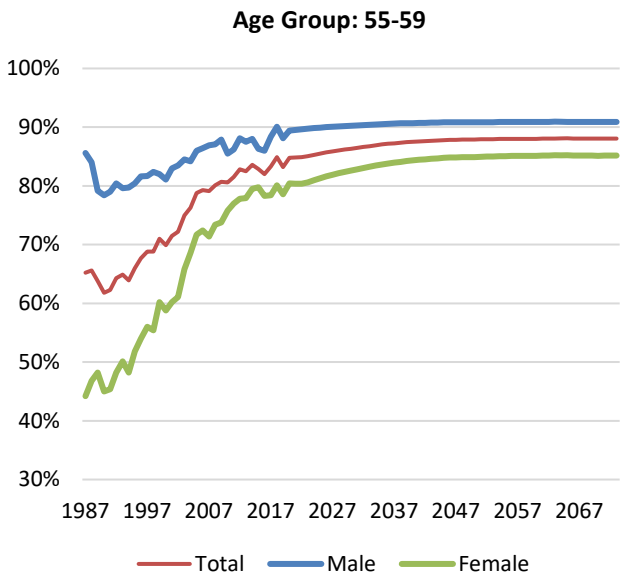
Figure 12 – Labour force participation rates by age groups and sex, 1987-2073

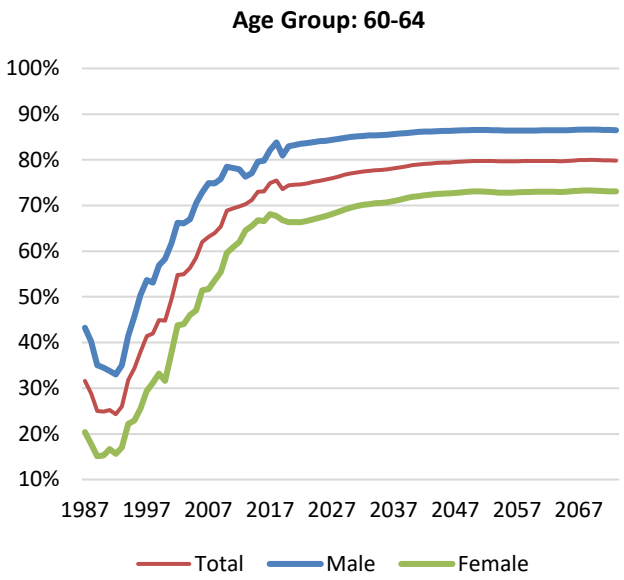

Age Group: 35-39
100%
90%
80%
70%
60%
50%
40%
30%
1987 1997 2007 2017 2027 2037 2047 2057 2067
Total
Male
Female

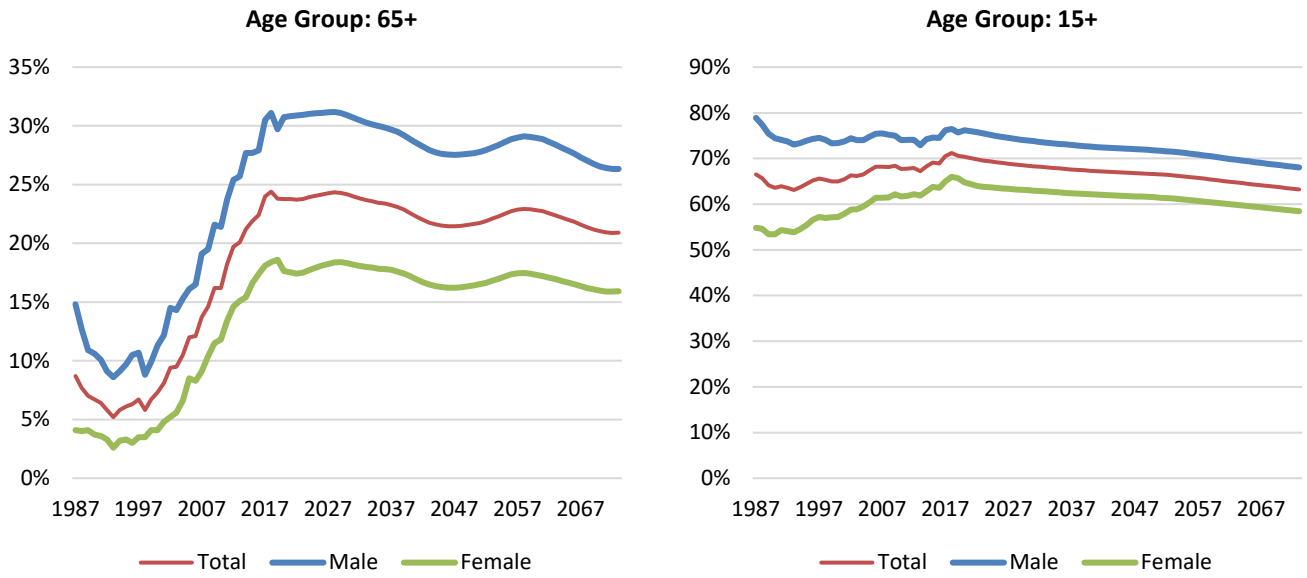

Age Group: 40-44
100%
90%
80%
70%
60%
50%
40%
30%
1987 1997 2007 2017 2027 2037 2047 2057 2067
Total
Male
Female


Age Group: 45-49
100%
90%
80%
70%
60%
50%
40%
30%
1987 1997 2007 2017 2027 2037 2047 2057 2067
Total
Male
Female


Age Group: 50-54
100%
90%
80%
70%
60%
50%
40%
30%
1987 1997 2007 2017 2027 2037 2047 2057 2067
Total
Male
Female


Age Group: 55-59
100%
90%
80%
70%
60%
50%
40%
30%
1987 1997 2007 2017 2027 2037 2047 2057 2067
Total
Male
Female


Age Group: 60-64
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
1987 1997 2007 2017 2027 2037 2047 2057 2067
Total
Male
Female



Source: Stats NZ

We can make the following **key conclusions** from these graphs:

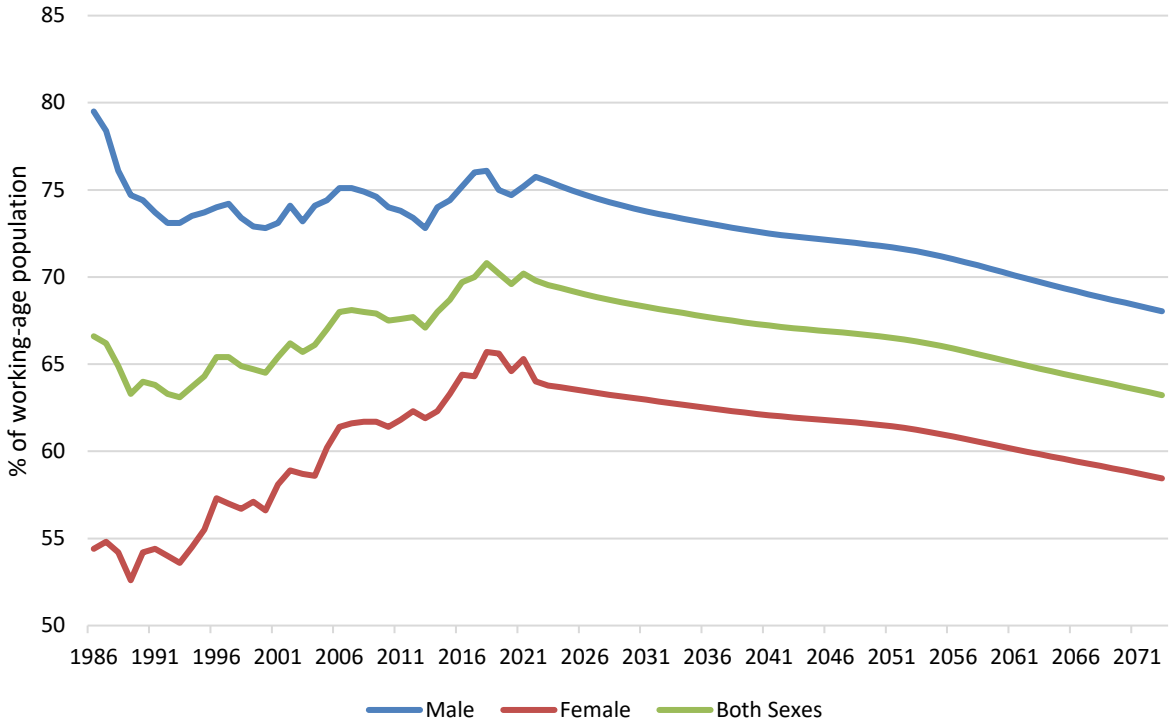
- Males generally have higher participation rates than females, but this gap has narrowed significantly over the years.
- The male-female participation rate gap has narrowed most sharply for the 25-34 and 45-59 age groups, with the 55-59 age group showing the sharpest decline.
- Labour force participation has risen sharply for both males and females among the older population.
- Labour force participation among the youngest age groups (15-19, 20-24) declined between 1987 and 2013, before starting to increase. The initial decline was likely driven by an increase in university attendance.
- Youth labour force participation tends to be more volatile since young people are more likely to have access to financial support from parents. According to Stats NZ (2013), some 40% of people aged 15-24 are in part-time employment. Moreover, worker turnover for young people was 28% over the 2007-11 period, compared to 13% for people aged 25+.
- As the population ages, the overall labour force participation rate will fall. Stats NZ projects that the aggregate labour force participation rate will reach 63.22% by 2073 (its median projection), compared to 70.5% in 2021.

Since the early 1990s, people in New Zealand aged 50 and over have participated in the labour force at an increasing rate. In part, this trend has been driven by changes in the Superannuation age eligibility rules.[6] The age at which individuals qualify for benefits rose gradually from 61 to 65 between 1993 and 2001. The other factor that has likely driven the increase in labour force participation among older workers is an increase in life expectancy. Since people are living longer and are generally healthier, there is an increase in both the need and ability to work for longer.

6 See Maloney (2000).

Figure 13 shows the aggregate labour force participation rate for the estimation period up to 2021 and projections from 2022 onwards.

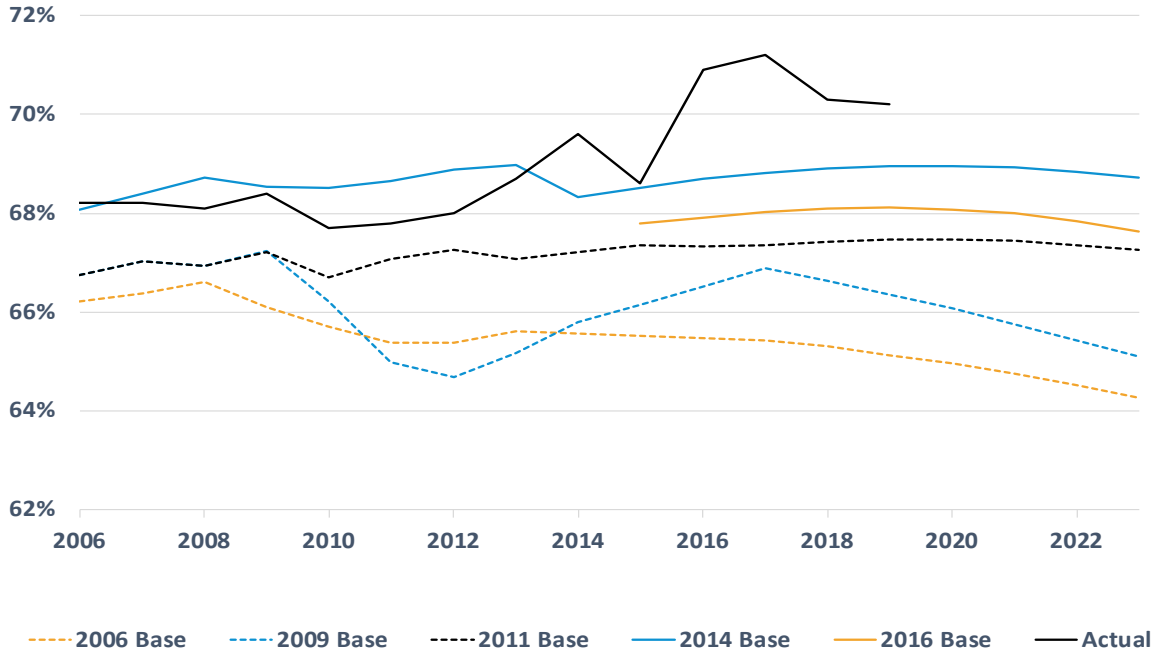
Figure 13 – Aggregate labour force participation rate



Source: Stats NZ

Figure 14 considers how Stats NZ's estimates and projections for the labour force participation rate have changed over time. Between the 2006 and 2014 bases, the agency lifted its long-term projections, before lowering it in the 2016 base. With the exception of the 2014 base, Stats NZ has tended to underestimate actual labour force participation.

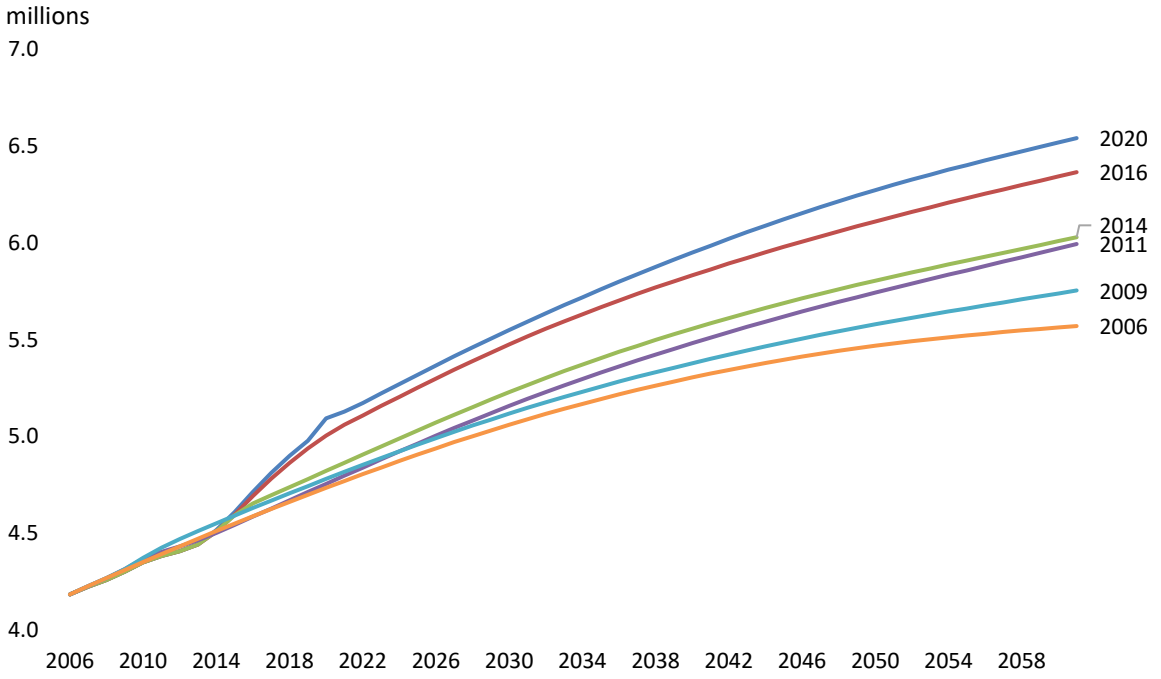
Figure 14 – Labour force participation rate projections over time



Source: Stats NZ projections taken from Treasury's Fiscal Strategy Model, various years

Some of the changes in the labour force participation rate projections might simply reflect changes in population projections. Figure 15 shows how Stats NZ's population projections have shifted upwards over time.

Figure 15 – Population projections over time



Source: Stats NZ

4.2 The impact of ageing on labour supply

Despite all the uncertainties surrounding long-term population projections, there are two things that we know for certain. The first is that the population will get older on average. The second is that an ageing population will reduce the growth in the size of the labour force. Inevitably, as people get older, they are much less likely to participate in the labour force and, if they do participate, they are more likely than younger workers to reduce the number of hours they work. Even with the certainty about direction, there is a lot of uncertainty about the magnitude of this effect and how people might change their behaviour in response to demographic shifts and changes in government policies.

In the following sub-section, we decompose the change in New Zealand's labour force participation rate into demographic and behavioural components, respectively, in order to determine what has been the main driving forces in the past, and how this may change in future.

4.2.1 Decomposing labour force participation

"The future will not look like the past — simple extrapolations on the basis of the aggregate labour participation rate would be highly misleading because they fail to take account of compositional effects." (Australian Productivity Commission, 2005: p.67)

A country's labour force can expand because there are more people in the working-age population, more people choosing to participate in the labour force, or a combination of these two factors. In this sub-section, the labour force participation rate is decomposed in order to determine which proportion of the change in New Zealand's labour force participation rate can be attributed to a change in the relative sizes of different population groups (demographic changes) and which proportion to a change in the participation rates of these groups (behavioural changes). To do this, we follow the methodology of Hotchkiss (2009).

Methodology

Following Hotchkiss (2009), we decompose the aggregate labour force participation rate as follows for different demographic groups:

$$LFPR_t = \sum_i p_t^i \, LFPR_t^i$$

Where $LFPR_t$ = the aggregate labour force participation rate in time period t

$LFPR_t^i$ = the labour force participation rate of demographic group i in time period t

p_t^i = the population share of demographic group i in time period t

Next, the change in the labour force participation rate from one period to the next is calculated as follows:

$$LFPR_t - LFPR_{t-1} = \sum_i \{[LFPR_t^i - LFPR_{t-1}^i]p_t^i + [p_t^i - p_{t-1}^i]LFPR_{t-1}^i\}$$

In other words, we calculate the change in the labour force participation rate from one period to the next and then decompose this into the change attributed to a behavioural change (weighted by this group's current share of the population) and the population group change (weighted by this group's labour force participation rate in the previous period).

Hotchkiss (2009) applied this decomposition to US data over the 1950-2008 period for four demographic groups, namely 16-24 year olds, 25-54 year-old females, 25-54 year-old males, and 55+ year olds. The study found that the decline in the population share of working-age men and women dominated the overall decline in the US labour force participation rate since 2005. In other words, the demographic effect has outweighed the behavioural effect; the former accounted for 58% of the total decline in the labour force participation rate during 2005-08. A number of other studies have been done using similar methodology. Selected results from other studies using similar methodology are discussed below.

Literature overview

Juhn and Potter (2006) examined the change in labour force participation in the US for different demographic groups. They construct counterfactuals by first keeping the labour force participation rate constant and varying population weights, and then by keeping population weights constant and varying labour force participation rates. The key finding is that the strong growth in female labour force participation seen in previous decades has come to an end.

Aaronson et al. (2006) also look at US data, asking the question of whether the decline in the labour force participation rate after the 2001 recession was due to cyclical or structural reasons. They conclude that the sustained decline in the labour force participation rate in the US since 2001 is structural in nature and likely to persist. Fallick and Pingle (2007) develop an econometric model of labour supply that accounts for ongoing demographic changes.

Specifically, their model decomposes the labour force participation rate into demographic changes, behavioural changes, and cyclical movements. They conclude that there is unlikely to be further increases in female labour force participation in the US.

Callaghan et al. (2018) examined the effect of population ageing and cyclical movements on the outlook for New Zealand's labour force participation rate. They determined that labour force participation in New Zealand is "*mildly pro-cyclical*". Furthermore, they find that the participation rates among the young as well as those nearing retirement age is the most responsive to fluctuations in the business cycle. **According to their projections, the labour force participation rate in New Zealand will remain largely flat up to 2035 due to the impacts of an ageing population offsetting further increases in the participation rates of women and the elderly.** If the participation rates of females aged 24-54 and males and females aged 55+ increase at a faster pace than seen over the past decade, the aggregate participation rate will increase further. On the other hand, if the participation rates have in fact peaked, the aggregate labour force participation rate will start declining due to the impact of an ageing population.

The Australian Productivity Commission (2005) did a similar analysis for Australia over the 1966-2004 period. They find that behavioural changes dominated the aggregate change in the participation rate over this period. Whilst behavioural changes had a positive impact on labour force participation over this period, ageing had a slight negative effect although the overall impact was still a slight increase in labour force participation. In turn, the main driving force behind the behavioural impact was increased female labour force participation. This was partially offset by a decline in male labour force participation, in addition to the ageing effect. The Commission further stresses the importance of analysing participation rates by birth cohort rather than age, since people born in different generations have different lifetime labour force participation patterns. There has been a structural increase in female labour force participation on the back of an increase in education, a decline in fertility, and improved access to childcare and part-time jobs. Hence, it is safe to assume that in the future, older women (aged 55+) will have higher labour force participation rates than earlier generations, over and above any increases due to policy changes. For Australian males the cohort effect is less pronounced, and in fact later generations of males tend to have lower participation rates at older ages than was seen in previous generations. Considering the future trend in labour force participation, the Commission notes that behavioural changes are likely to be much smaller, while ageing effects will dominate.

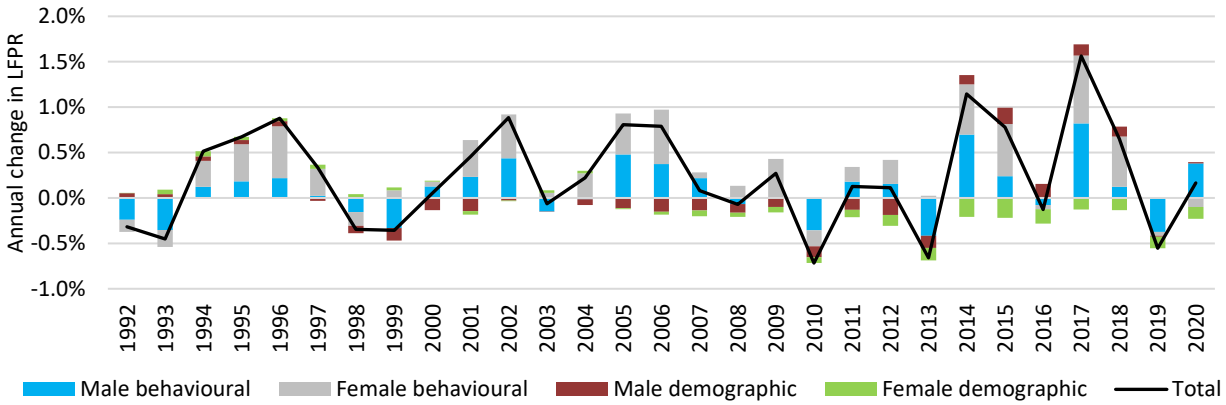
Results for New Zealand: 1992-2073

In this sub-section, we present the results of the labour force participation rate decomposition for New Zealand. The results are shown separately for different time periods to ease interpretation, but also to highlight different trends.

The first decomposition is shown for the historic period, 1992 to 2020. The change in the labour force participation rate from one year to the next is decomposed into behavioural and demographic changes for males and females separately. From this we can see that most of the change in the labour force participation rate over the 1992-2020 period came on the back of behavioural changes from both males and females. Closer inspection of the data reveals that most of the change is coming from behavioural changes in the 55+ age group.

In other words, **over the 1992-2020 period, New Zealand's labour force participation rate has increased mainly because of higher participation rates by the older generation**. In cumulative terms, New Zealand's labour force participation rate increased by 6.8 percentage points over this period. Note that in the graph below the annual change is shown, not the cumulative change.

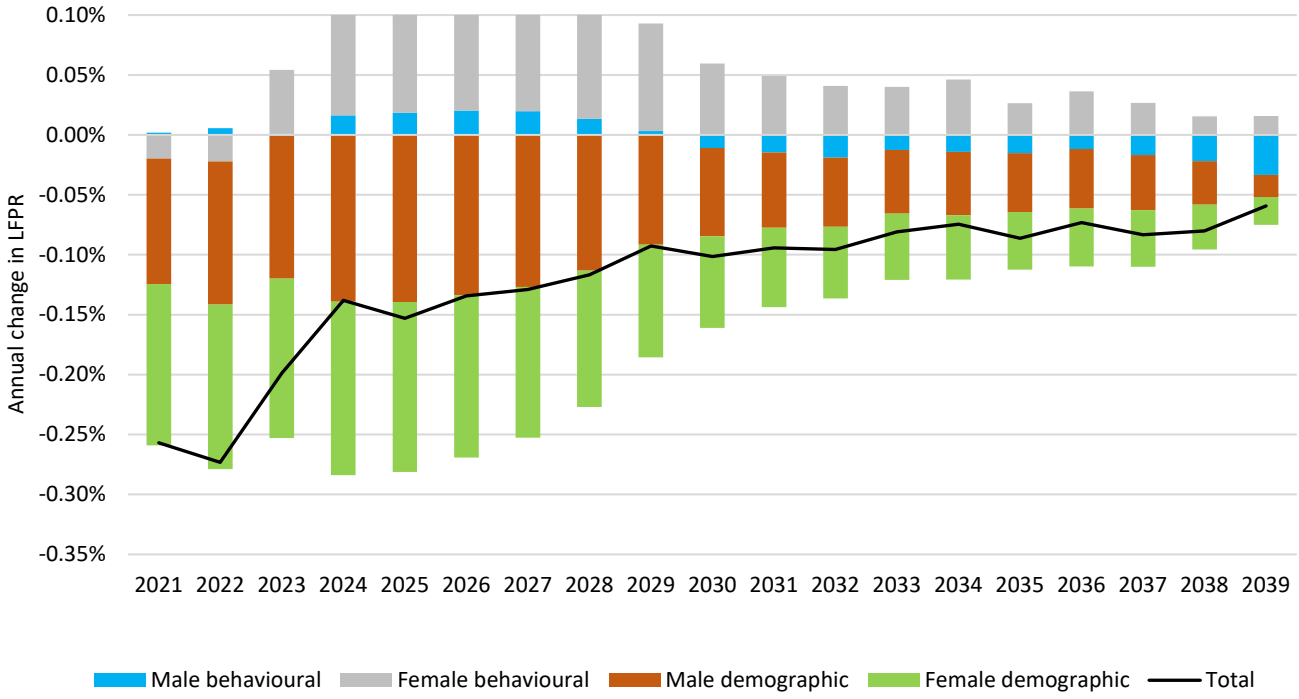
Figure 16 – New Zealand labour force participation rate decomposition, 1992-2020



Source: Stats NZ, the Treasury

In the first part of Stats NZ's projection period from 2021 to 2039, the labour force participation rate is projected to decline by a cumulative 2.3 percentage points. In contrast to the historic period, female *demographic* changes are projected to account for the largest share of the decline, followed by male demographic changes. In other words, the overall labour force participation rate is projected to decline over this period due to a relative decline in the population share of working-age females and males. These changes are only partially offset by female and, to a lesser extent, male behavioural changes. In other words, according to Stats NZ projections, while labour force participation by females will continue to increase, this will only partially be able to offset the impact of a relative decline in the population share of working-age females.

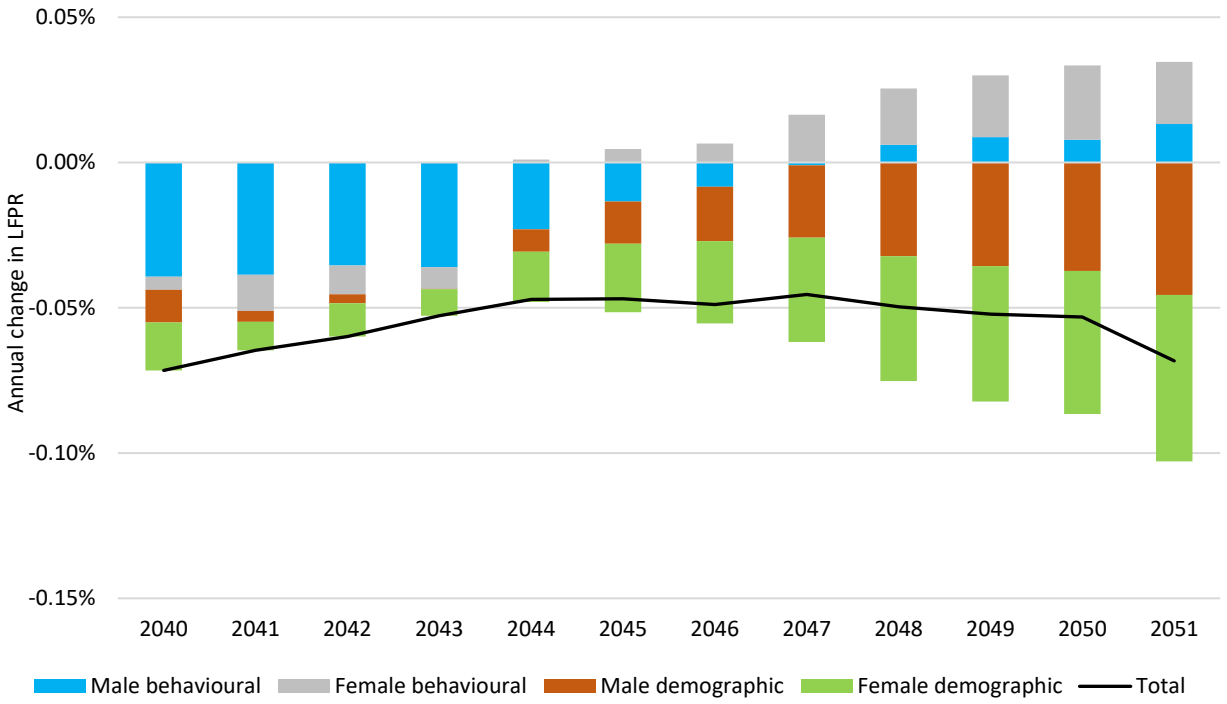
Figure 17 – New Zealand labour force participation rate decomposition, 2021-39



Source: Stats NZ, the Treasury

Figure 18 shows the decomposition for the 2040-51 period. Over this time frame, the decline in the labour force participation rate is initially driven by all factors, but after 2045 mainly by negative demographic changes for both males and females. This is partially offset by positive behavioural changes, first for females from 2045 and then for males from 2048. Over this entire period, the total labour force participation rate declines cumulatively by a further 0.6 percentage points.

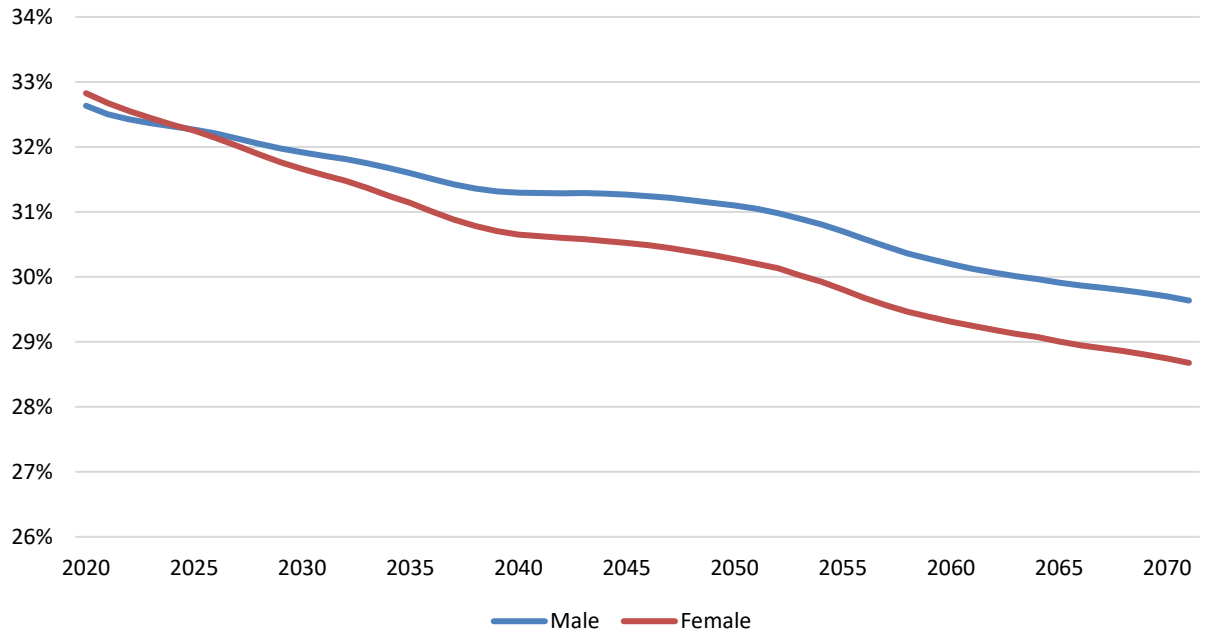
Figure 18 – New Zealand labour force participation rate decomposition, 2040-51



Source: Stats NZ, the Treasury

Interestingly, the share of the female working-age population is projected to decline from 31.4% of the total population in 2033 to 30.2% in 2051, while the proportion of the male working-age population is projected to decrease from 31.7% in 2033 to 31.0% in 2051. This trend is expected to continue, with the share of the female working-age population declining at a similar but slightly quicker pace in the remainder of the projection period as well. Gender population shares are driven by sex ratios at birth, migration trends, as well as death rates. New Zealand's sex ratio at birth has always favoured males, while migration tends to be equally split or if anything skewed towards males. On the other hand, females have higher levels of life expectancy at birth, but this gap has closed during the last few decades.

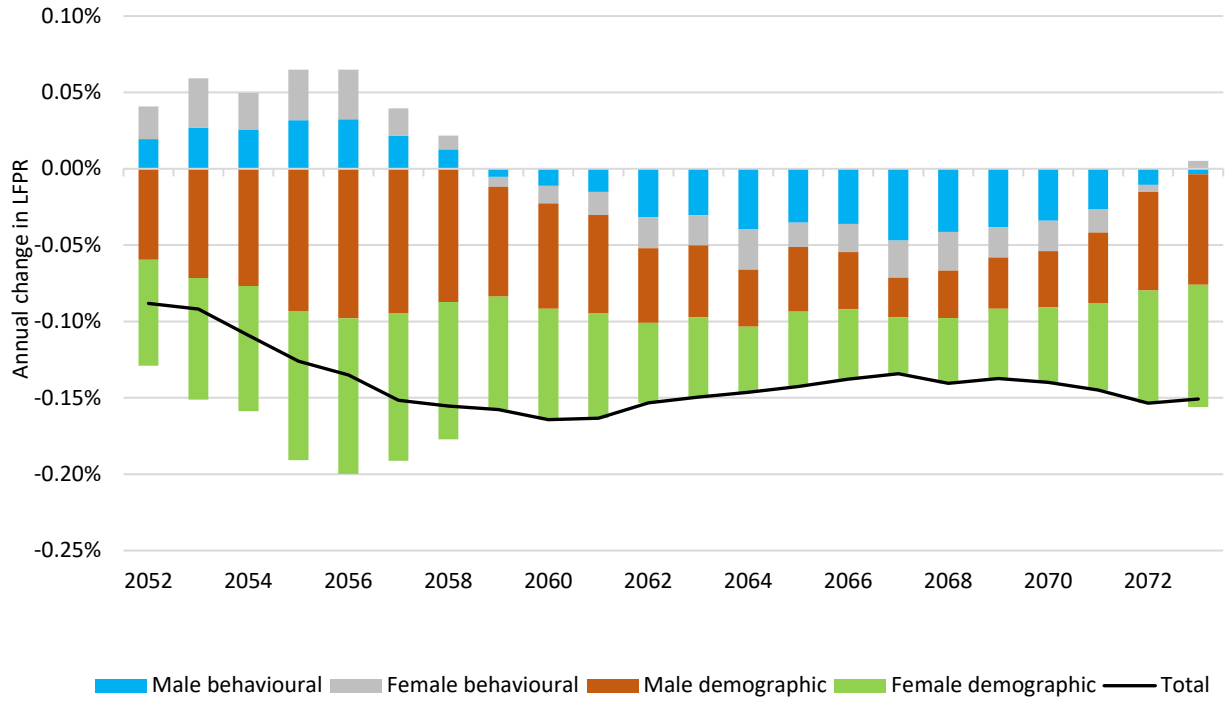
Figure 19 – Working-age population as proportion of total population, male and female



Source: Stats NZ

The final projection period (up to 2073) is shown in Figure 20. Over this relatively short period, the labour force participation rate is projected to decline by a further 3.0 percentage points. **The ageing process starts to accelerate over this period, with female and male demographic changes dominating the decline.** From 2059 onwards, male and female behavioural changes also start turning negative.

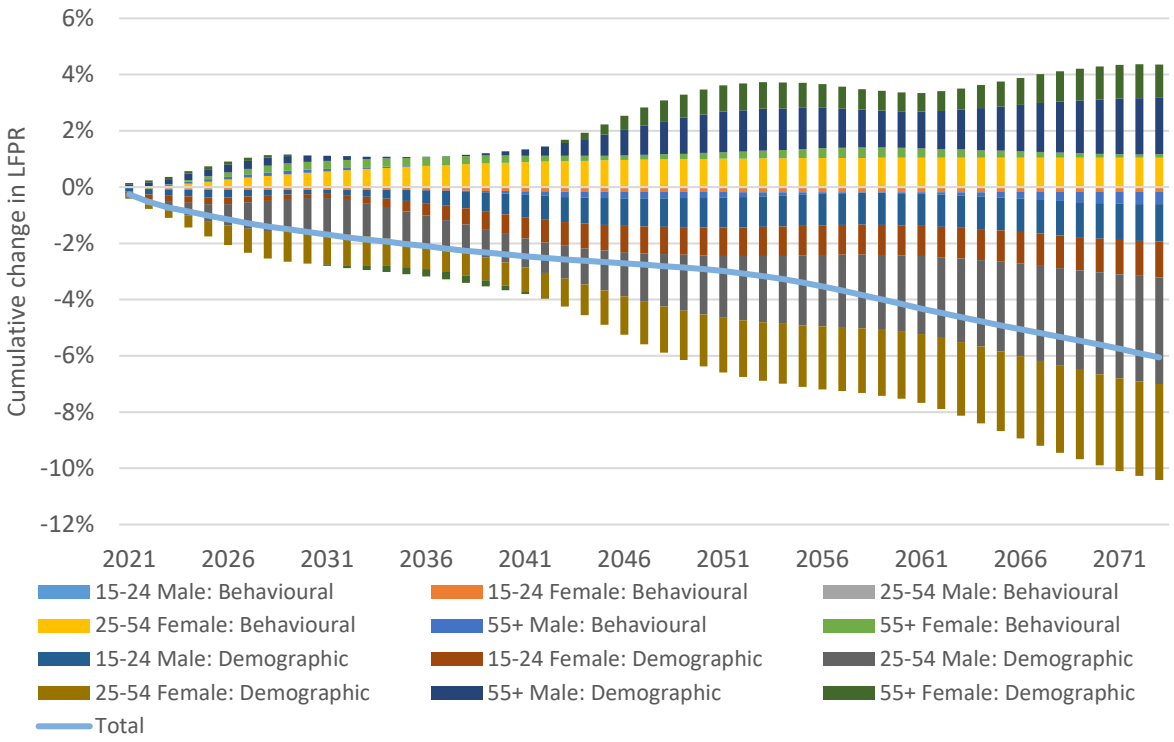
Figure 20 – New Zealand labour force participation rate decomposition, 2052-73



Source: Stats NZ, the Treasury

A final summary graph is provided below. Figure 21 presents the **cumulative** change in the labour force participation rate from 2021 and is decomposed by age, gender, and type of change. The graph shows that negative demographic changes in the 25-54 aged males and female group dominate over the projection period, putting downward pressure on the aggregate labour force participation rate. The size of the positive demographic effect from the 55+ male (and to a lesser extent, female) group starts increasing from the 2040s onwards, which dampens the decline in the aggregate labour force participation rate. In other words, **people increasingly move from the 25-54 aged group into the 55+ group and since the former group has a higher participation rate than the 55+ group, the net effect on the aggregate labour force participation rate is negative**. From 2050 onwards the ageing process starts accelerating due to a relatively bigger decline in the prime working-age population. In contrast to the historic period, all of the projected behavioural changes are quite small with the 25-54 female group expected to see the largest change, adding a cumulative 1.0 percentage points to the aggregate labour force participation rate over the 2021-73 period. Overall, the aggregate labour force participation rate is projected to decline by 6.1 percentage points over the 2021-73 period.

Figure 21 – Cumulative change in labour force participation rate by age, sex, and type of change, 2021-73



Source: Stats NZ, the Treasury

4.2.2 What if the labour force participation rates of older people and/or women continue to increase?

A key question is what the potential is for the labour force participation rates of older people and women of all ages to increase at a faster pace than is projected. Stats NZ's median projection for the 65+ group is that the combined labour force participation rate for both sexes will peak at around 24.3% in 2028, dip to 21.4% by 2046, peak at a lower rate of 22.9% by 2058, before starting to decline once more. These trends are mostly a reflection of projected changes in males' participation in the labour force, whereas for females aged 65+ a more gradual and measured

decline is projected. Meanwhile, for women of working-age, labour force participation is projected to continue increasing over the projection period, but at a more measured pace than was seen over the past three decades. An important issue to consider is whether there is the potential for labour force participation of these demographic groups to either increase instead of decreasing for the elderly, or increase at a faster pace for working-age women, since this would offset the demographic impact of the decline in their relative population shares. One way to address this question is to look at trends in other developed countries. These are shown in Figures 22-23. Note that the labour force participation rates of different countries will be influenced by government policies and taxes and are therefore not strictly comparable. Even so, it does place New Zealand's labour force participation rate into context.

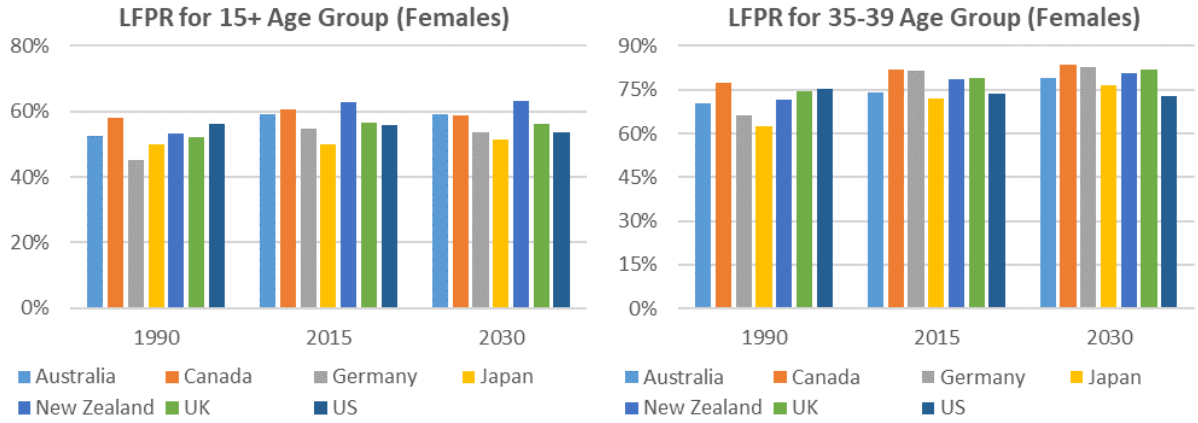
Figure 22 – Labour force participation rate by age, sex and country – 55+ age groups

Source: ILO Labour Force Estimates and Projections (LFEP) by age, July 2018

For all the age groups shown in the graphs above for people aged 55 and over, New Zealand's labour force participation rates are among the highest, higher even in some cases than those of Japan where the population ageing process is ahead of the rest of the world. Most striking is the high labour force participation by New Zealand women aged 60-64. New generations of older people will have better educational outcomes than current and previous generations, and there tends to be a strong link between educational outcomes and labour force participation.[7] That being said, an increase in female educational attainment will lead to an increase in the supply of skilled labour, which may lead to lower participation rates *at every given level of tertiary attainment*. There is some evidence of this having occurred for OECD countries between 1988 and 2002, with participation rates shifting downward at every level of tertiary education for both males and females aged 55-64 (Australian Productivity Commission, 2005: p.351-353). For females, this shift was less pronounced at relatively higher levels of education. The Australian Productivity Commission (2005: p.352) warns that if this trend persists, the current "*relationship between participation rates and educational attainment will not give reliable indications of the future impacts of educational attainment*". It is therefore important to keep in mind that the relationship between educational attainment and the labour force participation rate is not stable over time and that there are a number of additional factors at play.

Turning to labour force participation by women specifically, we consider two groups in Figure 23 – the entire working-age population and the 35-39 age group. The latter age group was chosen since this is often the age after which women return to the labour force following child birth. When looking at the working-age population as a whole (15+), New Zealand's labour force participation rates are once again higher than those of the other countries. In contrast, when considering the 35-39 age group, New Zealand's female labour force participation rate in 2015 was comparable to that of the UK and lower than both Canada and Germany. Thus, one might argue that for younger working-age females, there is still some scope for increased labour force participation in New Zealand. For this to happen, New Zealand would need to address barriers that are preventing women, especially those of child-bearing age, to be able to participate more in the labour force.

Figure 23 –Labour force participation rate by age, sex and country – working-age women



Source: ILO Labour Force Estimates and Projections (LFEP) by age, July 2018

7 See for example Australian Productivity Commission (2005: p.71-74), Gruen & Garbutt (2003), Kennedy & Hedley (2003), Venti & Wise (2015), and Laun & Palme (2018).

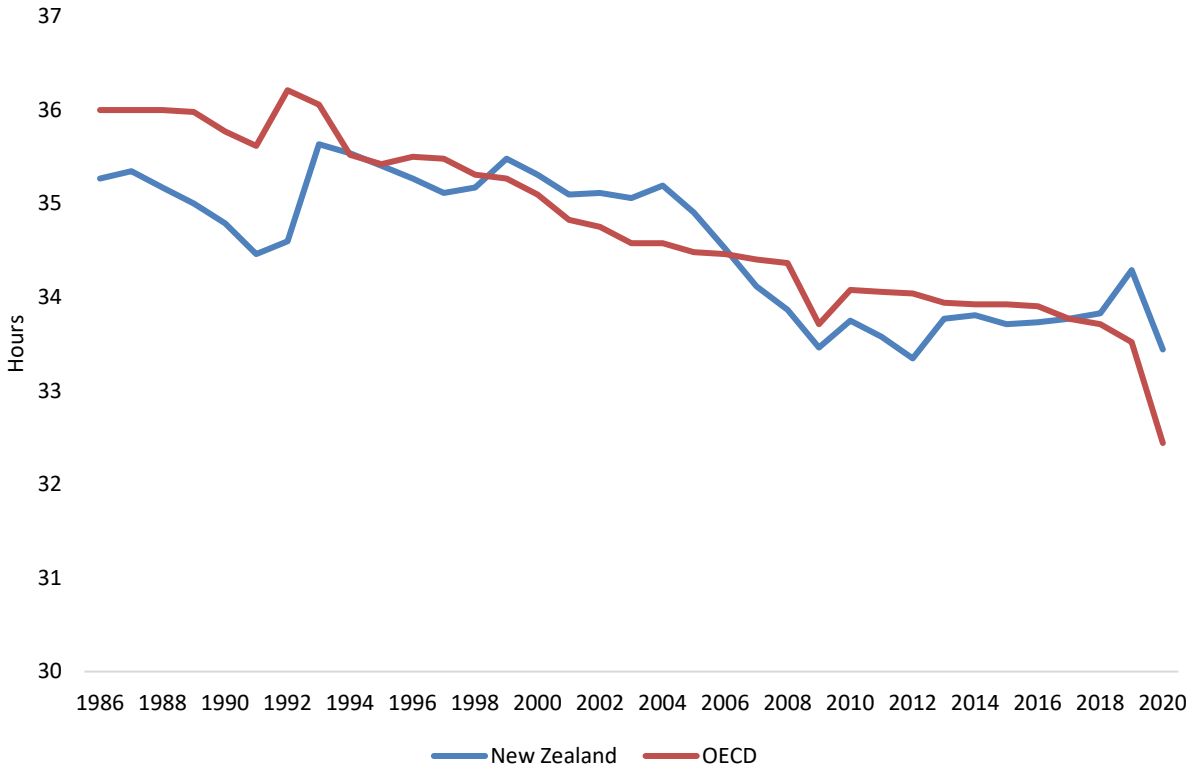
4.2.3 Hours worked

In addition to the decision of whether to participate in the labour force or not, people also make a decision on how many hours to work. This decision is affected by many factors, including gender and age. Research by the Department of Labour (2009) found that in New Zealand, older employees are more likely to work part-time than prime-aged workers, though they are less likely to do so than young people. An analysis of the data also reveals that women are more likely to work part-time than men, which is arguably due to a combination of social norms and the fact that women are more likely to spend a greater proportion of their time doing child-rearing and housework.

OECD comparison

Average annual hours actually worked per worker has generally declined across the OECD since 1986. The decline in actual hours worked over the past two decades can most likely be ascribed to the increase in labour force participation by women and older people, who are more likely to work part-time, as well as an increase in holiday entitlements. Average annual hours actually worked is calculated by dividing the total number of hours worked in a year by the average number of people in employment.

Figure 24 – Average actual hours worked per week (dependent and self-employment)



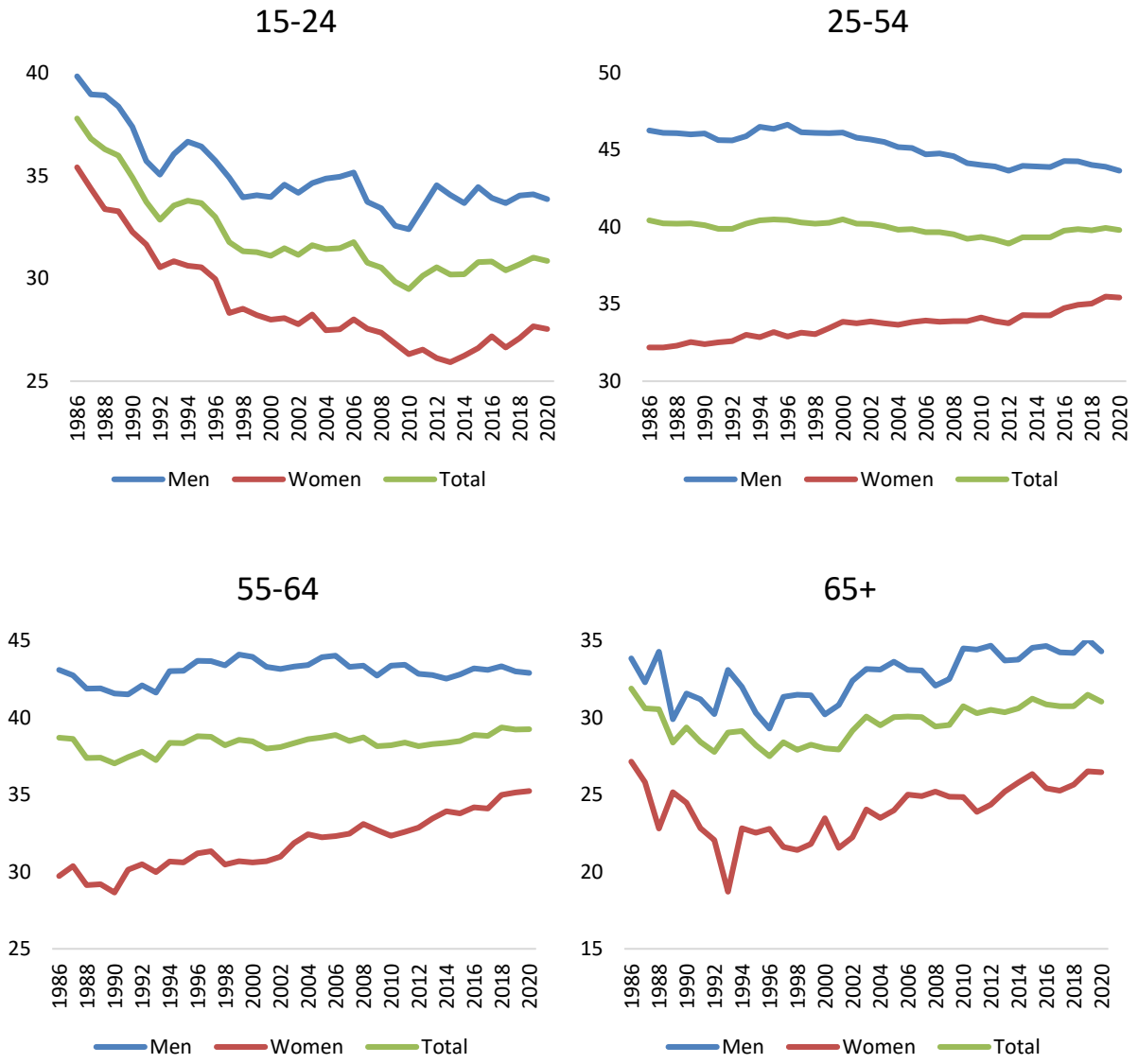
Source: OECD

The OECD has suggested a new methodology be used, whereby actual hours worked is calculated by adjusting usual hours worked for holidays. Some countries' data accounts for the new methodology, which has resulted in a reduction in their average hours worked. This adjustment, however, has not been made for all countries including New Zealand, meaning that New Zealand's hours worked are likely to be overestimated and consequently our productivity levels underestimated relative to the OECD average. Since actual hours worked data is not available by age and sex, we look at average *usual* weekly hours worked in the main job in order to investigate trends in hours worked by demographic group.

Demographic trends in hours worked in New Zealand

For the young age group (15-24 years), there has been a steady downward trend in hours worked. This trend is in line with an increase in the number of people attaining tertiary education. Meanwhile, for the prime working-age group (25-54 years), hours worked has increased steadily for females, while declining for males. Hours worked for the 55-64 age group has increased steadily for both males and females, although females have increased their working hours at a much faster pace, thereby closing the gap with their male counterparts. Average weekly usual hours worked data for the 65+ age group are more erratic, especially up to the early 2000s. Since then there has been a noticeable upward trend for both males and females.

Figure 25 – Average usual weekly hours worked in main job (full-time and part-time) by age and sex



Source: OECD

Table 3 compares New Zealand's hours worked for different age groups in 2000 and 2020 to the OECD average.[8] For the prime working-age group (25-54 years), New Zealand's hours worked in 2020 were higher than the OECD averages for males and females. The male/female gap in hours worked in New Zealand used to be significantly higher than the OECD average, but a sharp increase in female hours worked in New Zealand has narrowed this difference considerably. In the 55-64 age group, New Zealand's hours worked are again higher than the OECD average for males and females.

Table 3 – Average usual weekly hours worked by age group and sex

	2000			2020		
	25-54	55-64	65+	25-54	55-64	65+
New Zealand						
Male	46.1	44.0	30.2	43.7	42.9	34.3
Female	33.9	30.6	23.5	35.4	35.2	26.5
Total	40.5	38.5	28.0	39.8	39.2	31.0
OECD Average						
Male	42.4	41.0	36.0	40.4	39.1	33.4
Female	35.3	33.8	29.9	34.6	32.9	28.0
Total	39.3	38.0	33.7	37.8	36.3	31.2
Gap						
Male	8.9%	7.3%	-16.1%	8.2%	9.9%	2.8%
Female	-4.2%	-9.3%	-21.5%	2.5%	7.0%	-5.6%
Total	3.1%	1.2%	-16.8%	5.4%	8.2%	0.5%

Source: OECD

Meanwhile, in the 65+ age group, the hours worked by New Zealand males now exceeds the OECD average, while for females the 21.5% gap has shrunk to a 5.6% gap. 65+ aged males in New Zealand have increased their hours worked at a faster pace than females. Arguably there is scope for a further increase in hours worked by 65+ aged females in New Zealand.

Differences in hours worked between countries can be explained by a number of factors. Prescott (2004) and Rogerson (2008) emphasise the effect of differences in tax rates, while the latter also examines the impact of technology catch-up. In particular, Rogerson (2008) finds that in addition to the impact of tax differences, Europe's technological catch-up with the US also explains a significant proportion of the difference in hours worked. Meanwhile, Rogerson (2007) and Ragan (2005) show that differences in the composition of government spending in Scandinavia and Continental Europe can also explain differences in hours worked. Most of the academic literature focus on the difference in hours worked between Europe and the United States. Studies that focus on New Zealand specifically are limited.

[8] Note that care should be taken when comparing the hours work metric across countries as different methodologies are used. In particular, the OECD have not implemented their new hours worked methodology for all member countries.

According to the Australian Productivity Commission (2005), average weekly hours worked in Australia declined by 6% over the 1979-2004 period. This is because most of the growth in labour force participation was concentrated in part-time jobs, while the number of males working full-time has declined rapidly. This stresses the importance of looking at trends in hours worked and not just participation in order to project total effective labour supply.

4.3 What would be the impact of an increase in labour force participation or hours worked?

Bengtsson & Scott (2010) suggest that the best way to counter the effects of an ageing population in Sweden is to increase the number of hours worked. Due to hours worked being much lower in Sweden than in the US, for example, this seems like a plausible solution. Increasing working hours can be achieved in a number of ways, including:

- increasing hours worked per person
- encouraging more people to enter the labour force
- reducing unemployment levels
- a reduction in the time spent in formal education institutions
- a reduction in the size of the informal labour market
- a reduction in absence due to sickness, and
- an increase in the retirement age.

As noted in the previous sub-section, there might be some scope to increase labour force participation in New Zealand among working-age and elderly women if their incentives are adjusted accordingly. However, it is not clear whether further increases in these population groups' labour supply will be large enough to make a significant impact on overall labour supply in the context of an ageing population. Since elderly people are more likely to work part-time, the net effect on aggregate hours worked might still be downward (or flat at best), even if there are further upward behavioural responses.

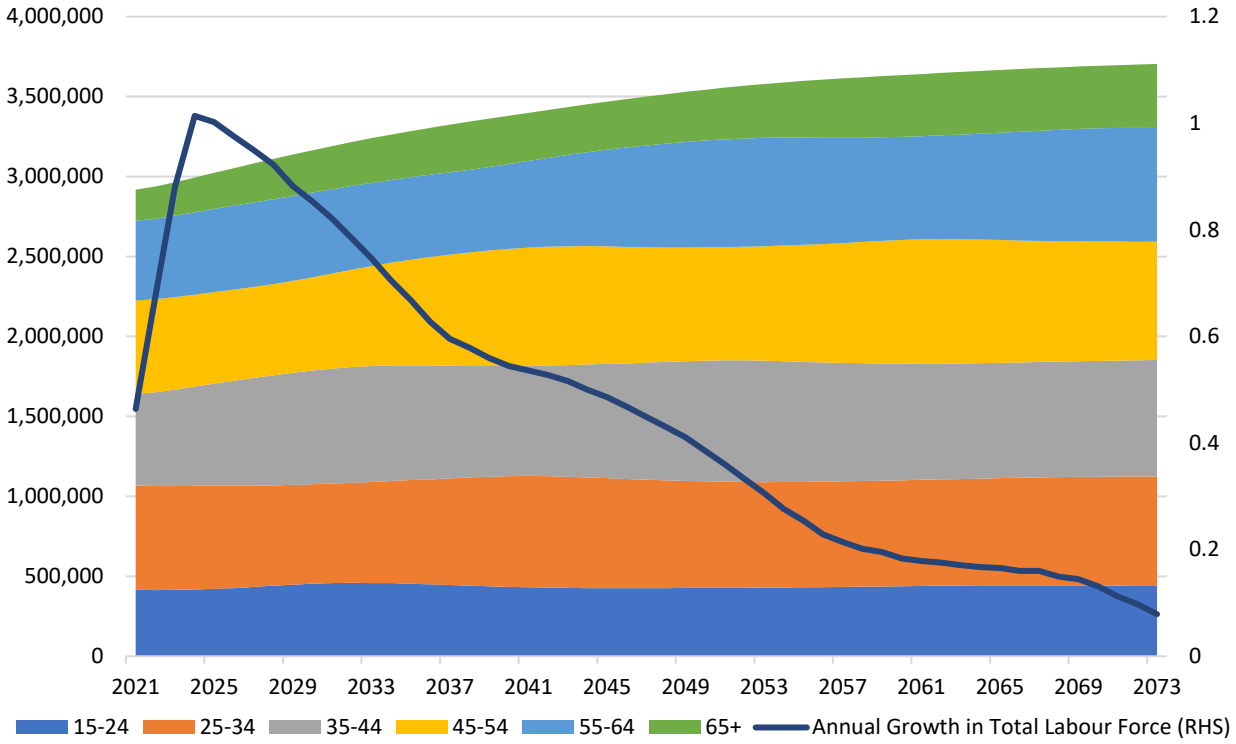
Gardiner et al. (2012) estimate the effect of ageing on average hours worked and find that it will decline by roughly 0.8 hours by the end of 2061. Meanwhile, Mercante and Mok (2014) use the Household Economic Survey from 2006/07 and 2010/11 to estimate New Zealand's labour supply. Compared to Kalb and Scutella (2003), the results from the 2014 study show both a higher predicted probability of working as well as expected hours worked for all demographic groups. Their model predicts partnered men to work 41.8 hours per week, compared to 32.9 hours for partnered women. This falls to 28.1 hours for women if they have a youngest child between 1 and 3 years old, while for men their working hours increase to 42.1 for this scenario.

The suggestion of lowering the time spent on formal tertiary education is perhaps one worth exploring further. Shifting the emphasis from the attainment of tertiary degrees to on-the-job training and micro-credentials has the potential to both increase labour force participation among the younger population and to improve the matching of the demand and supply of skills in the labour market.[9]

4.4 Projection of New Zealand's total labour supply

Despite the ageing of the New Zealand population, the labour force is not expected to shrink over the next 50 years based on Stats NZ's median projection, although the growth rate is projected to decline significantly. This is a considerably more favourable situation than is the case for a number of European countries, where the actual size of the labour force is projected to decline.

Figure 26 – Projection for New Zealand's total labour force by age



Source: Stats NZ

The combined effect of an increase in demand for certain services – such as health – and a decline in the size of the labour force (or a decline in the growth in the size of the labour force) can lead to occupation-specific labour shortages. In theory, this would push up wage rates and in that way address the shortage in labour by encouraging more people to participate in the labour force. Australia's Productivity Commission (2005: p.69) argues that sector-specific shortages are unlikely to affect aggregate labour force participation rates; instead they will affect inter-sector labour force participation and employment rates. The Commission (2005: p.70) further argues that economy-wide labour shortages brought about by an absolute shrinkage in the labour force would not lead to a significant permanent increase in the size of the labour force. However, **given that young people tend to be more mobile, an ageing population could elongate the economy's adjustment period during times of labour shortages**.

9 For more information on micro-credentials, refer to https://www.beehive.govt.nz/release/new-micro-credentials-system-first-new-zealand

5 Labour productivity

5.1 Impact of ageing on labour productivity

5.1.1 Does productivity decline by age?

Theory

It is not immediately clear what the net effect of population ageing will be on aggregate labour force productivity, *ceteris paribus*. On the one hand, older workers are more experienced and employee turnover levels tend to be lower. On the other hand, it can be argued that an older workforce might be relatively less dynamic, be slower to learn and use new technologies, and have relatively lower cognitive abilities.

According to spot market theory, workers will be paid their marginal product irrespective of their age (Conen et al., 2012). This implies that all differences in wages can be explained by productivity differences and are not affected by age. However, this will only hold in a perfectly competitive labour market. Moreover, this theory assumes that employers are able to observe employees' productivity levels, which is also unrealistic.

Human capital theory as developed by Becker (1962) suggests that productivity levels increase with investment in human capital, which in turn lead to higher wages. In practice, the lion's share of investment in education takes place at younger ages, while most of the benefits are only reaped later on in one's career. It can also be argued that the value of older workers' human capital would have depreciated the most, which would result in a decline in productivity (Conen et al., 2012).

Meanwhile, according to Lazear's (1979) delayed payment contract theory, employers enter into implicit contracts with their employees, whereby they are paid less than their productivity levels would have demanded when they are young, and vice versa when they are old. This theory is consistent with the presence of mandatory retirement rules in some countries and in certain sectors. If this theory is an accurate reflection of reality, an ageing workforce will put increased financial pressure on businesses. Businesses are likely to respond to this by either breaking the contract and paying older workers less or laying them off earlier.

Literature overview

Since productivity data by age is generally hard to come by, it is difficult to assess the relationship between the two. A number of studies, nonetheless, have been conducted on the relationship between age and cognitive ability. Verhaeghen and Salthouse (1997) do a literature review of 91 studies comparing age with various types of cognitive abilities, namely processing speed, memory, reasoning, and spatial ability. They find that processing speed suffers the most with ageing. Other factors showing a significant negative relationship are reasoning, spatial ability, and episodic memory. They also find significant negative quadratic age effects with regard to perceptual speed and reasoning ability, meaning that the negative effects of age on these measures of cognitive ability increase with age.

A literature review by Skirbekk (2004) considers various measures of productivity, namely supervisors' ratings, piece-rates, employer-employee matched data sets, and age-specific employment and earnings structures. When using supervisors' ratings, there is no discernible relationship between age and cognitive abilities. This method, however, is arguably flawed since managers' ratings may be biased as they would want to reward older employees for their loyalty and experience. Looking at piece-rates yields a more direct and unbiased comparison as this

looks at both the quantity and quality of a worker's output. Studies using this approach tend to confirm the negative relationship between age and productivity, although there are wide differences between industries. A number of studies look at the number of publications researchers publish and the quality of the journals that they are published in, finding a significant negative correlation with age. The next group of studies consider employer-employee matched data sets. Here employee productivity is measured by the contribution made to the company's value-added. Most of these studies tend to find an inverted U-shaped relationship between performance and age, with productivity peaking at around the late 30s to late 40s. One of the general problems with these kinds of studies is selection bias, which tends to increase with age as older people that are still working are not necessarily representative of the general older population. One of the key overall conclusions from Skirbekk's literature review is that **there tends to be quite strong reductions in productivity with age when it comes to problem-solving and speed, whereas the effect is much smaller or even non-existent for tasks where experience and verbal abilities are more important**.

Some other studies fail to find a negative relationship between age and productivity. Barth et al. (1993) find that older workers are viewed as being more reliable, having better skills, and in general exhibit better work behaviours than their younger colleagues, although this analysis is based on a survey of human resource executives which are not necessarily unbiased. Meanwhile, Hellerstein et al. (1999) use an employer-employee data set for the US and conclude that there is no difference in the productivity levels of prime-age workers (25-54), although people aged 55+ are less productive. The National Research Council (2012: p.120) concludes after a literature review and its own calculations that "*there is likely to be a negligible effect of the age composition of the labor force on aggregate productivity over the next two decades*". However, they caution that the results are tentative as they "*are quite fragile and subject to specification concerns*" (p.120). Börsch-Supan (2003) concludes that while there might be a negative effect of age on productivity, this effect is likely to be much smaller than the impact of a relative decline in the size of the working-age population.

Conclusion

There appears to be enough evidence that at least *some* types of cognitive abilities deteriorate with age. This means that the aggregate effect on labour productivity will depend on the structure of the economy – as the types of cognitive abilities needed differ by sector – and other idiosyncratic factors. The benefit of experience will probably only partially be able to offset this, since it is likely to exhibit diminishing marginal returns. Older workers also have other benefits, such as their breadth of industry knowledge and contacts, as well as lower job turnover levels. Moreover, the older people of tomorrow will be better educated than the older people of today, and hence it is not possible to make accurate conclusions about the productivity levels of the future elderly. Further, a rapid adoption of AI technologies will arguably favour younger workers since they are generally more open to change, learn new skills more quickly, and are better able to deal with the disruption of more frequent job loss. On the other hand, it can be argued that the type of cognitive abilities that decline less with age, such as verbal abilities and emotional intelligence, will become more important in the future labour market. Considering these factors and the available literature, we conclude that **the ageing of the population might have a small negative effect on aggregate labour force productivity**. Since the bulk of workers will continue to fall within the peak productivity range over the next 50 years, the overall impact is likely to be small and could be offset by targeted training programmes and other factors.

5.1.2 Macro-level effects: Impact of workforce age structure on labour productivity

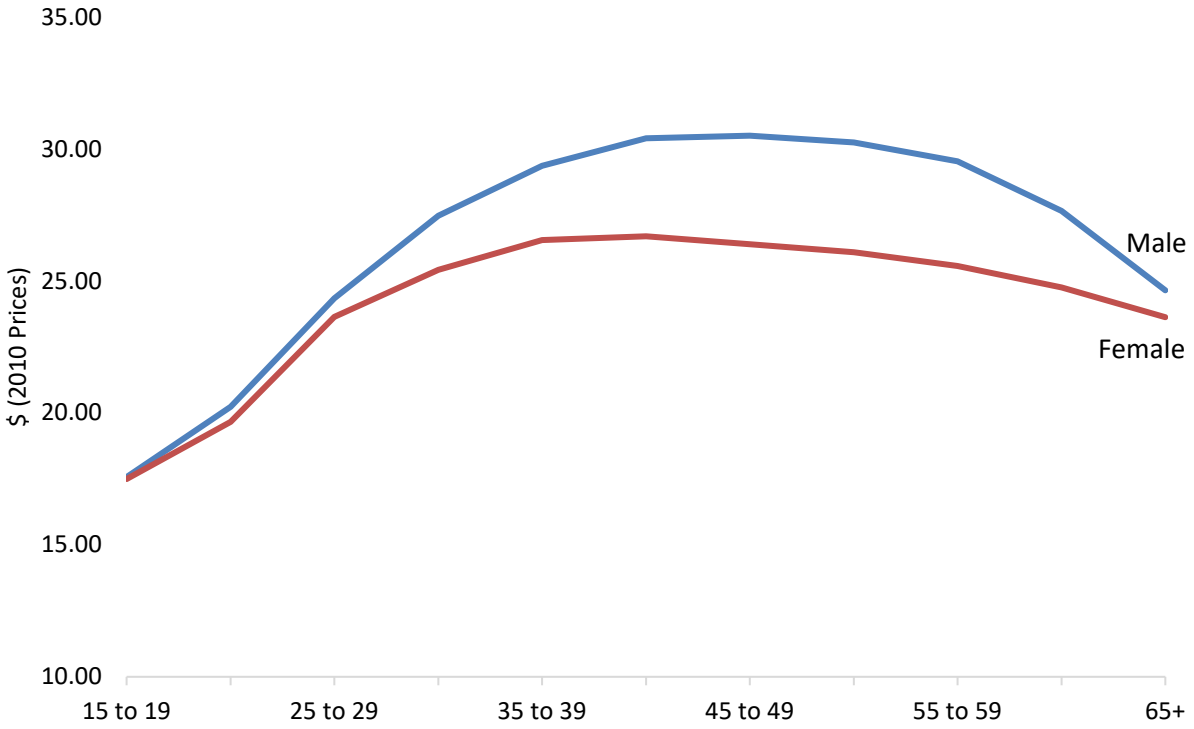
Even though ageing is expected to have a negative impact on individual-level productivity from a certain age onwards, at the macro-level, there is some evidence that suggests ageing may even have a *positive* impact on aggregate labour force productivity. Malmberg et al. (2005) conclude based on their estimates that "*there is little need to worry about the productivity consequences of workforce ageing*." They find that manufacturing plants with higher shares of older workers have higher productivity levels, *ceteris paribus*. Lindh and Malmberg (1999) find that the 50-64 age group has a positive impact of labour productivity growth in OECD countries, while the 65+ group has a negative effect, and the younger age groups have ambiguous effects. As the authors caution, however, this might be caused by other factors; for example, changes in savings behaviour (the so-called second demographic dividend). Further evidence in support of this trend is provided by Andersson (2001) for Scandinavian countries and Gómez and Hernández de Cos (2003) for a panel data estimation looking at 61 countries. In contrast, a study focussing on Belgium's private sector by Lallemand and Rycx (2009) shows that a higher share of young workers has a positive impact on productivity. Zhang et al. (2015), likewise, provide evidence from Chinese provinces that a higher working-age population share has a positive effect on GDP growth, while a higher share of older workers has a negative impact. In conclusion, the evidence on the net effect of workforce age structure on aggregate labour market productivity is mixed and more research is required in order to reach a definitive conclusion.

5.1.3 Wage profiles by age

Some studies look at wages by age in order to draw conclusions about the relationship between age and productivity. This makes intuitive sense, especially if we accept the standard neoclassical assumption that real wages should be equal to the marginal product of labour, which should hold in competitive markets. This means that for the labour income share to remain constant, real wages should grow at the same rate as labour productivity. Conway et al. (2015) analysed the labour income share in New Zealand's measured sector over the 1978-2010 period. The labour income share in New Zealand has generally trended downward, driven by the emergence of new technologies and globalisation; however, the decline in labour's income share in New Zealand appears to be less pronounced than have been seen in other developed countries and has been increasing since 2002. This study was updated by Fraser (2018) with additional data points for 2011-16 and additional sectors added. Over the 2011-16 period, the labour income share in New Zealand declined slightly, which partially reversed the increase seen in the early 2000s. Overall, though, there appears to be "*reasonably good coordination between product and factor markets across industries in the New Zealand economy*" (Fraser, 2018: p.7).

Figure 27 shows hourly earnings in New Zealand by age, which can be seen as a proxy for productivity. From the age/wage profile, we can see that there is a sharp increase in wage rates in the early years after becoming economically active, after which the growth rate declines and eventually turns negative. **The data on hourly earnings by age therefore seem to confirm the expected inverted U-shaped productivity curve.**

Figure 27 – Real median hourly earnings by age and sex, 2017-21 average



Source: Stats NZ, the Treasury. Nominal values deflated to 2010 price level.

Male wages rise much faster than female wages between the prime working ages of 30 and 49. At older ages – specifically 55+ – female wages do not decline as sharply as male wages. As a result, the male/female wage gap reaches a peak at the 50-54 age group and then starts narrowing somewhat. Looking at how New Zealand's wage/age profiles have shifted over time, we see that the age at which real hourly wages peak have increased from 30-39 years over the 1998-2013 period to 40-49 years from 2014 onwards.

There are numerous caveats that need to be considered when analysing wage/age profiles. One of the issues is that the older people who are still working are perhaps doing so because they have higher productivity levels than their peers who have already retired, either because their health levels are better or because their cognitive abilities have not declined by as much (Lee, 2016). They are therefore not necessarily representative of the entire elderly population. A second issue is that rules against age discrimination and the decision to reward employees for their loyalty and experience might result in higher wages being paid to the elderly than is warranted by their productivity levels. As such, the wage rates of older employees might overstate the aggregate productivity levels of the correspondent age groups. Furthermore, wage differences reflect not only the age effect, but a generational (cohort) effect as well, in addition to other factors such as educational attainment.

A study of wages in OECD countries (OECD, 1998) showed that gross wages peaked at the 45-54 age group for 17 out of the 19 countries that were studied, although there were significant cross-country differences in the steepness of the falls and the age at which wages peak. Moreover, when controlling for education, the decline in earnings at older ages is less pronounced.

5.1.4 The effect of ageing on aggregate wage costs

Docquier et al. (2018) study the effects of ageing, education, and migration on wages in OECD countries, concluding that "*changes in the age and skill structure of the population dwarf the effects of immigration and emigration in most countries*." For the purposes of their analysis, the authors define high-skilled workers as those with college education, while low-skilled workers are those without college education. Further, young workers are defined as those between the ages of 25 and 44, while old workers are defined to be between 45 and 65 years of age. For most countries in their study, the wages of low-skilled workers catch up with those of high-skilled workers over the 2000-10 period. This is explained by two factors: first, low-skilled workers have become relatively scarcer; and second, low-skilled workers are working with an increasing number of high-skilled workers, which raises their productivity levels. New Zealand is, however, an exception to this result. In New Zealand, the wages of high-skilled workers also decline over the 2000-10 period, but not as significantly as for the other countries. For the countries in the sample with relatively liberal and skills-focussed immigration policies, immigration tends to heighten ageing's impact on wages. In other words, both ageing and immigration increase wages for low-skilled workers and lower wages for high-skilled workers. For New Zealand, the socio-demographic effects (ageing and education) were less pronounced. In contrast to most other countries, socio-demographic effects in New Zealand during 2000-10 increased the wages of both low- and high-skilled young workers. This could be explained by the fact that over this period, the old low-skilled population in New Zealand increased by more in percentage point terms than in all other countries in the sample. Moreover, New Zealand is the only country in the sample that saw a decline in its young high-skilled native population over this period.

Conen et al. (2012) analyse employer surveys in Denmark, France, Germany, Italy, the Netherlands, Poland, and Sweden regarding their perception about how an ageing labour market will affect wage costs and productivity. They find that around half of employers expect an ageing labour force to increase the gap between wages and productivity. This is partly due to the presence of both tenure wages and employment protection rules. Even when accounting for these factors, however, 40% of employers still expect ageing to result in a net increase in labour costs. Although these are only perceptions and not necessarily an accurate reflection of reality, they are nonetheless important since they will affect employers' recruitment and retention strategies.

Tipper (2012) analyses the effect of the labour force age structure on real wages and labour productivity in New Zealand over the 2001-07 period. The labour input variable of the Cobb-Douglas production function is adjusted to take workers' ages into account and is then estimated empirically. The author finds that the labour market's age structure does not significantly affect labour productivity. They do find, however, that real wages are significantly lower for younger workers (aged 15-24) and that these workers are underpaid relative to their productivity levels.

The ageing process will accelerate significantly over the coming decades. It is therefore problematic to analyse empirical studies of past periods, since the population's future age structure will be structurally different than in any previous period. It seems reasonable to conclude that, given that the share of young workers in the total labour force is expected to decline over the next number of decades, they are likely to become more in demand and therefore the relative wage gap between young and older workers may well decline. As a result, **the aggregate wage bill is expected to increase by more than it would have in the absence of ageing**. Moreover, considering that ageing is very much a global phenomenon, the fight for skilled labour will intensify across the world, which supports the view that wages will increase.

5.1.5 Capital deepening

An ageing labour force will lower the growth in labour input, thereby increasing the capital to labour ratio. If, as was postulated in the previous sub-section, ageing also leads to an increase in the wage bill, this will further encourage the substitution of labour with capital and will incentivise investment in labour-saving technologies. In turn, a higher capital/labour ratio will boost labour productivity. An ageing population could also result in an increase in aggregate savings in the economy (see chapter 6 Capital Markets), which would put downward pressure on interest rates, thereby further stimulating investment in capital.[10] All of these trends point to an increase in the capital/labour ratio, which supports the general view that the rise of robots and AI will drastically change the way we work.

5.1.6 Multifactor productivity

An ageing workforce could potentially lower multifactor productivity (MFP) in an economy by having a negative effect on innovation and technological progress. This would come about if older workers are less willing and/or able than younger workers to invest in and adapt to the use of new technologies. On the other hand, an ageing population could incentivise an increase in investment in labour-saving technologies, especially in the areas of healthcare as well as in home care support services. Overall, the empirical evidence on the impact of ageing on MFP growth is mixed.

Feyrer (2007) examines the relationship between workforce composition and aggregate labour productivity for a sample of 87 countries for the 1960-90 period by using panel data techniques. The author finds that a relatively larger share of 40-49 aged workers has a significant positive impact on MFP relative to younger workers. Older workers tend to lower aggregate productivity levels, but the effect is much smaller and not as statistically significant. Aiyar et al. (2016) analyse the impact of population ageing on major EU28 countries over the 1950-2014 period, using a similar methodology to Feyrer (2007), adjusted to account for endogeneity issues and to be better able to account for cross-country heterogeneity. The authors have two main findings. First, an increase in the share of workers aged 55-64 has a significant negative impact on real productivity growth. Second, the main channel of impact is via a slowdown in MFP growth. Using their estimated coefficients, the authors calculate that population ageing will reduce MFP growth in the sample of countries by an average of 0.2 percentage points every year up to 2035. Put differently, in the absence of ageing, MFP growth in their sample of countries would be a quarter higher by the end of the sample period.

Another way in which an ageing population can negatively affect technological progress is via the political process due to older people having different preferences than younger people. In other words, elderly people might be more likely to oppose the adoption of new technologies. Lancia and Prarolo (2012) use an OLG model with three generations to illustrate that an increase in the share of the elderly population may lead to a slowdown in innovation growth, assuming that they have a relatively smaller incentive for innovation. This might be the case, for example, if they would prefer that a relatively larger portion of the government's budget is spent on pensions, health, and so forth. In a New Zealand context, the significance of this impact would depend on whether there is a material difference in the willingness of elderly people in New Zealand to adopt new technologies relative to the elderly in other developed countries.

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[10] Note that the impact of ageing on interest rates is not clear-cut. Refer to Section 6 for a thorough analysis on this.

5.1.7 Conclusion

Ageing is expected to have a small negative impact on individual-level productivity as the proportion of workers aged 50 and over increases due to a deterioration in some of their cognitive abilities. This effect will be partially offset by a relative decline in the share of workers aged 15-24, who also have lower productivity levels due mostly to their lack of practical work experience. That being said, the increase in the proportion of workers aged 50+ will exceed the decline in the share of workers aged 15-24, so overall the share of workers in their prime-age productivity will decline. Even so, there are a number of factors that could offset the potential deterioration in older workers' cognitive abilities. Of particular importance is the value of experience and industry knowledge, an increase in the aggregate capital ratio, and increased use of robots and other AI technologies. Moreover, targeted training programmes might be able to successfully address any decline in individual-level productivity. On the whole, it is therefore difficult to make an overall assessment on the impact of ageing on labour productivity. Finally, since labour – and in particular prime-aged workers – will be relatively scarcer, they will become more in demand which should boost real wages.

6 Capital markets

6.1 How will ageing affect aggregate savings in the economy?

6.1.1 Life cycle hypothesis

According to the life cycle hypothesis (LCH) developed by Ando and Modigliani (1963), when making decisions about how much to consume and save, individuals take into account their entire expected lifetime earnings. Consumption is smoothed over the individual's lifetime, which results in borrowing while young based on the assumption that future earnings will enable this debt to be paid off. During their prime working ages, individuals earn more than they spend, which enables them to both pay off debt accumulated while young and to save money for their retirement. Finally, during retirement, individuals start selling their assets and spending their savings in order to maintain their previous lifestyle.

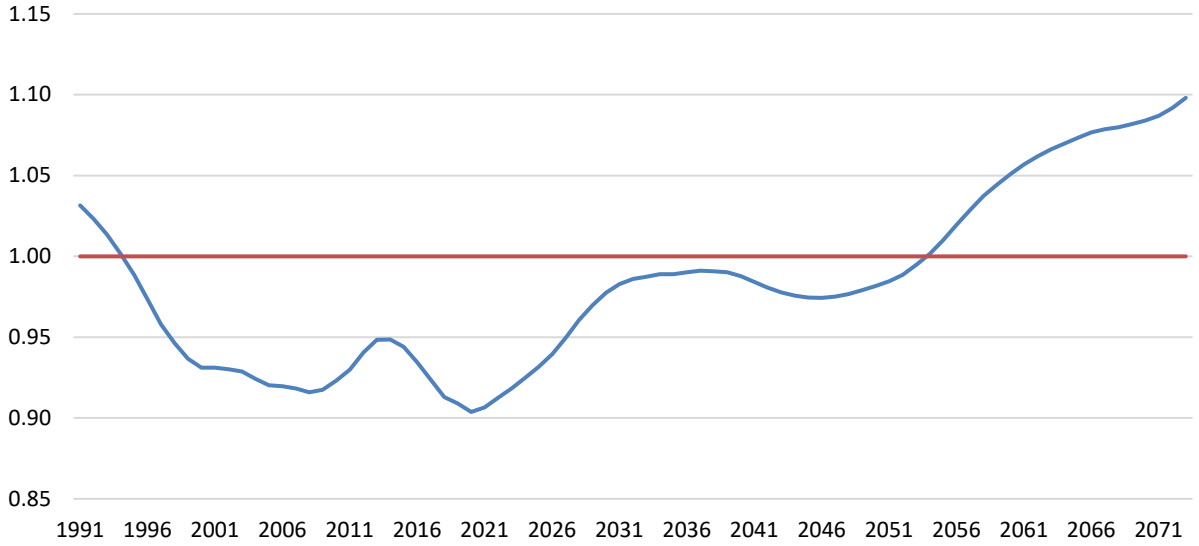
Extrapolating individual consumption and savings behaviour to the entire population enables us to make judgements about aggregate savings trends in the economy and how this might change as the population ages. A relative increase in the proportion of people that move into retirement would, at the margin, result in higher levels of dissaving (ignoring cohort effects). In turn, this would result in an increase in interest rates, all other factors being equal.

6.1.2 Savings behaviour in New Zealand

We assume that people aged 0-24 are net borrowers, those aged between 25 and 64 are net savers, and those aged above 65 are dissavers as they start drawing down on their savings.[11] If we divide the total number of net borrowers (those aged below 25 or 65+) by net savers (those aged between 25 and 64), we get the net borrowing ratio, which is shown in Figure 28. This ratio has been below one since 1995 meaning there has been relatively more net savers than net borrowers in the economy. Following this, the ratio started increasing in 2009 and is expected to rise above one by 2054. This simplistic analysis suggests that, all other factors being equal, ageing will put downward pressure on interest rates over the next decade, after which there will be upward pressure on rates due to savings increasingly being drawn down. The timing and extent of the pressure on interest rates will depend on the total stock of household wealth and the pace at which people will draw down their savings.

[11] As outlined below, this is a simplifying assumption. (Coleman, 2006) and Vink (2014) for example indicate that private savings may not decline for those aged 65+.

Figure 28 – Ratio between net borrowers and net savers in New Zealand

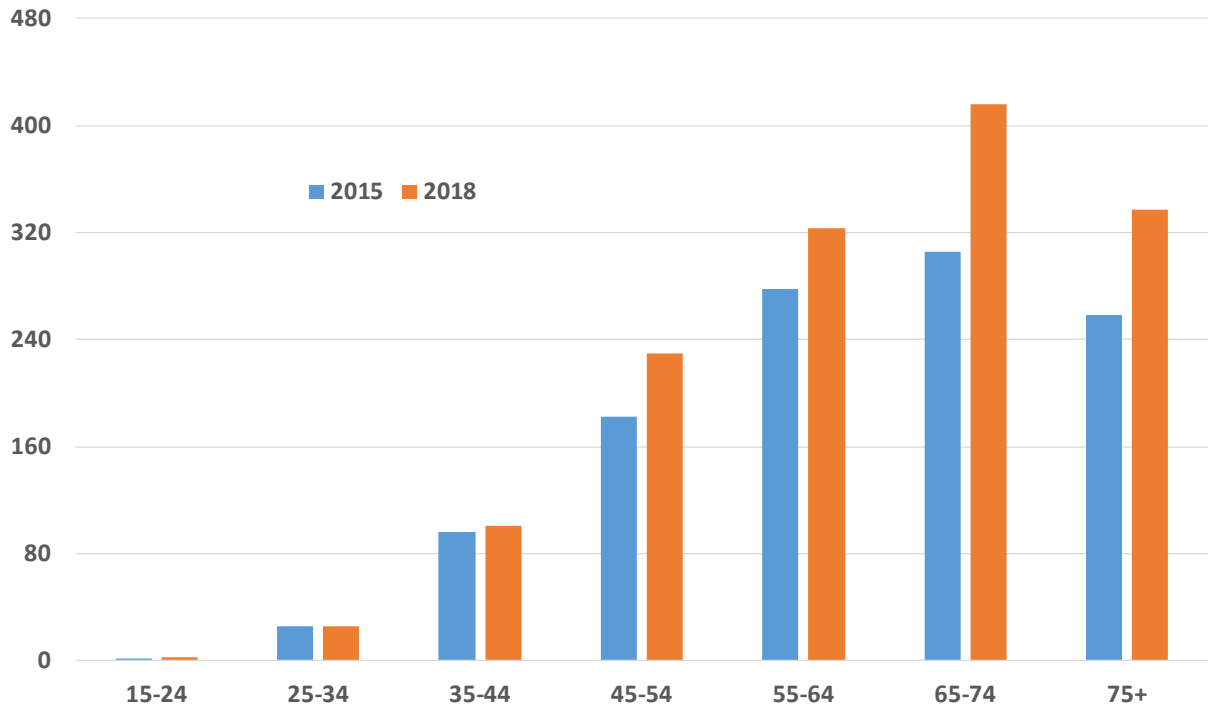


Source: Stats NZ (estimates up to 2021, projections from 2022)

Note: For the purposes of this analysis, net borrowers are defined as those below the age of 25 and 65+; net savers are defined as those aged between 25 and 64.

This analysis does not take cohort effects into account and assumes that net wealth is distributed equally within age groups. The actual effect of ageing on interest rates will depend on the magnitude of net wealth accumulation and on how adequately people are saving for their retirement. In New Zealand, people aged 65 and over get a basic income allowance from the government irrespective of whether they have worked or how much they earned. In addition, the government provides incentives to save under the KiwiSaver scheme introduced in 2007. Figure 29 shows that New Zealanders continue to build up their net worth throughout their lives, reaching a maximum of $416,000 (median value) in the 65-74 age group. This falls to $337,000 in the 75+ age group as people start drawing down on their savings during their retirement. That being said, the pace of drawdown does not appear to be rapid; in fact, in 2018 the median earnings of the 75+ age group in New Zealand was 4.3% higher than that of the 55-64 group.

Figure 29 – Median individual net worth by age bracket and year ('000 NZ$)



Source: Stats NZ

People do not have perfect foresight about either how long they will live or how much money they will need in their retirement. Parents may also wish to bequeath some money to their children, while the support provided by the government plays a role as well. The effect of ageing on private savings behaviour is therefore not as clear-cut. Further, it can be argued that, due in part to the universal financial support provided by the New Zealand government to elderly people, the private retirement sector is not as well developed as in other countries. Indeed, only in the last few years have retirement annuities started gaining in popularity and most people still seem to be taking their KiwiSaver pay-outs as a lump sum benefit rather than converting it to an income stream. In the 2020 Mercer CFA Institute Global Pension Index, New Zealand was ranked 10th overall out of 39 countries (Mercer, 2020). New Zealand's pension system performs well with regard to 'Integrity' but less well regarding its 'Adequacy' and 'Sustainability'. The integrity pillar measures factors such as regulation and governance; the adequacy pillar considers benefits, saving rates, tax support, system design, and home ownership; the sustainability pillar considers factors such as total assets, pension coverage, government debt, economic growth, and demography. In the 2019 edition of the index, New Zealand was ranked eighth out of 37 countries.

According to a survey by the Commission for Financial Capability (2013), only 20% of New Zealanders think that people should consider the possible length of retirement when thinking about saving for retirement, while only one in three have calculated how much they will need for retirement, although it increased by five percentage points from the 2009 survey. Meanwhile, only 12% of people believe that because of Superannuation they do not need to save for retirement – down from 24% in 2009. Moreover, research by Le et al. (2009) shows that most New Zealanders aged 45-64 have made adequate provision for their retirement, which the authors define as being able to maintain one's standard of living. Law et al. (2011) studied New Zealanders' savings behaviour following the introduction of the KiwiSaver scheme. They found that about a third of contributions to KiwiSaver could be viewed as additional savings that would not have taken place in the absence of the scheme. Furthermore, 22% of

people have a shortfall in expected retirement income based on basic needs, while 50% have an expected shortfall based on living comfortably. KiwiSaver membership was not found to be a factor that had a statistically significant effect on the level of expected retirement shortfalls/excesses. In a later paper, Law and Scobie (2014) analysed to what extent KiwiSaver had increased net wealth accumulation. The authors used the Survey of Family, Income and Employment, which was linked with Inland Revenue Department data on KiwiSaver membership. The total linked dataset covered the 2002-10 period. The authors found that, when using difference-in-differences estimation, KiwiSaver members had accumulated $16,000 less in net wealth than non-members. In order to control for other factors that may affect wealth accumulation, the authors further estimated fixed and random effects panel regression models. They found that KiwiSaver had a statistically insignificant effect on net wealth accumulation.

6.1.3 Empirical evidence for the LCH

Empirical evidence for the LCH is mixed. Rosevaere et al. (1996) estimate in a study of OECD countries that a 20% increase in the old-age dependency ratio over the subsequent 30 years would result in a reduction of 6% in private savings (an elasticity of -0.3). In a comprehensive literature review by McMorrow and Röger (2003), the authors note that, while most studies tend to find a significant relationship between demographic variables and private savings, there is substantial disagreement about the magnitude of the effect. From the reviewed studies, both cross-section and time-series, they calculate a simple unweighted average of the effect on the private savings rate of a 1 percentage point increase in the dependency ratio. These averages are -0.52 for the youth dependency ratio and -0.75 for the old-age dependency ratio. According to projections by Stats NZ, New Zealand's youth dependency ratio is projected to decline by 5 percentage points between 2020 and 2068, and the old-age dependency ratio to increase by 23 percentage points. Using the average elasticity estimates from McMorrow and Röger (2003), we calculate that New Zealand's private savings would decline by a combined 14.7% over this period.

In a similar vein, Martins et al. (2005) ran panel regressions for 30 OECD countries for the 1970-2003 period in order to quantify the effect of demographics on savings. In particular, the authors regressed the household savings rate on age-structure variables, in addition to a number of control variables. The age structure variables used were the share of the population aged 25-59 as well as the share of the population aged 60-99. Some of the control variables that were used were the budget balance, real short-term interest rates, CPI inflation, public health expenditure as a percentage of total expenditure, average pension replacement rates, and life expectancy at birth. With the exception of life expectancy, all of the estimated coefficients have the expected signs and are statistically significant. *A priori* one would expect life expectancy to have a positive sign; as people expect to live longer, they would need to save more in preparation for a longer retirement. Overall, the regressions suggest that the share of the old-age population has a large negative impact on the savings rate, while the share of the prime-age population has a positive effect. The magnitude of the former (-4.3) is, however, more than five times larger than the latter (0.8). The authors warn that these estimates should be used with caution when making projections since the old-age population shares in the estimation period are much lower than what is projected for the subsequent 50 years. Moreover, the analysis does not take possible behavioural responses into account.

It is of course essential to look at national savings as a whole – both private and public savings – as well as the possible interaction between the two. If Ricardian equivalence were to hold fully, a change in government saving would have no impact on private saving since people would anticipate that taxes would be changed in future in order to offset the change in government saving. In practice, empirical studies suggest that strict Ricardian equivalence does not hold. More realistically, there tends to be a negative correlation between private and public saving. In this regard, an increase in fiscal pressures due to an ageing population that results in a decline in government saving will tend to increase private savings, which should partially offset the downward pressure on private saving caused by more people moving into retirement.

6.2 Impact on domestic asset markets

According to the asset meltdown hypothesis (AMH), as more and more people start drawing down on their retirement savings, there will be a sharp reduction in asset prices and an increase in interest rates. In turn, this would have negative consequences for capital accumulation in the economy and therefore also long-term economic growth. In a literature review of the empirical and theoretical studies of the AMH, Thenuwara et al. (2017) conclude that although there may not be a meltdown as such, "*it remains plausible that ageing will have a significant negative impact on asset prices*." The reviewed studies contain contradictory results, which the authors attribute to the fact that the elderly in reality draw down on their savings at a much slower pace than is suggested by the LCH.[12] Brooks (2006), further, shows that in countries with high levels of household participation in equity markets (including New Zealand), financial asset prices are projected to continue rising in real terms as the population ages.

Looking at New Zealand's projected age structure, our previously defined 'net borrowers' group starts exceeding 'net savers' from the 2050s onwards, which is when downward pressure on asset prices is expected to start building. However, apart from the assumption on the pace of dissaving by the elderly, the AMH has another major flaw: it, in effect, treats domestic capital markets as closed. In reality, capital markets are generally quite open and are likely to become even more open in future. For New Zealand specifically as a small open economy, it becomes crucial to consider *global* capital flows. This emphasises the importance of looking at ageing dynamics in a global context. The role of international capital flows is considered in Section 6.3.

Immovable assets (such as property) are less affected by international capital flows; this is especially true if there are restrictions on foreign ownership of property, as is the case in New Zealand. Owner-occupied dwellings accounted for about 30% of total household assets at the end of June 2018, with other real estate accounting for a further 8%.[13] There is an ongoing debate about how population ageing will affect house prices. On the one hand, as the population ages, it is reasonable to assume that the demand for housing would go down since home ownership levels rise with age. In turn, this would put downward pressure on house prices. On the other hand, population ageing will also lead to a reduction in the supply of housing which would put upward pressure on house prices. The net effect on house prices is therefore uncertain.

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12 However, it is also true that we do not yet know how savings behaviour might change in response to an acceleration in the pace of ageing.

13 This is according to the household net worth statistics from Stats NZ.

In a study of 22 advanced economies, Takáts (2012) finds that in the past 40 years, demographic factors resulted on average in a 30 basis points (bps) per annum increase in house prices, while over the subsequent 40 years, population ageing will decrease house prices by 80 bps per annum compared to the baseline of neutral demographics. For New Zealand, the historic demographic impact is larger at around 80 bps, while the projected future impact is smaller at around 40 bps. In a study considering the Australian economy, Thenuwara et al. (2019) find that macroeconomic shocks and housing-specific factors explain much more of the variation in house prices than demographic factors. In a study looking at the Scottish housing market, Chen et al. (2012) find that demographic factors do not play a significant role in the determination of house prices.

The ageing of the population might also affect households' portfolio strategies. This view rests on the assumption that risk aversion increases with age, which seems reasonable, since the older you are the less time you have to recover from a negative shock to your investment. In turn, this would result in a relative increase in the demand for bonds and a decrease in the demand for equities, which would increase bond prices – lowering bond yields, thereby lowering the value of retirement income streams – and lower stock prices. Empirical evidence on this subject is inconclusive and there is a severe identification problem since many factors are interrelated.

6.3 The role of international capital flows

The relatively free movement of capital across borders allows for the diversification of demographic risks. In essence, countries that are ageing relatively more rapidly will have an excess capital stock, which can be invested in countries that are not ageing as rapidly. In turn, this will increase the effective return on capital in the countries that are ageing more rapidly. The degree to which countries can diversify their ageing risks depends on the free movement of capital. In reality there are restrictions on the movement of capital, including taxes, capital controls, country risk factors, exchange rate risk, and home bias. Another key question is to what extent developing countries would be willing (via capital account liberalisation) and able (via the presence of a sufficient amount of profitable investment opportunities) to absorb this increase in capital inflows. This would effectively determine the direction of global interest rates, which will be influenced by changes in the overall stocks of savings and investment. According to a study by Fehr et al. (2005), once China is added to their dynamic life-cycle general equilibrium model, the usual gloomy predictions of the effects of ageing on the European Union (EU) become much more positive. Even though China is also ageing quite rapidly, its savings rate, economic growth, and policies are much different to those of developed economies. This implies that "*China will gradually become the world's major source of capital*" (Fehr et al., 2005: p.40). Nevertheless, since China is also ageing rapidly, this is not a long-term solution; China will also over time become a net borrower, which will have a major effect on global capital flows.

Liu and McKibbin (2019) use a global general equilibrium model to examine the effects of population ageing. The model contains 18 regions and 6 sectors. A common age/earnings profile based on data from Japan and the United States is applied to all regions. The baseline (counterfactual) scenario shows what would happen if population growth is zero and the population age structure is frozen at their 2015 levels. This is then compared with the demographic shock scenario based on UN projections. The authors find that capital flows to the relatively younger populations of sub-Saharan Africa and emerging Asia, which results in an increase in global GDP and real interest rates. Countries are affected in different ways depending on their demographic profiles.

Börsch-Supan et al. (2005) use a computational general equilibrium model for seven regions to assess the impact of population ageing. They find that "*[o]pen economies are able to diversify a great deal of the demographic effects that depress savings and the rate of return to capital*." Another important conclusion is that the overall effects of population ageing are much less severe once accounting for the response of households working more.

The effect of ageing on a country's current account balance will depend on whether the decline in domestic investment demand exceeds the reduction in national savings. In a study looking at seven OECD countries, Fougère and Mérette (1998) conclude that rapidly ageing countries will experience an improvement in their current account balances due to the decline in domestic investment exceeding the fall in savings.[14] The authors employ an open economy OLG model based on the LCH. Similar results are reported by Batini et al. (2006) and Bryant (2004). The opposite result is reached by Kim and Lee (2007) in a study of East Asian economies, namely that an increase in the old-age dependency ratio lowers saving rates and thereby leads to a worsening of current account balances. Essentially, the results of these kinds of studies are sensitive to assumptions about the trends in savings and investment, the degree of capital mobility, the countries included in the model, the time period, and the structure of the model.

6.3.1 New Zealand evidence

Guest et al. (2003) use an open economy model with flexible exchange rates in order to assess the impact of population ageing on living standards and on the optimal rate of national saving. Living standards are defined as consumption per person, while optimal savings are the level that would maximise growth in living standards. The authors find that population ageing reduces consumption per person by 12% by 2051 in the baseline demographic scenario. Overall, consumption per person still roughly doubles by 2051, so the negative impact of population ageing is not particularly large. Since population ageing has a relatively small impact on consumption, the effect on the optimal savings rate is also not very large. The authors estimate that the national savings rate increases by less than 1% in the first few years relative to the case of no ageing, followed by a decline for several decades to -1.5% by 2051.

Claus et al. (2001) examine whether the theoretical prediction that higher savings will boost economic growth holds empirically in a New Zealand context. Given an open economy, domestic savings and investment need not be equalised. The authors find that New Zealand households' portfolios are relatively more diversified than in other OECD countries for which data was available, which implies that barriers to capital flows are likely to be small. They conclude that "*investment and hence economic growth does not appear to have been constrained by domestic saving rates that are 'too low'*" (Claus et al., 2001: p. 31).

6.4 What is the likely overall impact on interest rates?

When thinking about the direction of interest rates over a long-term horizon, there are many factors that must be taken into account. Ageing is a significant part of this but it is just one factor. A summary table of the expected effects of ageing on interest rates is presented in Table 4. Based on the literature and the available data for New Zealand, we make a judgement on the expected direction of the movement. There are factors that will tend to increase interest rates, while others will put downward pressure on interest rates. The timing and magnitude of these effects, which we do not evaluate in this study, will determine the net impact on interest rates.

[14] Canada, France, Italy, Japan, Sweden, United Kingdom and United States.

Table 4 – A summary of the population structure-related driving factors of interest rates in the long term

Factor	Expected Direction
Slowdown in the growth in the labour force → increase in capital/labour ratio	Downward
Possible slowdown in MFP growth	Downward
Increase in risk aversion due to ageing	Downward
Increase in savings due to higher life expectancy	Downward
In a no policy change scenario, an ageing population will increase the public debt/GDP ratio	Upward
A decline in aggregate savings as more people move into retirement	Upward
An increase in capital flows to emerging and developing countries	Upward

Due partly to uncertainty about the pace at which retired people will draw down on their savings, the trend in aggregate savings and therefore interest rates is uncertain. If interest rates do increase, this would lead to a slowdown in capital accumulation and consequently economic growth. It is important to note, however, that this in itself does not imply a fall in wellbeing. An ageing population implies a relative change in the population's needs and preferences, and thus a relative decline in the capital stock should not automatically be of concern, even if it does lower economic growth. In other words, since there are fewer workers, they need less capital, and resultantly the increase in interest rates is not necessarily problematic (Rosevaeare et al., 1996).

7 Demand-side effects

An ageing population will result in changes in both the level of consumption since older people tend to have a higher propensity to consume, as well as in the types of goods that are demanded by the population. This could have a number of knock-on effects, including:

- lower savings and capital stock (discussed in Section 6)
- a change in the sectoral composition of the economy
- a change in aggregate labour force productivity
- inter-sector labour shortages and excesses
- a change in the level and composition of government spending, and
- a change in the weights of the consumer price index.

7.1 Composition of spending

An ageing population will result in a change in the composition of consumer expenditure. For example, one might reasonably expect the demand for health services to increase, while the demand for education is expected to decline. For some other sectors, it is not as simple to judge how the demand for certain goods or services might change in response to an ageing population. More generally, an ageing population is expected to increase the demand for non-tradables, especially services.[15]

Ballingall et al. (2013) use Stats NZ's Household Expenditure Surveys (HES) of 2004 and 2010 to compare how expenditure differs by age and how it has changed over time for every age group. Expenditure shifts can occur over time due to changes in relative prices, preferences, the composition of the population (by age and ethnicity), and wealth changes, amongst other factors.

The key conclusions from the comparison of the HES in 2004 and 2010 are as follows:

- spending on health and insurance increases with age
- spending on household energy increases for the oldest cohort (65+)
- spending on rent falls with age, while rates increase with age, reflecting the shift from renting to home ownership
- spending on education falls with age, and
- spending on fruit and vegetables increases slightly with age.

The Office for Senior Citizens (2015) projects that the after-tax income of the 65+ group will grow by 3.5% per annum in real terms between 2016 and 2061. Total income includes remunerated work, government transfers, and investment and other income. The strong growth in income reflects an increase in this age group's share in the total population, an increase in

[15] See for example Lührmann (2005).

labour force participation and hours worked, and better health outcomes due to an increase in longevity. Total spending by the 65+ age group (including GST) is projected to increase from $18.4bn in 2016 to $85.7bn in 2061, which emphasises that older people will become increasingly important as a consumer group. Companies would have to take note of these trends when designing their business and marketing strategies.

Llewellyn and Chaix-Viros (2008) look at some of the implications of ageing on companies at a sectoral level. While most of their analysis is done from a UK market perspective, some of the general trends apply universally. Some of their key conclusions from a consumer trend perspective are summarised below:

- Older people tend to have higher levels of brand loyalty. This can be either an opportunity or a challenge. Generally, it will tend to benefit those companies who have already established themselves in the market, while making it more difficult for new entrants.
- Convenience shopping and home deliveries will become more popular.
- There might be increased demand for high-end spirits, nutritional supplements, and anti-ageing cosmetics. On the other hand, the demand for confectionary, beer, and soft drinks may decline.
- There might be an increase in the demand for retirement and other savings products as well as life insurance. Financial advisors might also become more in demand.

7.2 Labour force productivity

Demand-side changes could affect aggregate labour force productivity in the economy simply because different sectors inherently have different productivity levels – for instance, retail trade has higher productivity levels than education – due to the type of skills that are required and the work that is done. Due to this difference, a shift in economic structure may result in a change in aggregate productivity levels. During the past two decades, the primary and secondary sectors' contributions to New Zealand's GDP have declined, while that of the services sector has increased. In turn, this was mostly due to a decline in manufacturing's share, while there were large increases in rental, financial, professional, and health services, as well as in the construction sector.

Based on Ballingall et al. (2013), Llewellyn and Chaix-Viros (2008), Martins et al. (2005) and the Office for Senior Citizens (2015) combined with productivity data from Stats NZ, we make a judgement on what impact a change in the economic structure (due to ageing and other factors) will have on aggregate labour force productivity in New Zealand over the long term. This is illustrated in Table 5. For example, the education sector's contribution to GDP is expected to decline as the population ages; since this sector has below-average productivity growth, a decline in its share will have a positive impact on aggregate productivity growth. Meanwhile, the health sector's contribution is expected to increase while its productivity growth is also below-average; thus, an increase in its share could arguably have a negative effect on aggregate labour force productivity. This analysis is over-simplified and we do not yet know how technologies, including in the health sector, will change over time. Moreover, a significant portion of the shift is from and to sectors where productivity growth is difficult to measure, such as health and education. Table 5 merely provides a snapshot of what the effect may be on aggregate labour force productivity if sector-specific productivity differences persist in the long term. More research is required to get more definitive results.

Table 5 – Expected impact of economic structure changes on aggregate labour force productivity

Sector	Average Annual Labour Productivity Growth (%)		2018 Contribution to Employment	Possible long-term change in GDP contribution	Possible impact on labour productivity growth
	2000-2008	2008-2018			
Primary industries	2.1	2.0	5.6%	Negative	Negative
Manufacturing	1.3	0.5	11.1%	Negative	Neutral/uncertain
Electricity, gas, water, and waste services	-3.0	-2.2	0.8%	Positive	Negative (small)
Construction	0.2	0.9	7.6%	Negative	Positive
Wholesale trade	2.0	1.0	5.0%	Neutral/uncertain	Neutral/uncertain
Retail trade	2.7	3.1	9.7%	Neutral/uncertain	Neutral/uncertain
Accommodation and food services	0.3	0.7	7.4%	Neutral/uncertain	Neutral/uncertain
Transport, postal, and warehousing	1.4	1.3	4.3%	Neutral/uncertain	Neutral/uncertain
Information media and telecommunications	4.0	3.9	1.5%	Positive	Positive
Financial and insurance services	2.6	2.0	2.6%	Positive	Positive
Rental, hiring, and real estate services	3.7	1.3	1.6%	Neutral/uncertain	Neutral/uncertain
Professional, scientific, and technical services	0.3	0.3	7.2%	Negative	Positive
Administrative and support services	0.2	-2.0	5.2%	Neutral/uncertain	Neutral/uncertain
Education and training	-1.5	-1.3	8.4%	Negative	Positive (large)
Health care and social assistance	0.8	-0.3	10.7%	Positive	Negative
Arts and recreation services	-1.0	-0.5	1.8%	Neutral/uncertain	Neutral/uncertain
Other services	1.7	0.2	9.4%	Neutral/uncertain	Neutral/uncertain
Total measured sector	1.3	1.0	-	-	-

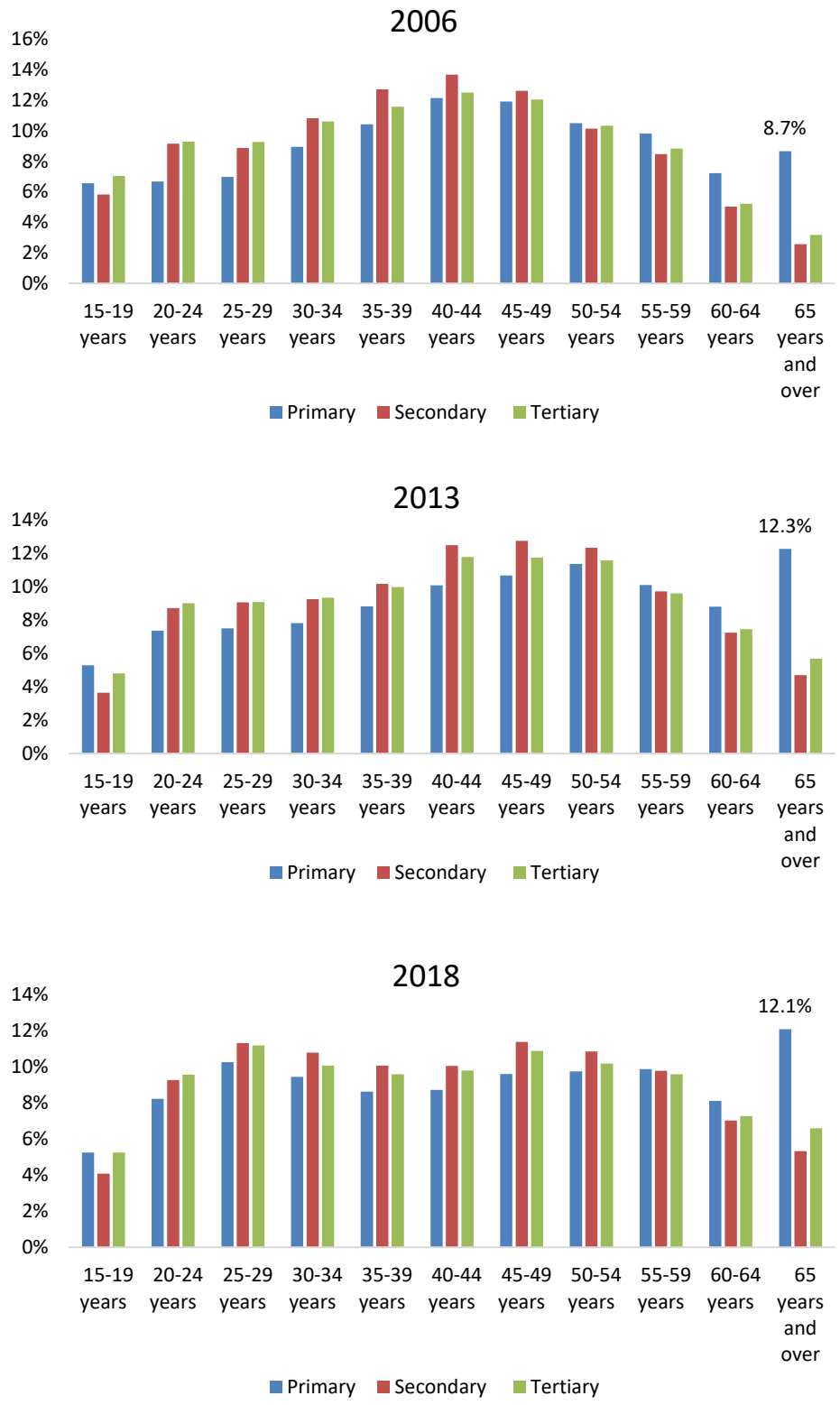
Laws and Meehan (2015) decompose New Zealand's labour productivity growth into within-industry productivity growth, changes in labour shares by industry, and changes in industry real prices. For the 1978-2011 period, within-industry changes in labour productivity dominate the overall change in aggregate labour force productivity growth. Changes in labour input shares reduced labour productivity growth by only 0.1 percentage points. However, during the 1997-2000 cycle, the decline was more pronounced at -1.1 percentage points. At an industry level, the biggest declines in labour productivity caused by a fall in the labour input share were in the manufacturing and agricultural sectors.

7.3 Labour force age composition by sector

Another factor that needs to be considered is that different sectors have different employment age profiles. Figure 30 shows the age composition of employed people by sector in New Zealand for 2006, 2013, and 2018. Even though it is a relatively short period, there were quite significant changes in the age composition by sector.

The most striking is the increasing concentration of older people in primary sector employment between 2006 and 2013. In 2006, people aged 50+ accounted for 36% of total employment in the primary sector. By 2013, this proportion had increased to 43%. This appears to have subsided in 2020, falling to 40% with a greater proportion of the primary sector workforce coming from younger people.

Figure 30 – Employment by sector and age, 2006, 2013, 2018



Source: Stats NZ

8 The indirect impact of an ageing population on the economy via fiscal changes

The fiscal impact of an ageing population, in particular the increase in spending on pensions and health, will have an economic impact as well. The Treasury's Long-term Fiscal Model (LTFM) shows that, given the realities of an ageing population, if no policy changes are made, New Zealand's public debt levels will reach unsustainably high levels. The government has a wide array of options of policy changes it can make. The effect on the economy will depend on which of these options it chooses and the magnitude and the timing of the changes. Some of these options include:

- increasing tax rates
- increasing the NZS eligibility age
- cutting back on some expenditures, and
- implementing policies that will boost the economy's productivity.

Each of these policies will have different economic and intergenerational impacts. Higher taxes will tend to distort the allocation of resources, as well as affect labour supply and capital accumulation. The effect of expenditure cuts will depend on sector-specific fiscal multipliers and the private sector's response. Meanwhile, policies like raising NZS's eligibility age will affect behaviours, such as increasing labour force participation.

Using an OLG model with three generations (dependent children, working adults, and retired adults), Ehrlich and Kim (2005) analyse the interactions between social security taxes and benefits, and family formation choices and fertility rates, which in turn have an effect on human capital formation and therefore economic growth. The authors use data from 57 countries for the 1960-92 period and find that PAYG tax changes have had significant negative effects on the marriage/divorce ratio, fertility, savings rates, and economic growth, especially in OECD countries. These results imply that the fiscal response to the effects of an ageing population might actually reinforce the ageing trend by lowering fertility levels.

Boldrin et al. (2005) provide further evidence for the negative relationship between social security and fertility. The authors use both cross-sectional and panel data for a large number of countries to evaluate this relationship. Based on the fertility model developed by Boldrin and Jones (2002), whereby people in effect have children so that they will care for them in their old-age, increases in public pensions account for 65% of the differences between European and US fertility rates and for more than 80% when considering a broad range of cross-section countries.

A different approach is taken by Zhang and Zhang (2003). They analyse how social security policies interact with different economic growth determinants, namely savings, human capital investment, and fertility, which are all treated endogenously. While the authors also find that social security negatively affects fertility rates, they find a positive association with economic growth. The argument is that social security tips the quantity/quality trade-off with regard to the decision of how many children to have towards quality. In other words, parents decide to have fewer children, which leads to increased human capital investment per child and is positive for an economy's long-run growth prospects.

Creedy et al. (2014) use a two-period life-cycle model to assess how saving and consumption respond to changes in fiscal policy in a New Zealand context. In the model there is a universal public pension as well as a compulsory saving scheme. Overall, the authors find mild responses. For example, if the average income tax rate increases by 6%, total savings decline by 0.7 percentage points. The authors conclude that "*it would take very substantial changes in existing policy settings to induce significant increases in household saving rates*". The biggest increases in savings rates come via a reduction in the PAYG pension or a significant reduction in the tax on interest income. Both of these policies would result in a 2-3% decline in house prices. On the fiscal side, a reduction in the PAYG pension would allow for either tax cuts or an increase in other areas of government expenditure, whereas the reduction in the interest income tax rate would necessitate higher taxes elsewhere or a cut in government spending.

9 Overall impact on economic growth

The previous sections each focused on particular aspects of the economy in order to do an in-depth analysis of the impact of population ageing. In this section, we assess what the overall GDP impact might be. Population ageing can affect GDP in numerous ways. First, there are the so-called three Ps of economic output, that is, population, participation, and productivity. Generally, population ageing can be expected to negatively affect the first two Ps, population and participation, while the impact on productivity is not as easy to pin down. Productivity might decline slightly, but it is not a given. In addition to the three Ps, there are other factors that will also drive changes in GDP, including capital accumulation, interest rates, and fiscal policy.

Due to the interrelatedness of these factors, it will be useful to consider some results from endogenous growth model studies. In a study of the impact of population ageing on economic growth in seven OECD countries, Fougère and Mérette (1998) analyse how results are affected if economic growth is endogenised. This is done by allowing for the accumulation of both human and physical capital. Relative to exogenous growth models, population ageing increases investment in human capital, which boosts economic growth in the long run. Another important result is that, even though savings decline, this does not lead to lower economic growth. This is because, in effect, savings are re-allocated from physical to human capital. One way to look at it is that the decline in savings is due to a permanent fall in the optimal level of savings due to the demographic changes and the relative costs and benefits of human vs. capital investment. Finally, the increase in tax burdens is not as severe as in other models, given the positive GDP impact. The model has a number of shortcomings; most notably, it assumes a closed economy and does not take into account the effect of population ageing on government expenditure.

The Australian Productivity Commission (2005) concludes that the ageing of the population "*clearly depresses economic growth*." They estimate that per capita GDP growth will be around one third lower than it would have been in the absence of ageing in the mid-2020s. This is caused mainly by the slowdown in labour force growth relative to overall population growth. In absolute terms, GDP per capita is projected to be $8,800 lower (in 2002/03 prices) in 2044-45 compared to if there was no ageing. Cumulatively, GDP is $4,100 billion lower between 2004/05 and 2044/45, which amounts to $167,000 per person.

Fougère et al. (2009) develop a dynamic general equilibrium model with overlapping generations for the Canadian economy, where human capital investment and labour supply decisions are endogenous. The authors simulate the model for the 1982-2050 period. The model explains the sharp increase in education levels in Canada seen over the past 25 years: population ageing incentivises young people to invest more in their education, thereby increasing the quality of their labour supply later in their lives. In turn, this could lower the economic cost of population ageing in later years. The authors conclude that the "*accumulation of human capital is a powerful smoothing mechanism: neglecting this is bound to lead to substantial overestimation of the economic costs of ageing*." They also note that the trend of increased labour force participation among older people "*might be the beginning of a new trend from more educated workers that will amplify over the next few decades*."

Prettner (2013) uses an OLG model with three sectors (final goods production, intermediate goods production, and Research and Development) and endogenous fertility. Specifically, utility increases with the number of children, while the cost is accounted for in terms of foregone consumption. The author considers two cases, one where technological spillovers are strong and population growth is zero based on Romer (1990) and one where the technological spillovers are not as strong and the size of the population is changing based on Jones (1995).

The author finds that a reduction in mortality is positive for long-run economic growth, while a fall in fertility negatively affects economic output. The overall effect on long-run economic growth depends on which model specification is used as well as the relative changes in mortality and fertility. Prettner (2013, p.831) concludes: "*[O]ngoing demographic changes do not necessarily hamper technological progress and therefore economic prosperity. Simultaneously decreasing birth and death rates can even lead to an increase in the economic growth rate. These results, while holding in a stylized theoretical modeling framework, are also in line with empirical studies claiming that the negative effects of population aging on economic prosperity might not be as severe as often argued."*

Lees (2013) uses an OLG model from Kulish et al. (2013) in order to assess the impact of ageing on the New Zealand economy. In this model, the retirement decision is endogenous: it responds to changes in wages, interest rates, and life expectancy. In other words, depending on the macroeconomic environment or changes in longevity, individuals can change the timing of their retirements. Since labour is relatively more expensive and capital relatively cheaper, firms invest more in the latter, resulting in an increase in the capital/labour ratio. Further, since it is assumed that workers save more in order to be able to afford their longer lives, savings increase relative to the baseline scenario of no ageing, which results in a decline in interest rates. Specifically, the author finds that ageing increases real wages by 16% relative to the baseline of no ageing, while the real interest rate falls by 160 bps.

Maestas et al. (2016) find significant negative effects of an ageing population on economic growth. The authors analyse the effect of population ageing on different US states. Since the population age structure of states may in fact partly be determined by factors that affect economic growth, the authors use an instrumental variables strategy, specifically by estimating the number of people by age by using national survival rates.[16] The authors find that a 10% increase in the proportion of the population aged 60+ leads to a 5.5% decline in GDP per capita. Over the 1980-2010 period, some two thirds of the effect on per capita GDP was due to a fall in labour productivity growth, while the other third was due to a slowdown in labour force growth. Using these estimates, the authors estimate that over the 2020-30 period, population ageing will reduce US real GDP per capita growth by an annual average of 0.6 percentage points. The authors caution, however, that broader general equilibrium factors have not been taken into account, such as tax changes at the federal level or increases in labour force participation at older ages.

Choi and Shin (2015) employ an OLG model with endogenous human capital investment in order to assess the effect of population ageing on economic growth in South Korea. The authors find that the growth in GDP per capita falls by about 25% as a result of population ageing. Population ageing results in slower growth in the labour force, which causes real wages to rise. In turn, this incentivises investment in human and physical capital. Even so, this only partially offsets the decline in human capital caused by population ageing. This model includes neither the public nor the foreign sectors, which detracts from its usefulness.

[16] The national survival rate is defined as the proportion of the national population aged j+10 (according to the census) relative to the size of the population in the previous census (aged j).

10 Conclusion

Population ageing is occurring in all developed countries, although at varying speeds. As it is an unprecedented phenomenon, there is significant uncertainty about the ways in which it will affect society. The fiscal impact is relatively easy to fathom; a few calculations are sufficient to show that an ageing population will put an immense strain on public funds over the long term if we do not start taking action now. On the other hand, the economic implications are much harder to pin down; we have to rely on models that use historical data to project a future that will look entirely different. For example, it is problematic to try to predict what effect an increase in the old-age dependency ratio will have if the extent of the increase has never in the past been experienced. The global average old-age dependency ratio has never before been above 15; over the next 40 years it is projected to more than double.[17] There are other problems too, such as behavioural responses, policy changes, measurement issues, and the validity of assumptions. In this paper, we assessed the available literature on the economic effects of an ageing population complemented with our own analysis in order to provide our best possible judgement. Our key findings are summarised below.

Labour force growth will decline. As people get older, they are less likely to participate in the labour force and, if they do participate, they generally work fewer hours. In this regard, as people age, the aggregate labour force participation rate will decline. The extent of the overall decline in labour supply can be softened by an increase in the labour force participation rate and hours worked by both women and elderly people. In New Zealand, the elderly's labour force participation has already increased significantly. As such, the scope and potential effect of further increases are arguably limited. There is potentially still some scope for female labour supply to increase, but it will not change the overall picture of a slowdown in labour force growth.

Labour force productivity might decline slightly, but it is not a given. There is considerable evidence that at least some types of cognitive abilities decline with age. Older workers make up for this at least partially by their experience, as well as their breadth of industry knowledge and networks. Moreover, there is also macro-level evidence that suggests that having a relatively older workforce might even have positive effects on labour productivity and company performance. A relatively smaller labour force will also increase the amount of capital per worker, which should boost productivity levels. Therefore, on the whole it is difficult to make an overall assessment on the impact of ageing on labour productivity. If there is a negative impact, it is unlikely to be substantial and could be addressed by targeted training programmes.

Ageing will tend to increase the average propensity to consume and this will have knock-on effects on both goods and capital markets. Assessing the net impact of population ageing on interest rates is challenging, as there are both downward and upward pressures. A slowdown in labour force growth will increase the capital/labour ratio, which in turn will put downward pressure on interest rates. Further, if productivity growth slows down, this will also tend to lower interest rates. Of crucial importance is also how adequately people are financially prepared for their retirements. Theoretically, there should be a positive relationship between life expectancy and savings and consequently population ageing should, at least initially, result in an increase in savings, which will exert downward pressure on interest rates. In contrast, as more people move into retirement and start drawing down on their funds, aggregate savings will fall, putting upward pressure on interest rates. Furthermore, international capital flows should also be considered. It is reasonable to assume that capital will increasingly flow to relatively younger developing

[17] Defined as the proportion of people aged 65+ relative to the population aged 15-64.

countries with growing labour forces, provided there is an adequate amount of profitable investment opportunities. In turn, this will raise the return on capital in developed economies. On balance, the net effect of ageing on interest rates is difficult to pin down and it might conceivably first decline for a number of years before it starts increasing.

The composition of consumption will look different in an older society, shifting, for example, away from education and towards health. Since retired people will tend to have a higher propensity to consume, consumption per capita should increase assuming net worth levels are high enough, which could benefit retailers. As a consumer group, older people will increase in importance meaning that companies will have to adjust their brand and marketing strategies to stay relevant.

Fiscal changes in response to population ageing will have economic effects as well. If there is no fiscal response, public debt will reach unsustainably high levels, implying that at some stage policy changes will simply have to be made. The economic impact of these changes will depend on the specific suite of policies that are implemented and their timing and magnitude. It is important to stress that some of these policies could have feedback effects to demographic factors such as fertility such that the fiscal policy response to population ageing might reinforce the ageing trend. More research, however, is required in this area in order to better understand all the linkages.

The net effect on economic output is uncertain. By lowering labour supply growth and possibly also labour productivity growth, population ageing might lead to a reduction in potential output. While some endogenous growth models show a negative relationship between population ageing and GDP growth, others reveal a positive relationship. Ultimately, estimates of how ageing will affect GDP growth depend heavily on the model specification, assumptions, countries assessed, and the time period. It is therefore difficult to come to a definite conclusion. There are also potential mitigative effects that must be considered, such as behavioural and public policy responses, technological progress, shifts in relative prices and wages, and lifestyle changes.

To summarise, population ageing is likely to lead to a slowdown in labour force growth, might reduce labour force productivity slightly, and may lead to lower savings and higher interest rates in the long term. But what will the overall wellbeing impact of the economic effects of population ageing be? People are living longer, healthier lives, and this must surely be a positive, provided that it does not unduly influence the ability of future generations to enjoy the same benefits. Whether GDP, savings, and/or the capital stock move to permanently lower levels is, arguably, irrelevant, since it could merely indicate that the optimal levels for these aggregates have changed along with the structural change in the composition of the population. Population ageing will arguably have more of a fiscal than an economic impact; if the former is managed well, the negative impact on wellbeing should be minimised.

The main objective of this study was to provide a comprehensive review of the literature on the economic implications of an ageing population. Although there is a substantial amount of research on this topic in general, there are still some specific gaps in the literature. In particular, further research is required on the capital markets impact, especially in a New Zealand context. Likewise, while the topics of technology and population ageing have been explored extensively separately, research on the interaction between the two is limited. Further research would also be worthwhile on the general demand-side effects, as well as the age-structure impact on productivity in a New Zealand context.

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