NEW ZEALAND'S LONG-TERM
FISCAL POSITION

New Zealand's Long-Term Fiscal Position

Contents

Statement of Responsibility under Section 26N of the Public Finance Act

The Treasury has used its best professional judgements about the risks and the outlook in preparing this Statement on the New Zealand Government's long-term fiscal position.

This Statement on the New Zealand Government's long-term fiscal position relates to a period of at least 40 consecutive financial years, commencing with the 2005/06 financial year.

John Whitehead

Secretary to the Treasury

22 June 2006

Preface

This Statement is about
New Zealand's long-term fiscal
outlook and what drives it.

In 2004, the Public Finance Act was amended to require the Treasury, at least once every four years, to prepare a statement on New Zealand's long-term fiscal position. The Statement must look out over at least a 40-year horizon. This is the first such Statement.

It is impossible to predict with any accuracy what governments will be doing in the next 40 years. Modern governments do a myriad of things, in areas as diverse as foreign aid, taxes, health and road-building. Therefore, rather than attempt to make such predictions, we have used the available information to make projections of the fiscal consequences of particular scenarios. These scenarios set out the implications of possible policies and patterns of development of the economy. To pick up the uncertainty around these, we have used a series of "what if" questions; for example, what if economic growth is higher than we assume, what if fertility increases, and what if governments choose to spend more on education?

The starting point for our analysis is Statistics New Zealand's work on the future size and structure of the New Zealand population and Treasury's assumptions about the future size of the economy. Using this information, we have made projections of major spending categories and taxes, based on assumptions derived from history, current policy settings and judgements.

The purpose of this Statement

We see the purpose of this Statement as being to increase the quality and depth of public information and understanding about the long-term consequences of spending and revenue decisions. This will assist governments in making fiscally-sound decisions in the decades ahead.

The material presented here should be useful as the basis for discussions about the fiscal and other consequences of different policy settings.

The Statement builds on past work

This is not the first time the issue of New Zealand's long-term fiscal position has been placed in the public arena, although it has been some time since such studies were done, and the fiscal position has strengthened considerably over recent years.

Over the past 15 years, many reports by the Treasury and other agencies have thrown light on the long-term fiscal position. Some have looked at the impact of an ageing population and others at a wider range of drivers of the fiscal position. The common approach of these studies (like those undertaken in other countries) is to project the path of expenditure and taxes based on some notion of "current policy." The idea is to investigate the impact of external drivers on the overall fiscal position. Often, these drivers are demographic but sometimes they are economic, like the cost of health care.

Using this Statement to assess policies

The projections in this Statement do not draw conclusions about whether an individual policy is appropriate or affordable. Often such conclusions will depend on knowing what else the government is doing, or on having a view on the preferred role of government, an appropriate level of taxes or the overall state of the economy.

Material in this Statement will help people to make their own judgements about what they think are appropriate policies.

We present a range of scenarios of future policy settings to demonstrate the effect that drivers of different combinations of policies have on the fiscal position.

The trend towards taking a long-term view

Future governments have plenty of time to plan for the future. Demographic change is, by its nature, a slow process and New Zealand's public finances are in sound shape. Debt is low and assets are being built up to meet the future needs of society. That said, there is often a case for adjusting policy slowly or early to meet future changes, rather than waiting and making a sudden and larger adjustment.

Successive New Zealand governments have increasingly looked to the long term in setting their policy objectives. Part 2 of the Public Finance Act requires governments to look to the future when making decisions today. It does this by requiring them to set objectives for at least a 10-year horizon and to report their actions against these. This Statement, mandated by a new section of Part 2 of the Act, is a natural extension of this reporting framework, although it differs in that it looks out over a very long period, and across many parliaments and governments.

As well as extending reporting, governments have acted to strengthen the Crown's fiscal position. At a macro level, the Crown's accounts have moved from a position of persistently large operating deficits, high debt and negative net worth to the current strong position, in which net debt is zero.

At a more detailed level, perhaps the two most prominent examples of governments taking a long-term perspective are in the area of superannuation. The first was the increase in the age of eligibility for New Zealand Superannuation in the early 1990s. The second and more recent was the establishment of the New Zealand Superannuation Fund, which invests a proportion of current taxes to contribute towards the costs of New Zealand Superannuation in the future.

Demographics are changing

World-wide, population structures started to change hundreds of years ago, and New Zealand has been part of this trend. The Statement shows how this demographic shift is expected to affect the government's finances in the years ahead.

Demography directly affects the Crown's financial position in areas such as superannuation, education and health. In superannuation, the impact of demography is potentially very large: the proportion of people over 65 years is expected to double in the next 50 years. In education, the proportion of school-age children is set to fall by five percentage points over the same period. In health, the impact is not as clear-cut. Falling levels of disease and mortality are positive fiscally, while others, such as the increase in the numbers of very old people, may be negative.

Demography is, however, only one driver of government spending. While it is important for some programmes, it has little or no impact on others. It is important not to lose sight of the broader issues that matter for the long-term fiscal position, such as overall economic performance and productivity.

New Zealand's population is still relatively young compared with those of some other countries. Accordingly, those countries have to make policy adjustments more rapidly than we have to. We can learn lessons from them about how to harness the benefits of economic growth and meet the challenges posed by demography.

Preparing this Statement is not an end in itself

This Statement is a resource for policy makers, commentators and the general public. We hope that they will find it a useful addition to the information they use in making policy choices.

John Whitehead

John Whitehead
Secretary to the Treasury

Executive Summary

This Statement is about the factors that the Treasury expects to influence New Zealand's fiscal position over the next 40 years.

It is part of a suite of documents that the Public Finance Act requires the New Zealand government and its advisors to produce. These documents report on the government's fiscal position and fiscal intentions and its performance against these intentions. They are part of a wider set of provisions of the Act that require governments to operate policy in accordance with principles of responsible fiscal management.

Criteria for responsible fiscal management

Future New Zealand governments will have many policy choices open to them, leading to a wide range of fiscal results. Judging between these options requires some sense of what makes a "good" fiscal outcome. The principles of responsible fiscal management contained in Part 2 of the Public Finance Act provide guidance on this matter.

These principles require governments to pursue their policy objectives so as to achieve and maintain prudent levels of debt; ensure, on average, that spending does not exceed revenue; achieve levels of net worth sufficient to provide a buffer against future shocks; manage risks prudently; and have predictable and stable tax rates.

Governments to date have focused on reducing debt to levels judged to be prudent, because these were high in the early 1990s. As set out in the 2006 *Fiscal Strategy Report*, the current Government has concluded that maintaining gross debt at around 20% of Gross Domestic Product (GDP) is prudent for the coming decade. The Government also intends to continue building up net worth by accumulating financial assets in the New Zealand Superannuation Fund to help contribute to the costs of an ageing population.

Allowing some variation in debt could be consistent with responsible fiscal policy, as could alternative levels of spending and revenue. What is a prudent level of debt may vary through time as circumstances change.

In this Statement, the level of debt is used as a guide to responsible fiscal management. Policies resulting in an ever-increasing level of debt (or indeed assets) would not be consistent with the principles in the Act.

The approach to preparing this Statement

Over the past 15 years, the Treasury and others have produced reports on New Zealand's long-term fiscal position. Governments in other countries - for example, Australia, the United Kingdom, the United States and all 25 members of the European Union - also prepare projections of their long-term fiscal position. Some, like New Zealand, are required to do so by legislation.

The common approach in these studies is to express the long-term implications of continuing with existing policies. This approach is not an entirely straightforward task. First, there is the challenge of projecting forward the costs for different policy areas. Second, in addition to these policy intentions, governments also have fiscal objectives (such as those to do with overall levels of debt, and levels of taxes), which may not all be consistent.

Accordingly, this Statement adopts two broad approaches to looking at the future fiscal position. Put simply, the first is to carry on as we are, assuming no constraints, and see where it takes us. This involves looking at how existing policy in current spending programmes and revenue affect the aggregate fiscal measures. This is called the "bottom-up" approach. The second is to decide where we want to be and see how we can get there. This involves rolling forward current fiscal objectives indefinitely and looking at how spending and taxes would need to be changed in order to remain within the fiscal limits of the objectives. This is called the "top-down" approach.

Both these approaches use the same modelling framework for calculating the future fiscal position, but give different insights into the fiscal challenges that may lie ahead.

The addition of a top-down approach is an advance on previous reports on New Zealand's long-term fiscal position. Its particular attraction is that it is closer to what happens in the actual budget-setting processes that governments have been using over the past decade.

The modelling starts with projections of the population and combines these with assumptions of future productivity growth and labour force participation to produce projections of GDP. These projections are used in both the bottom-up and top-down approaches.

It is assumed that recent trends in participation and productivity will continue.

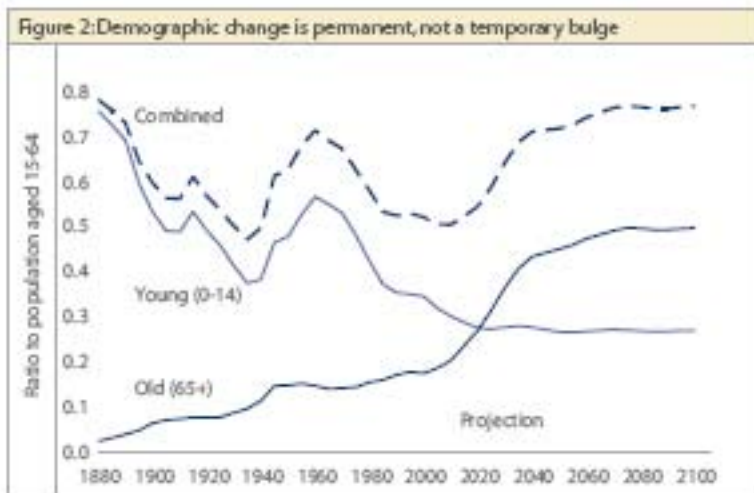## Structural demographic changes over the next few decades

The structure of New Zealand's population is changing. This is driven mainly by increases in longevity (life expectancy) and lower fertility rates (number of children per woman). New Zealand used to have high rates of mortality and fertility, but both have fallen markedly over the past century (Figure 1).

The result of these changes is a permanent shift in the make-up of the population. This change is not a demographic bulge that will reverse at some time in the future.

One way to show the permanent nature of these changes is to compare the number of young and old people with the rest of the population.

Figure 1: Birth and death rates have declined

Source: Statistics New Zealand

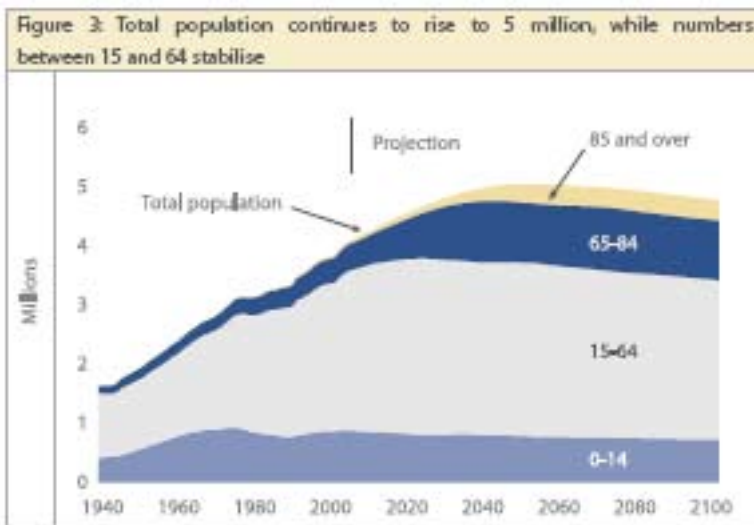**Figure 2: Demographic change is permanent, not a temporary bulge**

Source: Statistics New Zealand

Figure 2 shows changes in the ratios of these groups from 1880 to 2100. The effect of the baby boom is evident. Equally clear is that there is no downturn in the proportion of old people when the baby boomers have died. There is going to be a permanent change in the structure of the population.

While by 2100 the combined ratio of young and old is back to the levels seen at the beginning of the 20th century, the composition is different: people over 65 make up the largest share.   What is also evident is that most of the change in population will occur over the next 30 years. This is significant for the government's fiscal position because the cost of supporting young people tends to come from their families, while the cost of supporting the elderly tends to come from the State.

Population ageing is a story of survival: more and more people are living past 65 and past 85.   However, not only is the average age of the population increasing, but what it means to grow old is also changing.

Projecting these changes out 50 years is fraught with uncertainty.

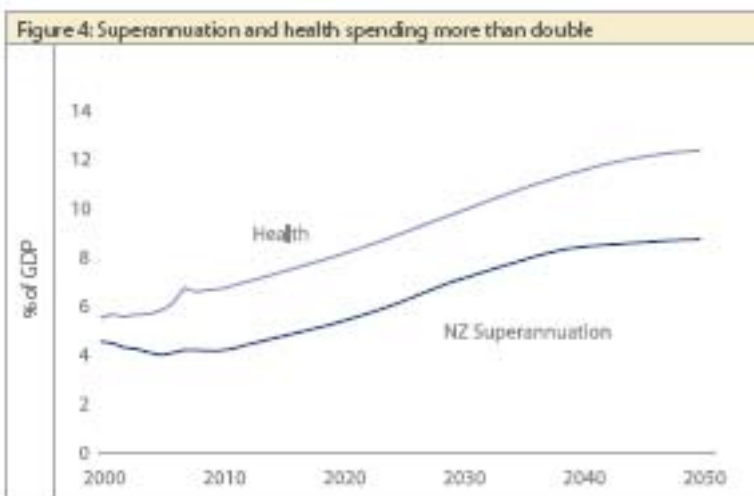**Figure 3: Total population continues to rise to 5 million, while numbers between 15 and 64 stabilise**
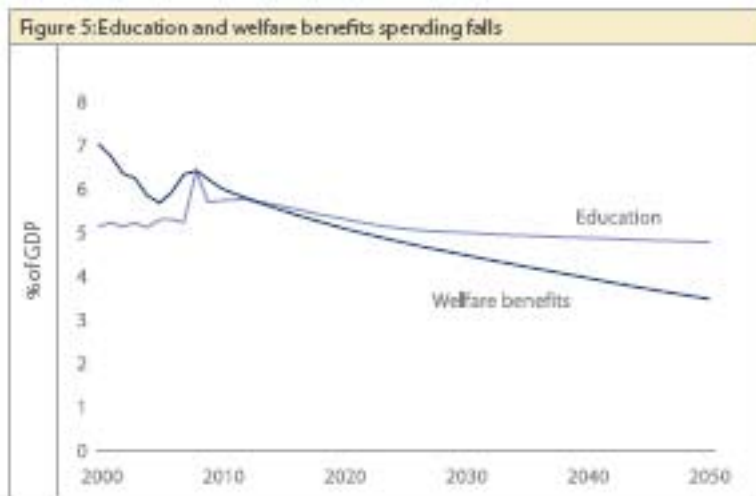

Source: Statistics New Zealand

The optimistic view is that life expectancy will continue to increase steadily and that morbidity (the incidence of disease) will also reduce steadily.   As a result, more people will live healthy, active lives into what was once considered "old age."

The pessimistic view is that past increases in life expectancy were generally the result of reductions in infant mortality that will not continue.   The incidence of chronic health conditions, such as obesity and heart disease, is increasing in the adult population.   The result is more old people requiring increasing amounts of health care just to maintain a basic standard of health.   Life expectancy may even fall.

The Statement uses Statistics New Zealand's median projections of the future population (Figure 3).   These tend towards the optimistic view of ageing.   Life expectancy will continue to grow, but will eventually stabilise.   In addition, the health projections assume that older people are likely to be somewhat healthier than they are today.

Figure 4: Superannuation and health spending more than double

Source: The Treasury

Figure 5: Education and welfare benefits spending falls

Source: The Treasury

Individual drivers of spending

In the tradition of previous studies of the long-term fiscal position, the projections made here of major spending categories and taxes and other revenue are based on assumptions derived from history, current policy settings and judgements.

This approach is a powerful tool for examining how changes in the population affect individual spending areas. An example is New Zealand Superannuation, where it is possible to project the number of people who will be 65 and over and multiply that by the projected rate of superannuation. The results of this approach are shown in Figure 4. One point to note is the similarity between the shape of the superannuation curve in Figure 4 and that for older people in Figure 2. These are similar because the main driver of superannuation spending is the number of people aged 65 and over.

For health, the main driver is the cost of individual treatments and advances in medical care: more diseases will become treatable in the future.

It is possible to undertake similar "no policy change" projections for other areas of government spending, although in some instances, more judgement is required. Figure 5 shows projections for welfare benefits and education.

In the case of welfare, the main driver is the level of benefits, where a continuation of the current policy of indexing benefits to price inflation is assumed. Benefit levels fall, as a proportion of GDP, because GDP grows much faster than prices over the projection period.

For education, demography again has a key role to play: the shape of the education curve mirrors the curve showing the relative number of young people in Figure 2. That is, because there will be fewer young people relative to the total population, total spending will fall as a share of GDP, even if the cost per pupil increases (as projected here).

The two approaches to making projections

Long-term projections can be done from either a bottom-up or a top-down approach. The bottom-up approach traditionally looks at how existing policy in current spending programmes and revenue affect the aggregate fiscal measures. It often calculates revenue assuming taxation remains a fixed share of GDP, and puts no restrictions on the total level of spending, operating balance or debt. The top-down approach, on the other hand, starts by setting restrictions for fiscal aggregates. It calculates the difference between projections for revenue and some particular expenditures. This difference is the amount that would be available for expenditure under the remaining policy programmes.

The bottom-up approach

With all spending allowed to grow according to the drivers of individual policy (discussed in more detail below), core government spending (excluding finance costs) is projected to increase by around 7.5 percentage points between now and 2050 (Figure 6).

Figure 6: Revenue is relatively flat while core spending rises
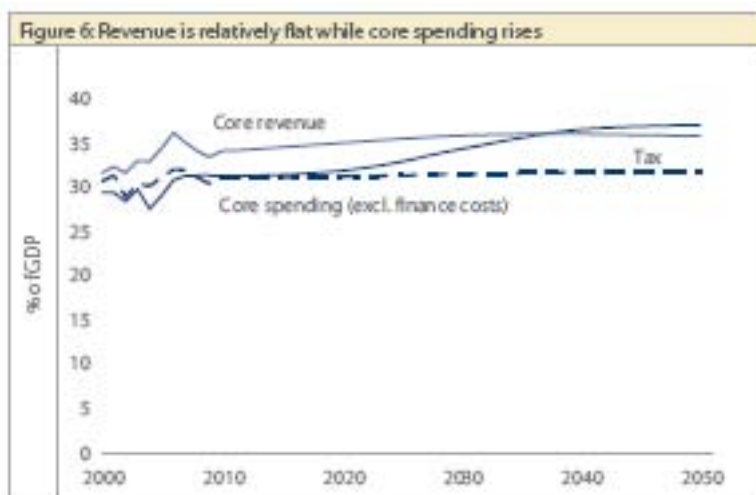
Source: The Treasury

The current tax bases are assumed to grow with the rest of the economy and most tax rates stay the same. In the case of personal taxes, the modelling assumes that the tax rates will stay the same, but that the thresholds are indexed to wages (the only growth coming from the tax on rising spending on superannuation).

Not surprisingly, such an increase in spending, combined with an assumption that taxes are kept broadly constant, results in a decline in the operating balance and an eventual move from surplus to deficit (Figure 7).

Figure 7: Growth in spending eventually outpaces the taxbase
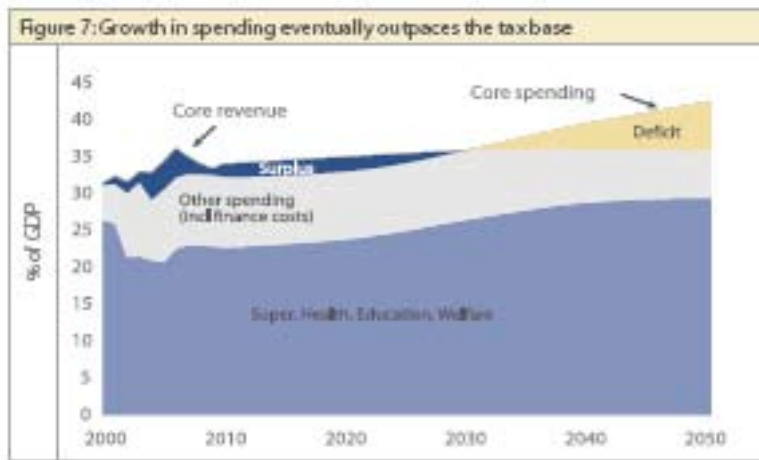
Source: The Treasury

Under this set of assumptions, debt will begin to rise and higher debt-servicing costs will reinforce the move from surplus to deficit, accentuating the impact on the overall operating balance (Figure 8). The impact on total spending is illustrated by the difference between the two core spending lines in Figure 6 and Figure 7.

Figure 8: Gross sovereign-issued debt rises
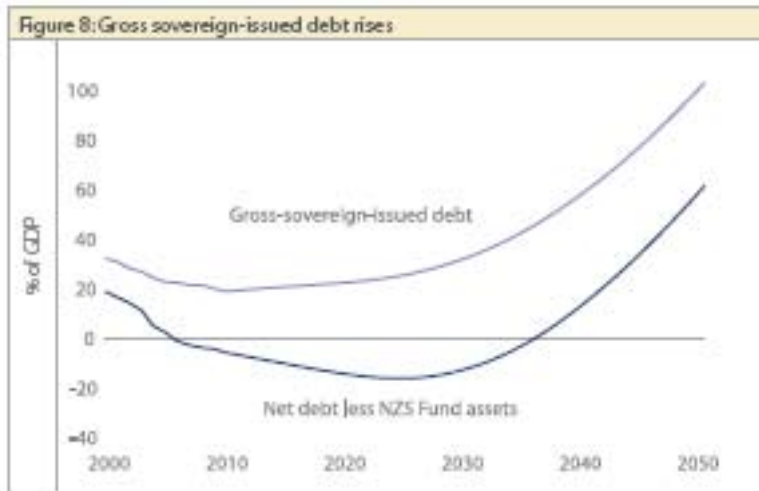
Source: The Treasury

The New Zealand Superannuation Fund assets would offset the rise in gross debt, such that the net debt position of the government at the end of the projection period would still be below the level it was at in the early 1990s. However, the debt position, and more particularly its upward trajectory, is not consistent with the principles of responsible fiscal management. Moreover, without some policy change, the debt position would continue to deteriorate beyond 2050.

The top-down approach

The top-down approach asks what might need to happen to spending and taxes, or some mix of them, in order to meet a set of fiscal objectives, such as a stable path for debt.   This approach gives some sense of the magnitude of change that could be required to meet such an objective.

In order for gross debt to remain stable at around 20% of GDP over the projection period (Figure 9), the operating balance needs to remain in small surplus.
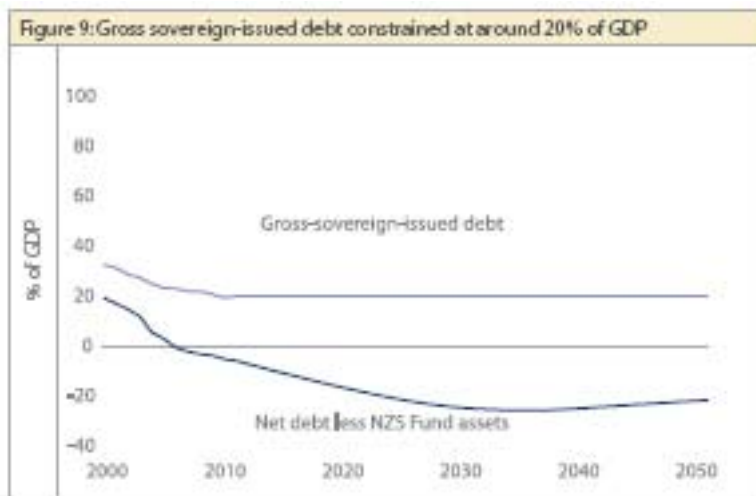
Figure 9: Gross sovereign-issued debt constrained at around 20% of GDP

Source: The Treasury

Figure 10: The effect of reducing other spending to maintain small surpluses and stable debt
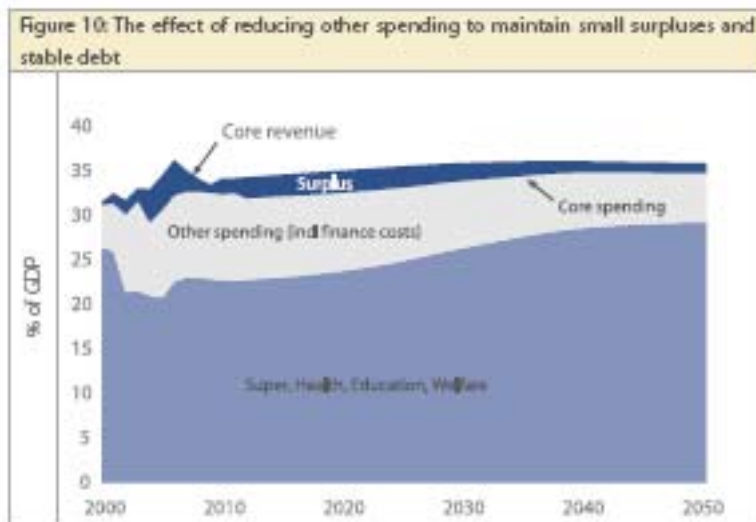
Source: The Treasury

If all the adjustment was to occur on the spending side, one possible path might have spending in the four major areas of health, education, New Zealand Superannuation and social welfare benefits projected as in Figure 10, with other spending acting as the residual. This selection of policies has been made for illustrative purposes only, and does not imply that spending in these four areas should be regarded as unchangeable. In such a case, other spending would have to decline as a proportion of GDP in the medium-to-long term from the current 10% of GDP to 5.5%.

If all the adjustment was to occur on the tax side, the tax-to-GDP ratio would have to increase to about 35% at the end of the projection period, up from the current level of around 32%. Total revenue would have to rise from about 36% now to around 39% of GDP in 2050.

The impact of debt is one of the main differences between the bottom-up and top-down approaches. Debt dynamics are such that small, persistent changes to spending or revenue can have very large effects if they accumulate over a long period of time. For example, if health spending were to grow each year at 0.6 percentage points slower than the average 5.6% used in the bottom-up approach, and nothing else changed, then debt would remain at around 20% of GDP. Health spending as a share of GDP would be around 9% compared with 12% (Figure 11).

Figure 11: Health spending slowed to limit debt to 20% of GDP
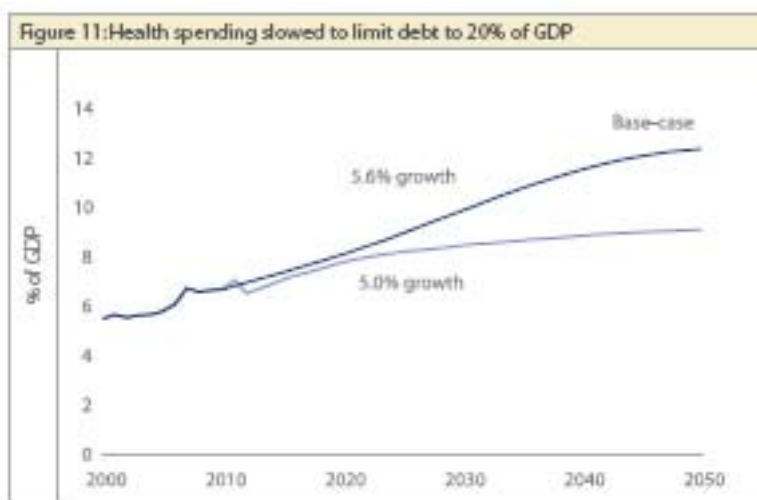
Source: The Treasury

Outline of the assumptions made in the Statement

Making projections of the future is inherently difficult, and there is a high degree of uncertainty around the projections set out above. This is because the projections are based on some key assumptions.

One key assumption is that fertility rates will stabilise at just below the level required to replace the population. If fertility rates were to continue to fall to much lower levels (as they already have in Italy, Japan and Korea), then the population would age more markedly. In the short term, the number of school-age children would decline more than we are projecting. In the medium term, the working-age population would be smaller than the rest of the population, thus reducing the size of the economy and the tax base. Eventually, the number of old people would also decline.

Another key assumption is about how economic growth affects fiscal outcomes. Demand for many publicly provided goods and services increases with income, meaning that growth leads to pressure for greater spending, not less. Some spending programmes are directly linked to economic growth, through things like indexation regimes.

Policies that explicitly or implicitly link spending to economic growth mean that spending as a proportion of GDP remains about the same regardless of the rate of economic growth. For example, New Zealand Superannuation is linked to wages and therefore is not affected by growth. In contrast, welfare benefits are linked to prices and therefore will fall as a proportion of GDP, if growth increases. Health spending, both in New Zealand and in most Organisation for Economic Co-operation and Development (OECD) countries, seems to be very strongly linked to economic growth.

The following paragraphs discuss taxes and the "big four" areas of spending, drawing out some of the key assumptions and identifying alternative results.

Figure 12: Effects of different indexation regimes on taxes
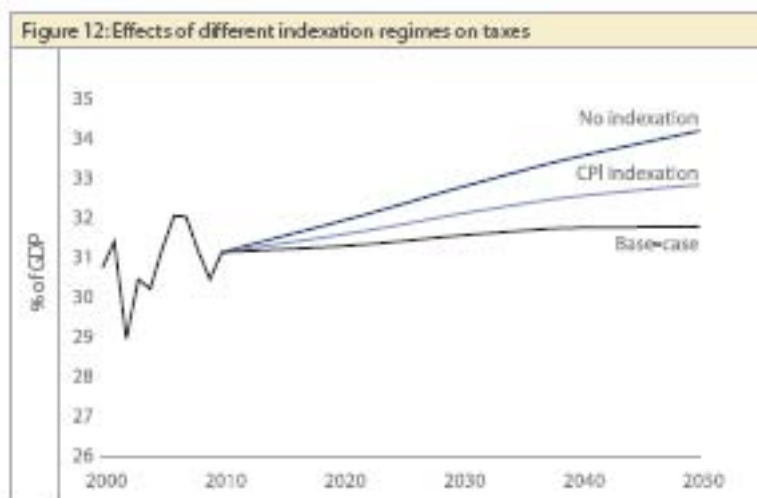
Source: The Treasury

Taxes

In both the bottom-up and top-down cases, the starting assumption is that the tax-to-GDP ratio will remain largely constant during the projection period. This is not quite "current policy," because of the issue of fiscal drag, which is the effect of increasing incomes pushing people into higher tax brackets. Incorporating the full effects of fiscal drag into the projections would mean that the thresholds in the personal rate scale would remain fixed in nominal terms over the projection period. The result would be that the vast bulk of income earners would be paying the top marginal tax rate of 39% by 2050. The tax-to-GDP ratio would be around 34% of GDP under this scenario.

Removing the fiscal drag assumption implicitly suggests that possible changes in tax bases in the projected years would be addressed by changing policy in a revenue-neutral manner. The projections do not specify how this strategy would be achieved.

As a result, tax revenue projections may be conservative. The recent decision to index personal tax thresholds to inflation serves to reduce the wedge between the current projection and a projection including fiscal drag.

An alternative scenario allows taxes to increase in response to increasing spending pressures, so that taxes take some of the load of increased spending levels. These alternative projections adjust the tax take at the highest level of aggregation (the tax-to-GDP ratio) and also provide some policy realism by modelling the sorts of tax rates that would result.

Health

Projections of health spending are driven by three factors: demographics, growth due to increases in income, and a residual growth factor.

While there will be more older people, the Statement assumes that they will be healthier as well and that this, in turn, will reduce demand for some health services and push out the timing of others.

Local and international experience suggests that there is a one-to-one ratio between increases in income and health spending: a 1% increase in income leads to a 1% increase in health spending. When this factor is combined with projected increases in real incomes, it means higher spending can be expected in the future.

The largest driver is the residual growth factor. This can be thought of as a proxy for decisions around the "cost and coverage" of the public health system. The projection assumes that cost containment reduces the size of the residual growth factor over time.

The combined effect of these three factors is a projected doubling of government spending on health as a proportion of GDP.

The assumed total growth in health spending is based on a long-term average. If the rate of change in spending over the next 50 years were closer to the average over the past decade, then the projected rate of growth would be higher, with growth in health spending being 2 percentage points higher than in the base case by the end of the projection period.

Education

Projections of education spending are based on the changes in the population base, inflation and a real per-student growth factor of 1.5% (based on teachers' wages) each year.

Population ageing produces a fall in the student population through time. The projection assumes that savings from the fall in student numbers are captured, which will see spending decline as a proportion of GDP. There are, however, several reasons why this may not happen. Governments may choose to have higher teacher-to-student ratios, or there may be more publicly-funded life-long learning.

Superannuation

The drivers of future superannuation spending are a doubling of the number of people over 65 (who are also living longer) and the link between New Zealand Superannuation payments and wages – New Zealand Superannuation being based on 65% of average weekly earnings. Also relevant here is the assumption that, on average, wages will grow faster than prices by 1.5% a year.

Two scenarios demonstrate the effects of these drivers.

First, the Statement looks at the impact of following the approach, being implemented or considered in some European countries, of linking the age of eligibility of pensions to longevity. If one-third of the projected increase in longevity were spent working and the other two-thirds in retirement, spending on New Zealand Superannuation would be 0.7 percentage points of GDP lower in 2050 than it would be in the base case reported above.

The Statement also investigates the fiscal impact of alternatives to a wage link, including linking benefits to inflation, or a mixed index of, say, "inflation plus 1%." Price indexation would reduce spending by 2.3 percentage points of GDP by 2050.

Welfare benefits

Spending on non-superannuation benefits is driven by beneficiary numbers, which are calculated from assumptions about unemployment and other benefit take-up rates, population growth and an indexation regime.

Benefits are assumed to be indexed to the Consumers Price Index (CPI), following current policy. This is a strong assumption, as it would mean that benefits would fall markedly as a percentage of wages over the long term. This is the experience of the past 30 years. Therefore, the Statement explores the effects of alternative regimes, such as full wage indexation or variants such as "inflation plus 1%." Indexing benefits to wages in this way would increase expenditure in this area by 2.3% of GDP in 2050.

Conclusion

The New Zealand Government's current fiscal position is strong, by both historical and international standards. Debt is low, assets are being built up to provide a buffer against future shocks and tax and spending rates have been stable and predictable.

The projections presented here, which are based on history, current policy settings and judgements, show that this strong position is likely to continue for a long time.

In common with many other countries, New Zealand is experiencing a shift in the structure of the population. The population has completed a transition from a high fertility/high mortality state to a low fertility/low mortality state. This transition is not a demographic bulge that will correct itself at some time in the future and is not just the result of the post-Second World War baby boom. In time, the number of old people will increase as a proportion of the total population and, correspondingly, the number of young and working-age people will fall.

The Statement assumes a continuation of solid economic growth, which means that the tax base also grows through time, giving governments the wherewithal to finance their expenditure.

The combination of the projected structural change in the population and present policy settings is likely to lead to growing challenges to the fiscal position, and these pressures will accelerate in the 2030s. By the middle of this decade, public spending on health and New Zealand Superannuation is projected to rise by more than falls in welfare and education spending.

The base-case projections using the bottom-up approach show the operating balance moving into deficit and the debt-to-GDP ratio rising after about 2030.

However, the Statement assumes that governments will continue to follow the principles of responsible fiscal management contained in the Public Finance Act, meaning that they will act before then to ensure that the fiscal position remains sound.

The top-down projections show that if major spending areas were left to grow as in the base case, other spending would have to fall by half in order to keep gross debt stable at 20% of GDP.

The largest single driver of the fiscal position is the policy choices governments make, which means governments have the capacity to make the necessary changes. Policy adjustments need not be large. A number of small adjustments, starting early and sustained, will be sufficient to maintain a sound fiscal position. Governments have already taken a very long-term view in setting policy and this trend is likely to continue.

Publishing a Statement on the long-term fiscal position is not an end in itself. What this Statement does is present information that will allow readers to develop scenarios consistent with what they define as desirable fiscal results.

1 Introduction

This is the first Statement on the long-term fiscal position that the
Treasury has produced under the Public Finance Act.

The Act was amended in 2004 to require the Treasury, at least once every four years, to prepare a statement on the long-term fiscal position, looking out over at least a 40-year horizon.

The Statement projects the fiscal consequences of particular scenarios of what governments might be doing over the next 40 or so years. We have captured the uncertainty around these projections by using a series of "what if" questions; for example, what if economic growth is higher than assumed, what if fertility increases, and what if governments choose to spend more on education?

The starting point for this analysis is Statistics New Zealand's projections of the future size and structure of the New Zealand population and Treasury's assumptions about the future size of the economy. This information is used to project forward major spending categories and taxes, based on assumptions derived from history, current policy settings and judgements.

The Statement is structured as follows.

Chapter 2 discusses the principles of responsible fiscal management contained in the Public Finance Act. The chapter explains what the principles are and how this Statement adds to the transparency of fiscal policy in New Zealand. Overseas practice is also reviewed.

Chapter 3 discusses the techniques used to prepare the projections in the Statement.

This Statement goes beyond the traditional "bottom-up" approach of using current policy as the sole basis of constructing projections of the long-term fiscal position.

The "bottom-up" approach, which involves projecting future expenditure and taxes on the basis that current policy in each area will continue, is a powerful tool for examining the impact of changes in the population on individual components of the fiscal position. It is the approach that has been used in many studies of the fiscal position in New Zealand. It is also an approach commonly used by other countries; for example, the European Commission has recently published a set of bottom-up long-term fiscal projections for all 25 members of the European Union in the areas of pensions, health and long-term care, education and unemployment benefits.

The Statement also contains projections on what could be termed a "top-down" basis. As the name implies, this projection method seeks to impose an overall set of fiscal constraints on the government and then looks at what various combinations of spending and taxes might meet these constraints.

The main demographic and economic assumptions are contained in Chapter 4.

The Statement uses Statistics New Zealand's projections of the population. Also included is some detailed discussion of the various drivers of these projections, as these drivers have implications for government spending and hence for projections of spending and revenue.

The projections of future GDP are based on the three Ps of Population, Participation and Productivity. This Statement deliberately adopts a simple model of future GDP growth, because it is about the long-term fiscal position, not the long-term economic situation. It does, however, present examples of the implications of different growth outcomes on various categories of expenditure.

The next five chapters contain projections for revenue and the main spending categories of health, education, New Zealand Superannuation, and other welfare. A further chapter contains projections for all other spending.

Each of these chapters presents base-case projections, as well as a discussion of the drivers of expenditure, together with alternative scenarios to demonstrate the sensitivity of the results to the various assumptions made.

Chapter 11 contains overall results, from both the bottom-up and the constrained, top-down, perspectives.

Note on historical data

The historical data used in the Statement come from a variety of sources and so are not necessarily consistent. They are used to give readers an idea of how we have arrived at the present point.

Demographic data

Statistics New Zealand has changed the way it counts population at least twice in the past century, from the de facto-population concept to the resident-population concept. This produces breaks in the data.

Economic and fiscal data

The Treasury has spliced together various GDP series to produce a long historical series. Through the long time period considered here, the System of National Accounts has undergone several revisions. The fiscal data on revenue and spending, operating balance, debt and net worth are also spliced together from a variety of sources. Before 1994, they were based on cash figures and combined operating and capital spending. After 1994, they were GAAP-based and kept operating and capital spending separate.

These long-term historical series are available on the Statistics New Zealand website (http://www.stats.govt.nz/tables/ltds/default.htm) and come with detailed health warnings.

2 Fiscal Responsibility

This Statement is part of a suite of documents that the Public Finance Act requires the New Zealand government and its advisors to produce.[1]

The Act requires regular fiscal reporting, including fiscal strategy reports, budget policy statements and economic and fiscal updates. The reporting requirements promote fiscal transparency. The requirements of the Act are based on international best practice.

Part 2 of the Public Finance Act, which covers fiscal responsibility, is founded on two key planks: increased transparency and greater accountability. It achieves this by requiring governments to be explicit about their long-term fiscal objectives and short-term fiscal intentions, in line with the principles of responsible fiscal management. It also requires governments to report on a wide range of economic and fiscal information.

What is fiscal transparency?

Fiscal transparency is the full disclosure of all relevant fiscal information in a timely and systematic manner.

It has been described as ". . . openness toward the public at large about government structure and functions, fiscal policy intentions, public sector accounts, and projections. It involves ready access to reliable, comprehensive, timely, understandable, and internationally comparable information on government activities … so that the electorate and financial markets can accurately assess the government's financial position and the true costs and benefits of government activities, including their present and future economic and social implications." (Kopits and Symansky, 1998)

Principles of responsible fiscal management and reporting

The Act requires the government to pursue its policy objectives in accordance with the following principles:

» reducing total debt to prudent levels so as to provide a buffer against factors that may impact adversely on the level of total debt in the future, by ensuring that, until those levels have been achieved, total operating expenses in each financial year are less than total operating revenues in the same financial year

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[1] The Treasury publication *A Guide to the Public Finance Act* provides more details. It is available on the Internet at: http://www.treasury.govt.nz/pfa/default.asp.

» once prudent levels of total debt have been achieved, maintaining these levels by ensuring that, on average, over a reasonable period of time, total operating expenses do not exceed total operating revenues

» achieving and maintaining levels of total net worth that provide a buffer against factors that may impact adversely on total net worth in the future

» managing prudently the fiscal risks facing the government

» pursuing policies that are consistent with a reasonable degree of predictability about the level and stability of tax rates for future years.

The Act also imposes regular fiscal reporting obligations on Ministers and the Treasury. The reports and statements required include:

» an annual fiscal strategy report

» an annual budget policy statement

» a periodic statement on the long-term fiscal position

» regular economic and fiscal updates

» an annual statement of tax-policy changes.

A key counterpart of these reporting requirements is parliamentary scrutiny of these reports and statements.

The current Government's long-term fiscal objectives are set out in the Fiscal Strategy Report accompanying the 2006 Budget. Accompanying projections indicate progress towards these objectives. The Fiscal Strategy Report also states what level of debt the Government considers prudent and the timeframe for achieving the objectives.

In brief, the current objectives are:

» manage total debt at prudent levels. This is defined as gross sovereign-issued debt being broadly stable at around 20% of GDP over the next 10 years

» the operating surplus, on average, over the economic cycle is sufficient to meet the requirements for contributions to the New Zealand Superannuation Fund and ensure consistency with the debt objective.

» increase net worth consistent with the operating balance objective

» ensure sufficient revenue to meet the operating balance objective

» ensure expenses are consistent with the operating balance objective.

The long-term debt objective is used as a constraint in the top-down projections later in the Statement.

International developments

New Zealand was one of the first countries to legislate principles of responsible fiscal management and to require a comprehensive suite of fiscal reports on a government's short- and long-term fiscal outlook.

Since the passage of the original Fiscal Responsibility Act in 1994, two international institutions, the International Monetary Fund (IMF) and the OECD, have developed guidelines for jurisdictions attempting to improve fiscal transparency.

The IMF *Code of Good Practices on Fiscal Transparency*[2] (adopted in 1998 and revised in 2001) contains general principles around clarity of roles and responsibilities, public availability of information, open budget preparation and reporting, and independent assurances of integrity.

The OECD publication *Best Practices for Budget Transparency*[3] is designed as a reference tool for member and non-member countries to use in order to increase the degree of budget transparency in their respective countries.

These guidelines recommend that a report assessing the long-term sustainability of current government policies be released at least every five years, or when major changes are made to substantive revenue or expenditure programmes. The report should assess the budgetary implications of demographic and other potential developments over the long term. The IMF also suggests that countries should provide some indication of the sustainability of fiscal policy. The IMF notes that such an exercise can be demanding for some countries, especially as there is no internationally agreed set of rules for establishing fiscal sustainability.

Two jurisdictions, Australia and the United Kingdom, have used approaches similar to New Zealand's in developing legislation that establishes guiding principles for fiscal policy and requiring a comprehensive suite of fiscal reports. Both these jurisdictions have long-term fiscal reporting provisions.

In Australia, the Charter of Budget Honesty Act 1998 aims to improve the Commonwealth Government's accountability for fiscal policy formulation. The Charter requires that governments release annual fiscal strategy statements (usually with each budget) based on principles of sound fiscal management.

The Charter also requires the Commonwealth Government to produce every five years an "intergenerational report" assessing the long-term sustainability of current Government policies over 40 years.

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2   http://www.imf.org/external/np/fad/trans/code.htm.

3   http://www.oecd.org/LongAbstract/0,2546,en_2649_33735_1905251_1_1-_1_1,00.html.

The framework within which the United Kingdom Government formulates and implements fiscal policy (including debt management) is set out in *The Code for Fiscal Stability* (1998). The Code requires fiscal and debt-management policy to be formulated and implemented in accordance with a set of principles of fiscal management. A government must state explicitly its short- and long-term fiscal policy objectives and ensure these objectives are consistent with the fiscal principles embodied in the code. A government must also report regularly on progress in meeting its fiscal objectives.

The Code also requires the government to publish illustrative long-term fiscal projections, covering a horizon of at least 10 years. In practice, a 30-year horizon has been chosen. These projections are based on a top-down assessment of long-term fiscal sustainability and are published in the Fiscal Strategy Report, usually at the time of the budget.

The next chapter discusses long-term fiscal reporting and past New Zealand and overseas practice in more detail.

3 Approach Taken Here

The section of the Public Finance Act that requires the Treasury to prepare this Statement simply states that "the Treasury must prepare a statement on the long-term fiscal position,"[4] which must relate to a period of at least 40 consecutive years.

This chapter outlines how the Treasury has gone about preparing the projections of the future fiscal position that go to make up this Statement.

The purpose of this Statement

The purpose of this Statement is to increase the quality and depth of public information and understanding about the drivers of the long-term fiscal position, the role of growth, and the consequences of spending and revenue decisions. This purpose has guided the methodology used in the Statement.

Building on the past and overseas practice

While the legislative requirement for the Treasury to produce a long-term fiscal statement is new, publishing this Statement will not by any means be the first time that the issue has been placed in the public arena.

Many reports by the Treasury and by other agencies over the past 15 years have thrown light on aspects of New Zealand's long-term fiscal position. Some have focused on the impact of population ageing, while others have looked at a wider range of drivers of the fiscal position. Annex 2 contains a list of these previous studies.

Increasingly, other countries are also preparing regular statements of their long-term fiscal positions. Three recent examples are Australia, the United Kingdom and the United States.

The Australian Commonwealth Government produced its *Intergenerational Report* in 2002. This study contains projections of individual spending programmes and taxes, looking out 40 years.[5] In 2005, the Australian Productivity Commission published a research study examining the productivity, labour-supply and fiscal implications of likely demographic trends over the next 40 years for all levels of

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4   Section 26N(1)(a) of the Public Finance Act 1989.

5   This is available on the Commonwealth Treasury's website at: http://www.treasury.gov.au/contentitem.asp?NavId=012&ContentID=378.

government.[6] This study extended some of the economic analysis underlying the *Intergenerational Report* and looked at the implications of ageing for Australian state and territorial governments (the *Intergenerational Report* focused exclusively on the federal level). The next intergenerational report is required to be produced over the coming year.

HM Treasury in the United Kingdom produces an annual *Long-term Public Finance Report*, which contains a mix of projections of individual programmes and investigates the impact of the United Kingdom Government's overall fiscal strategy on spending.[7] The United Kingdom Government's Pensions Commission, which issued its final report in April 2006, also undertook extensive modelling of the long-term impacts of demography on age-pension policy. Details can be found on its website.[8]

The United States' Congressional Budget Office prepares a *Long-Term Budget Outlook.[9]* This outlook models the effect of different scenarios of spending and revenue on the federal government's fiscal balance and, thus, levels of debt.

The European Commission and the OECD periodically make projections of their members' fiscal positions. The EC published a set of projections of age-related expenditure for all of its 25 member states in February 2006.[10] The OECD examined the fiscal implications of age-related spending in member countries in 2001[11] and published a set of projections of long-term health spending in 2006.[12]

Modelling the future fiscal position

The fiscal position at any point in time is the result of a series of policy choices made by governments over a long period. These choices relate both to individual policies or sets of policies and to the combined fiscal effects.

Those choices are driven by a complex set of interconnected influences. The state of the world (including the economic and social situation, in the past, the present and the future), the government's desired outcomes and the effectiveness or otherwise of outputs selected to achieve the desired outcomes all combine to produce the fiscal outcome.

Given the vast number of variables that can and will affect future fiscal outcomes, the task of modelling 40 years ahead is not easy.

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6   *Economic Implications of an Ageing Australia,* A Research Report, available at http://www.pc.gov.au/study/ageing/finalreport/index.html.

7   The December 2005 edition can be found at: http://www.hm-treasury.gov.uk/media/F59/32/pbr05_longterm_513.pdf.

8   http://www.pensionscommission.org.uk/.

9   2005 Long-Term Budget Outlook is available at http://www.cbo.gov/ftpdocs/69xx/doc6982/12-15-LongTermOutlook.pdf.

10   This is available on the European Commission website: http://europa.eu.int/comm/economy_finance/epc/epc_sustainability_ageing_en.htm.

11   Fiscal Implications of Ageing: Projections of Age-related Spending, OECD Economics Department Working Paper No. 305, 2001.

12   Projecting OECD health and long-term care expenditures: what are the main drivers? Economics Department Working Papers No. 477, 2006.

Projecting spending simply as a share of GDP is one approach, but it can involve an over-simplification of history. In particular, it can be difficult to reflect the variability of past patterns of spending and revenue into the future. Figure 3.1 provides an example of one of the components of government spending that needs to be modelled: core government services. This includes, for example, the cost of running government departments, and the provision of Overseas Development Assistance. Over the past 50 years, spending under this heading has fluctuated widely. Best practice fiscal modelling is unable to capture this degree of variability and produce projections that might mirror past performance (although probabilistic projections of expenditure might address some of this variability – see the next chapter on demography for more on this).

Figure 3.1: Spending on core government services is a fixed share of GDP

Source: The Treasury

Figure 3.2: New Zealand Superannuation is driven largely by demographics
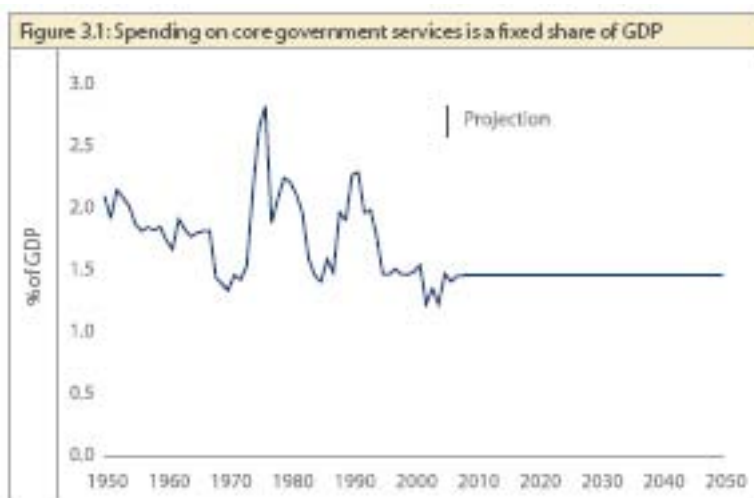
Source: The Treasury

In this case, future expenditure is assumed to grow by nominal wage growth (the largest cost driver of these services) and the number of public servants is assumed to remain a constant proportion of total employment. This produces a track where long-term spending is a fixed proportion of GDP.

If all components of spending and revenue were modelled on the same basis, the end result would become simply a "battle of the exponentials"; that is, all the components of spending and revenue would be growing at one exponential rate or another and the outcome would be determined solely by the differences in the rates of growth. Because of the long-term nature of the modelling, small changes in parameters could have large effects in the end.

Fortunately, there are some aspects of government spending that can be modelled with more information. An example is New Zealand Superannuation, where demographic developments are combined with other assumptions and projections to develop a spending track such as that shown in Figure 3.2.

The task is to bring together the appropriate modelling approaches and drivers for each spending and revenue area to build up an aggregate picture, taking into account any overall fiscal objectives the government might have.

Two approaches are used in the Statement

Previous studies of the long-term fiscal position in New Zealand and overseas use a variety of approaches to presenting potential outcomes. These studies all tend to present the long-term implications of continuing with existing policies. Where they differ is the degree to which individual policies are modelled in isolation from wider fiscal and economic objectives. While there are differences in the details, the two major approaches used can be termed "top-down" and "bottom-up."

The top-down approach starts with a set of constraints for major fiscal aggregates (such as spending-to-GDP, tax-to-GDP or debt-to-GDP ratios) and determines what spending or revenue track would be required to continue to meet these constraints, given likely changes to the population and the economy.

The bottom-up approach involves modelling the effect on major fiscal aggregates of individual spending programmes and the current tax system projected forward on the basis of demographic and other assumptions, without any overall constraints.

The difference between the two approaches should not be exaggerated. Both involve projecting forward individual elements of spending or revenue. In practice, a top-down approach usually involves allowing some programmes to develop alone and then uses the overall objectives to derive a constraint that has to apply to all other programmes. So, for example, demographic projections could be applied to New Zealand Superannuation, thus deriving a long-term track for spending on that item, then the government's current debt and revenue objectives could be applied to see what would have to happen to all other areas of expenditure.

Both bottom-up and top-down approaches have much to commend them. The particular attraction of a top-down approach is that it is closer to what happens in the actual budget-setting processes that governments have been using over the past decade. Another strength of the top-down approach is

that it starts from the proposition that governments will operate with some fiscal objectives in mind. There are certainly instances in New Zealand's past where this has not been particularly evident, but legislation such as the Public Finance Act and the Reserve Bank Act make it much less likely that such instances will occur in the future. While there will always be demographic and other pressures on the government to increase spending faster than taxes, there are limits. This is known in economics as Stein's Law: if something cannot go on forever, it will stop.[13] A top-down approach assumes that Stein's Law applies.

An advantage of a bottom-up approach is that it may allow richer details of the individual drivers of all spending and revenue to be examined. The disadvantage is that by construction, a bottom-up approach looks at individual spending and taxation items in isolation from everything else the government is doing. There can thus be an element of unreality in the combined picture of all spending and revenue.

Both bottom-up and top-down fiscal projections are therefore included in this Statement.

The addition of a top-down approach represents an advance on previous reports on New Zealand's long-term fiscal position.

Types of spending programmes

To derive both bottom-up and top-down projections requires projections of future spending and revenue. One place to start is to model the effects of a known set of policies in a projected world; namely, "current policy." Determining what is current policy, however, is not always straightforward. When this cannot be determined readily, it is necessary to make assumptions about what is driving the expenditure or revenue category.

In respect of major spending areas, current policy can be sub-divided into two broad types of programmes, parametric and non-parametric.

Parametric programmes

Parametric programmes are those where all (or at least most of the material) features of spending are driven by factors that are independent of the programme. The largest example is New Zealand Superannuation, where all scheme features are set in legislation and can be applied to a projected population to derive a projection of spending.

In terms of the Statement of the long-term fiscal position, parametric programmes can be modelled by applying the current parameters to a projected future world. Parameters can, of course, change, but it is possible to model the future fiscal impact of a set of parameters and construct scenarios around changes in parameters.

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13   Herbert Stein was Chairman of the US Council of Economic Advisers during the Nixon Administration. This particular quote comes from *The Public Interest* 97, Fall 1989.

Non-parametric programmes

Non-parametric programmes are those where spending is the result of discrete decisions made by governments. Examples are health, education and transportation. Some non-parametric programmes will remain in place for a number of years and can become at least "semi-parametric." An example is a formula-driven funding system for tertiary education: providers will receive a fixed amount per student of a certain type. Projections of future numbers of students by age group can thus be used to derive projections of spending on education by level.

Non-parametric programmes are more difficult to project forward, as the parameters are not clearly specified in the design of the programme and more assumptions need to be made about future policy choices. The approach followed here involves using a level of past expenditure (or expenditure per capita) as a starting point, and then growing that in line with some indexes (CPI, wages, GDP, or a population group). For example, it might be thought that governments are likely to see defence spending as a proportion of GDP as an important consideration, and thus defence expenditure should be projected forward using a fixed ratio to GDP as the parameter.[14]

Taxes

Current tax policy can be defined as the current set of tax laws, applied to a projected tax base (income such as corporate profits or salary and wages, or consumer spending). It can also be defined in terms of the aggregate path of the tax-to-GDP ratio.

In constructing a set of bottom-up projections, particularly over a period as long as that used in this Statement, one key issue is so-called "fiscal drag." This is the term used to describe the situation where the tax on an individual's income grows at a faster rate than the income. This occurs with a progressive tax scale where the tax rate rises with income.

The base projection for taxes used in this Statement assumes that the taxes-to-GDP ratio remains broadly constant at their 2010 level over the projection period. This implies that the projection of individual (personal) income tax does not include any fiscal drag.

Lack of fiscal drag simplifies the modelling in other ways as well. New Zealand Superannuation is indexed by net average wages and excluding fiscal drag means that gross wage growth equals net wage growth.

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14 The modelling of many of the "non-parametric" spending programmes uses the equivalent of nominal wage growth (3.5% a year) as one of the growth factors. A reviewer has suggested that in the overall economy labour costs make up about 60% of the cost of production and that the rest, capital and other inputs, would have a smaller deflator. Hence, these spending categories would be growing at less than the growth of nominal wages. However, labour costs make up 80%, or more, of the costs of government services and so the difference in the deflation between a weighted sum of labour and capital deflators and that of labour alone would be relatively small. Wage growth is thus used as the per capita growth index for these spending programmes.

Use of the existing long-term model

The projections have been generated using the Treasury's existing model, the Long-Term Fiscal Model. This model has been used over the past decade to assess the effects of proposed budget spending against the fiscal objectives over a period of 10 years or more.[15]

The Long-Term Fiscal Model adopts a three-stage approach to projecting the long-term fiscal position.

First, the model adopts Statistics New Zealand's Series 5 projections of the New Zealand population over the next 50 or so years, which take into account possible changes in demographic features (such as life expectancy).

These projections of the population are then used to generate projections of GDP.

Finally, projections of government spending and revenue are added.

The projections in this Statement use the Budget Economic and Fiscal Update 2006 forecasts to June 2010 as a base (Treasury, 2006). By construction, in 2010 the economy is on its long-term growth path. The projections after that point follow demographic and economic trends.

The modelling methodology of the Long-Term Fiscal Model is a partial-equilibrium approach. There are no explicit feedback loops from the government balance and debt back to the macroeconomy.[16] This is a common approach in long-term fiscal sustainability work.[17] It has, however, the virtue of simplicity, and for New Zealand, familiarity.

The modelling is kept simple for three main reasons.

First, and most pragmatically, it is better to base this work on an existing model (the Long-Term Fiscal Model), rather than try to build an entirely new model. While this is a relatively simple model, it does

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15 Further details on the Long-Term Fiscal Model can be found on the Treasury's website at:
    http://www.treasury.govt.nz/Long-Term Fiscal Model/default.asp.

16 Some of the macro-economic feedback loops that could be modelled are:
    - a rise in government debt might produce a higher country risk premium and higher interest rates
    - slowing labour supply growth might force production to relocate offshore and New Zealand would have more investment income earned abroad
    - growth could also be sustained on the demand side by the growing proportion of the elderly spending their savings
    - those between spending policies and other outcomes. For example, in the Long-Term Fiscal Model, demographic change (in particular, projections of mortality) influences population growth, which feeds into GDP growth, which in turn drives ealth spending. An extension would be to have changes in economic growth feeding into individual incomes which then cause changes in mortality and morbidity rates (on the assumption, which is supported by the evidence, that people with higher incomes have better health outcomes). More education spending may feed through to higher productivity growth.

17 Robert Barro (1990) pointed out that the government's fiscal position had a strong influence on the economy and should be included in a general modelling framework.

produce detailed projections of the government's GAAP[18] tables (expenditure and revenue items and the balance sheet) and has a decade-long track record of producing long-term projections for the New Zealand government.

Second, but related to this, there are few examples of complex, general equilibrium models on which we could base projections of the New Zealand fiscal position.

Third, and perhaps most importantly, trying to develop a more sophisticated model could be counter-productive. There is a risk that a more complex model would shift the debate from the drivers of fiscal policy onto issues of economic modelling, thus severely reducing the benefits of the Statement. The Long-Term Fiscal Model is "fit for purpose": users can project likely outcomes to better inform the policy debate about the best set of policies to achieve government objectives.

Of course, the issues raised by ageing go beyond their effects on the fiscal position. There will also be important issues to do with the economy, social change, gender differences, ethnic and occupational effects, and the growth or reduction of regional communities. These issues were canvassed in the 1996/97 Task Force on Positive Ageing and are being carried forward by a team led by the Ministry of Social Development, working with many other agencies.

The approach outlined here will undoubtedly evolve as the Treasury works on subsequent long-term reports. More broadly, as research into the economics of ageing progresses, more of this will be incorporated into future projections.

Modelling uncertainty

Projections for half a century are subject to uncertainty, which tends to grow with time. The accuracy of long-term demographic projections has not been great in the past. A study of world population undertaken in 1963 projected that by 2000, 9.2% of the total population in North America would be aged 65 or older. The actual result was 12.5%.[19]

Another example comes from the United Kingdom's 2005 *Long-term Public Finance Report*. This cites a study of population estimates made in 1891, where the projected combined population of Australia and New Zealand in 1981 was 94 million, five times greater than the actual outcome.[20]

There are two main ways of handling this uncertainty. One is to display scenarios showing the results of a range of plausible values for key assumptions. The other is to run thousands of probabilistic (or stochastic) projections drawing on distributions of the input assumptions to produce a distribution of projections. This has the advantage of assigning a probability that some outcome could happen. A summary of early experiments with this probabilistic approach is contained in Chapter 4.

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18 GAAP or Generally Accepted Accounting Practice is an independent set of rules that govern the recognition and measurement of financial concepts such as assets, liabilities, revenues and expenses adopted by the New Zealand Government for its own accounts. It is based on private sector commercial accounting standards.

19 See Figure 3.5, Chapter III, IMF (2004).

20 Chris Shaw, "Accuracy and uncertainty of the national population projections for the United Kingdom," Population Trends No 77 (1994), page 24.

Assessing long-term fiscal sustainability

Several different methods have been developed to assess the long-term sustainability of the fiscal position. Some methods are based on trends in fiscal aggregates such as debt-to-GDP. Other methods condense a time series of fiscal aggregates into a single numerical fiscal indicator. This section reviews several approaches.

Developments in fiscal policy and theory over recent years have increasingly taken a longer-term focus. The longer-term metric for evaluating fiscal policy is typically the government's intertemporal budget constraint. The intertemporal budget constraint is based around the notion that all government spending must eventually be financed. Formal definitions of fiscal sustainability are satisfied if, on the basis of current policies, the present value of future primary balances (the fiscal balance before interest costs are deducted) is equal to the outstanding stock of debt.

There are a number of numerical fiscal indicators based around the concept of the intertemporal budget constraint and a large number of studies (see Bank of Italy, 2000; HM Treasury, 2005). For example:

» generational accounting examines the effect on different generations of alternative ways of satisfying the government's intertemporal budget constraint.[21] Generational accounting compares the projected net lifetime taxes (the difference between taxes paid and transfers received) faced by newborns born in different years. Past newborns (ie, existing generations) are excluded from the comparison because they have faced past tax and transfer regimes and the government can only partially affect their overall lifetime net taxes

» fiscal imbalance adds to the government's current debt the present value of projected primary balances. Generational imbalance indicates how much of the fiscal imbalance arises from older generations shifting tax burdens to younger (including yet-unborn) generations (see Gokhale and Smetters, 2003)

» the concept of comprehensive net worth set out by Bradbury, Brumby and Skilling (1999) also centres on the present value of future fiscal plans. This concept is broader than the reported net worth disclosed in the GAAP statements because it incorporates the present value of all future revenue and expenditure flows

» the fiscal gap calculates the change in fiscal policy settings needed to achieve a particular debt target at some point in the future.[22] This change can be calculated in terms of the adjustment needed now, or what is required in the future if adjustment is delayed. The change in policy can be in the form of adjustments to taxes and/or spending.

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21   See Auerbach and Kotlikoff (1999).

22   See Auerbach (1994) and Auerbach (1997).

The simplest versions of these indicators require only a few key variables (eg, outstanding debt, projections of future primary surpluses, and discount and economic growth rates). The Treasury's Long-Term Fiscal Model captures all the key variables needed for such calculations and is more detailed in the sense that it incorporates a fuller set of assumptions around different financial assets and liabilities, interest rates and financial rates of returns.

These indicators have some advantages over methods that look solely at the time paths of key fiscal aggregates:

» they provide a single number that represents the size of any fiscal adjustment

» because they consider the government's overall budget constraint, they encourage consideration of the totality of revenues and spending rather than an overly narrow focus on individual spending programmes.

Some of the disadvantages of these indicators include:

» the size of any fiscal adjustment will depend on the (arbitrarily) chosen time period and debt target

» on their own, the indicators do not convey the timing of fiscal challenges. Even if a particular sustainability condition is satisfied over the chosen period, there may still be fiscal challenges further out

» the indicators can be sensitive to key parameters such as the discount rate and economic growth rate

» although some indicators such as the fiscal gap are relatively straightforward, others such as generational accounting are more challenging to calculate, interpret and communicate

» satisfying the sustainability condition can involve a sequence of sustained fiscal surpluses and debt reduction (or asset accumulation). On their own, the indicators tell us little about the cost and benefits of alternative financing approaches.

Extending the period over which the calculations are made can reduce the first two disadvantages. Extending the time period, however, can introduce more uncertainty and the need for simplifying assumptions (eg, Statistics New Zealand's demographic projections do not alter life expectancy beyond 2050). This Statement emphasises the projected trends in components of spending, the totality of spending, and fiscal aggregates generated by the Long-Term Fiscal Model rather than single numerical fiscal indicator methods.

4 Demographic and Economic Assumptions

This chapter outlines projections of the population and GDP, as well as the other economic assumptions used in the Statement.

Who will populate New Zealand?

The starting point of the projections is to look at the issue of the size of the New Zealand population. Three things drive population: fertility (how many children are born), mortality (how many people die each year and, importantly, at what age) and migration (how many people leave and arrive in New Zealand).

Demographic change: the big picture

In common with many other OECD nations, New Zealand is experiencing a shift in the structure of the population.[23] The developed world (and increasingly the developing world) is in a transition from a high fertility/high mortality state to a low fertility/low mortality state. This is commonly referred to as "population ageing" and is the result of more people living into old age (defined here as 65 and older) and very old age (85 and older).

Figure 4.1: Demographic transition in New Zealand - birth and death rates have fallen

Source: Statistics New Zealand and the Long-term Data Series. Total crude birth and death rates. In the demographic charts and tables, most of the historical data points are averaged from around census years, such as 1996 or 2001. For clarity and consistency with other charts, we have moved the data to the nearest "rounded" year.

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23   For a summary of the demographic transition, see Lee (2003).

This transition is not a demographic bump that will correct itself at some time in the future. In particular, it is not just the result of the post-Second World War baby boom. Rather, what has been driving this ageing of the population (Figure 4.1) is a demographic transition from the high fertility and high mortality rates of a century or more ago to the present and projected low fertility and low mortality rates. This is a permanent change in the age structure of the population; it will not reverse in the coming centuries, given the trends in demography.

The reduction in fertility is, of itself, likely to lead to a lower population (with no migration), while lower mortality has the opposite effect.

The combined effect is seen in the resulting median age of the population; this is the age that divides the population exactly in half. If you were 19 in 1880, half the New Zealand population would be older than you, and half younger. In 2005, the age of the median person had nearly doubled to 36.

Figure 4.2: The median age has been rising in New Zealand

Source: Statistics New Zealand

Assumptions for population projections

Statistics New Zealand, in the official National Population Projections published in December 2004, presents a range of different scenarios for fertility, mortality and net migration. They have produced nine separate projections. Of these nine, Statistics New Zealand considers that the mid-range projection (known as Series 5) is the most suitable for assessing future population changes. The Statement therefore uses Series 5 as the basis of our future demographic profile, but also illustrates the uncertainty around this series by use of alternative scenarios and probabilistic projections.

The Statement contains demographic and other projections for the entire New Zealand population and does not break out Māori as a separate group. There are several reasons for this. First, Statistics New Zealand's projections of sub-populations go out only to the early 2020s. Second, convergence between Māori and Pākehā is continuing in many aspects of life – labour markets, income support,

and intermarriage, to list but three. This is not to deny that disparities and differences exist between parts of New Zealand society, but only to suggest they are probably less important to the aggregate long-term picture than the similarities.

For further details, see Statistics New Zealand's report to the 2005 Hui Taumata (Māori Economic Development Conference).[24]

Fertility

The total fertility rate is assumed to fall in New Zealand from around 2 live births per woman now to 1.85 in 2016 and then remain constant. This is the level favoured by the United Nations in its long-term work for world population. The rate that replaces the population with zero net migration is around 2.1. This Statement's projections are therefore based on an assumption of a sub-replacement birth rate.

New Zealand's experience of fertility rates falling below replacement levels is not an isolated one. In some European countries, the total fertility rate has fallen, reaching 1.2 in Italy and 1.7 in the United Kingdom. Currently, 65 countries (with a combined population of over 2.8 billion people) have fertility rates at or below replacement levels (United Nations, 2005). The United Nations is predicting that the international trend towards sub-replacement fertility rates will continue.

Figure 4.3: After the baby boom, fertility has stayed flat for 30 years
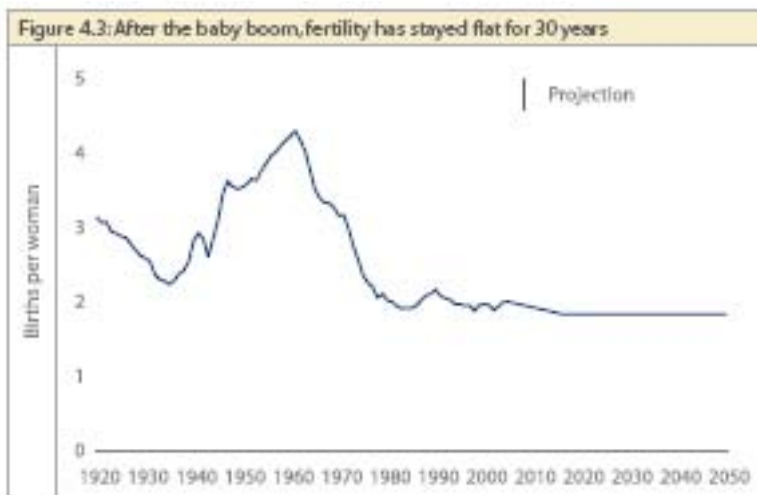
Source: Total fertility rate from Statistics New Zealand, history and medium fertility assumption

Alternative fertility paths

Statistics New Zealand has produced projections based on two alternative assumptions of the future course of fertility: low fertility, where fertility falls more sharply to 1.60 in 2016, and high fertility, where fertility actually increases from the base-year rate (2004) of 2.01 to become 2.10 in 2016, before remaining constant.

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24   Statistics New Zealand (2005).

The effect of the low fertility assumption, with nothing else changed, is to reduce the proportion of young New Zealanders in the population in 2050, and raise the proportion of people 65 and above compared with the base case. Overall population is smaller by 7% in 2050. Hence, there will be less demand for schooling, and greater pressures on pensions and health care for the elderly.

Using the high fertility assumption will result in the opposite: a larger population (by 7% in 2050), with a greater proportion of youth and smaller relative numbers of elderly.

Mortality

Life expectancy at birth in a particular year is a way of summarising age-specific mortality rates in that year. This means that if mortality rates are falling, then life expectancy will be rising. Under Statistics New Zealand's medium assumptions, the median male life expectancy at birth rises from 76.3 years in 2000 to 83.5 years in 2050, while median female expected longevity grows from 81.1 years to 87.0. Overall, this means a gain of 1.3 years per decade, on average.

This rate of gain is slower than we have seen in the past half century (eg, female longevity grew by 9.8 years from 1950 to 2000 but is expected to grow by only 5.9 years in the next half century). For those aged 65 and 85, the assumed life expectancy gains are generally greater than the historical growth.

Figure 4.4 shows life expectancy at birth since 1890, while Table 4.1 includes life expectancy at birth as well as at different ages.

Figure 4.4: Statistics New Zealand assumes gains to life expectancy (at birth) slow

Source: Human Mortality Database, Statistics New Zealand medium mortality assumptions

Table 4.1: The median life expectancy at birth, at 65, at 85, in the stated year

Years	1900	1950	2000	2025	2050	1950 -2000	2000 -2025	2025 -2050	2000 -2050
Males	Age					Gain			
Birth	57.4	67.2	76.3	81.4	83.5	9.1	5.1	2.1	7.2
Age 65		12.8	16.7	20.2	21.8	3.9	3.5	1.6	5.1
Age 85		3.9	5.2	7.3	8.3	1.3	2.1	1.0	3.1
Females	Age					Gain			
Birth	60.0	71.3	81.1	85.3	87.0	9.8	4.2	1.7	5.9
Age 65		14.8	20.0	23.2	24.5	5.2	3.2	1.3	4.5
Age 85		4.2	6.5	8.5	9.4	2.3	2.0	0.9	2.9

Source: Life expectancy at birth from Statistics New Zealand, medium mortality assumption

Alternative mortality paths

As with fertility, Statistics New Zealand has produced projections based on two alternative assumptions of the future course of mortality: high mortality, where life expectancy in 2050 is 81.0 and 85.0 for men and women respectively; and low mortality, where life expectancy is 86.0 and 89.0 for men and women respectively.

There are two particular features of this increase in life expectancy.

First, there has been a substantial reduction in infant mortality. In 1900, for example, 8% of non-Māori children (born alive) would be expected to die before their first birthday. By 2003, this had fallen by a factor of almost 16 to 0.49%. Similar reductions have occurred at all ages up to 10.

Second, death rates have also reduced substantially during the middle stages of life. Although the reduction is not as dramatic as in the early years of life, it is still substantial: in the order of four to eight times lower in 2003 than in 1900.

Figure 4.5: Death rates have fallen across all age groups
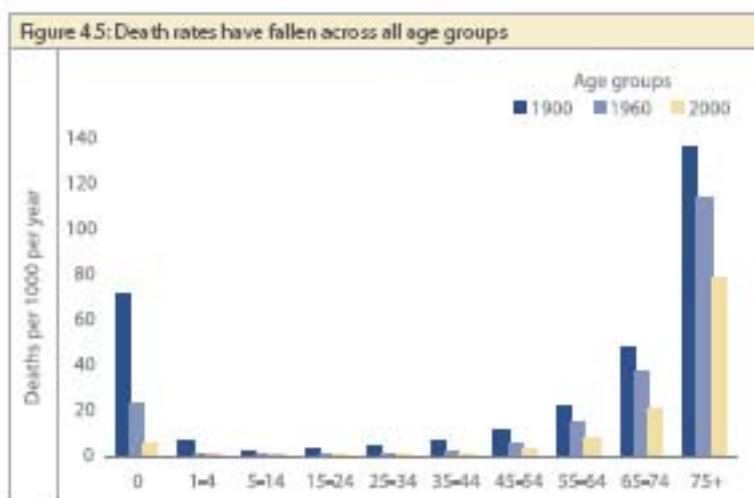
Source: Statistics New Zealand

The combination of the lower death rates in early and middle age and little movement in the oldest age to which people live results in what demographers refer to as a "rectangularisation" of the survival chart: far more people survive into old age, and indeed into very old age, but the oldest age to which people are living is increasing at a slower rate (see Figure 8.3).

While mortality trends are clear, as yet we do not have full knowledge of what is causing this decline in death rates, what sorts of lives people are leading, especially in later life, and whether the trends of the recent past will continue or reverse. Chapter 6, which deals with health spending, contains an extended discussion of the drivers of mortality.

This Statement uses Statistics New Zealand's medium mortality assumption to drive the base-case projections. This may be on the conservative side (relatively low longevity outcomes) compared with some assumptions being used by other agencies in their long-term work.

Statistics New Zealand's low mortality (higher longevity) assumption has a greater proportion of elderly, a relatively smaller labour force, and a larger population by 2050 (up by 2.3%). This is likely to place more pressure on the fiscal position.

An assumption of high mortality (lower life expectancy) will reverse these differences relative to the base case. The labour force would be proportionately larger, while the population in 2050 would be smaller.

Net migration

Finally, Statistics New Zealand assumes that median net migration settles at 10,000 from 2009 onwards (0.24% of the population in that year). Typically, we have a net inflow of people in their late teens and 30s and 40s, but a net outflow of people aged in their 20s. The horizontal lines in Figure 4.6 are the averages for the periods covered by the lines and show that this assumption is plausible, given recent trends.


Figure 4.6: Projected net migration follows recent averages
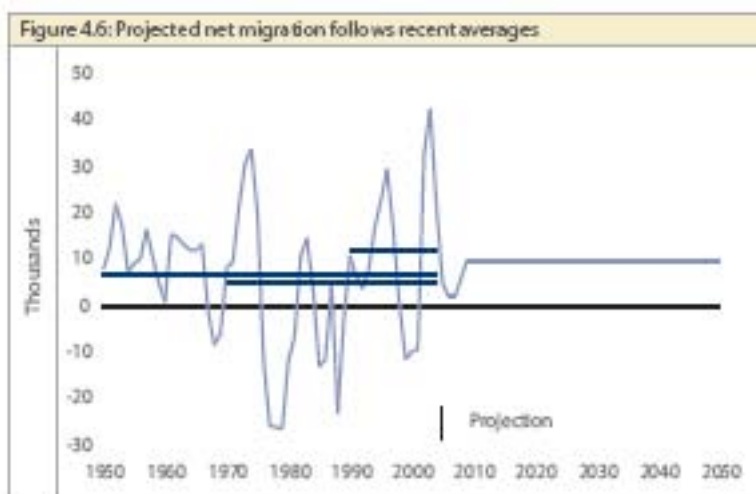
Source: Statistics New Zealand, annual net permanent and long-term migration

Resulting demographic projections

These assumptions produce projections of the changing shares in the total population of the young, those of the traditional working age,[25] the old and the very old. Total population is projected to reach 5 million in the mid-century and then to shrink back slowly.

The number of people over 65 is projected to grow almost three-fold, while those 85 and over will grow six-fold by 2050. Under this scenario, the working-age population grows until the mid-2020s and then contracts (it shrinks from 66% of total population now to 58% by 2050).

Figure 4.7: Changing shares in the total population
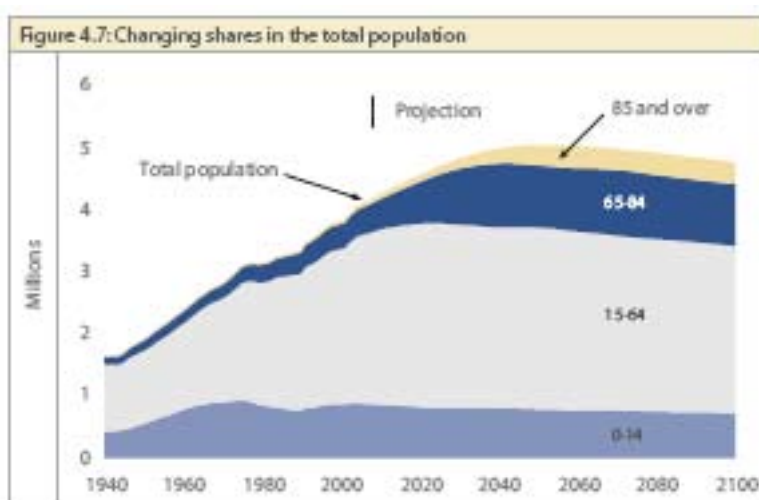
Source: Statistics New Zealand, history and Series 5 projection (static assumptions after 2050)

Another way of showing the changing structure of the population is to use population pyramids. The three snapshots below of New Zealand show a change from a population dominated by the young in 1900 (the pine tree), through to middle-aged spread in 2000, and then to a peg-shaped structure in 2100.

Another common way of looking at changing demographics is to chart the ratios of people in various age groups to the whole, or to another base group. Three ratios are of interest:

» the "old" ratio compares those aged 65 and above with the traditional working-age population of those aged 15 to 64

» the "young" ratio compares those under 15 with the working-age population

» adding young and old people together and comparing their numbers with the working-age population produces a "combined ratio."

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25 The Statement uses "working age" as a convenient label for describing people aged between 15 and 64. There are people outside these limits who work and people inside who do not. The official definition of the working-age population (as used in the Household Labour Force Survey) is the civilian, non-institutionalised population 15 and older (no upper limit), and this definition is used to produce projections of the labour force.

Figure 4.8: The changing shape of New Zealand's population
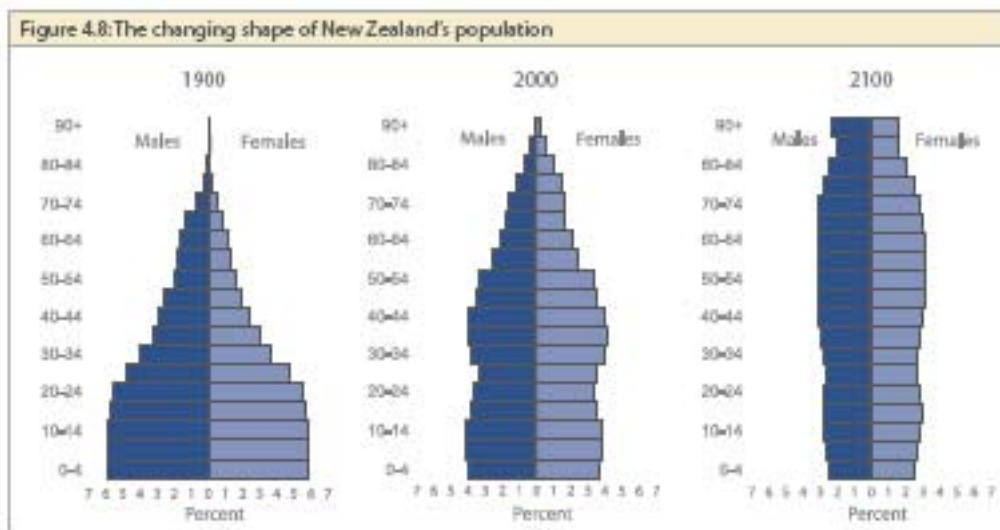
Source: Statistics New Zealand

» The old-age ratio climbs from 0.18 now to 0.45 in 2050. Put another way, in 1900 there were 15 people of working age for every person over 65. Today, this has shifted to five people of working age for every person 65 and over, while by mid-century, there will be two.

The young ratio continues to fall slightly, before stabilising at around 0.27 in 2020. As a result, the combined ratio shows the same trend as the old ratio.

Figure 4.9 also shows that the demographic change is not a bulge but rather a structural change in the population. Unlike the earlier baby boom, the ageing boom (which is partly due to the earlier baby boom) will not be followed by an ageing bust, under these demographic projections.

Even with Statistics New Zealand's conservative assumption of fixed mortality rates after the mid-century, the old ratio continues to rise until the 2070s, when it stabilises around 0.5. Past trends suggest that life expectancy could continue to rise strongly after the 2030s and this would mean that the old ratio would be even higher.

New Zealand is around the OECD average for the projected increase in both the old ratio and the combined ratio. The old ratio in 2050 of nearly 0.5 means that New Zealand will have two people working to support the consumption of one retired, down from five now. In Japan, this ratio is currently one for one.

Some people tend to downplay the effect of ageing by pointing to the combined ratio, which was almost as high in 1960 (pushed up by the youth side) as it is likely to be in 2050 (pushed up by the elderly). The problem with this for the fiscal position is that the young are more likely to be supported privately by families and by relatively small amounts of public spending on schooling, while the elderly in the recent past have tended to use a far greater proportion of public resources.

Figure 4.9: Ratio of 65 and over to 15–64s doubles between 2000 and 2050
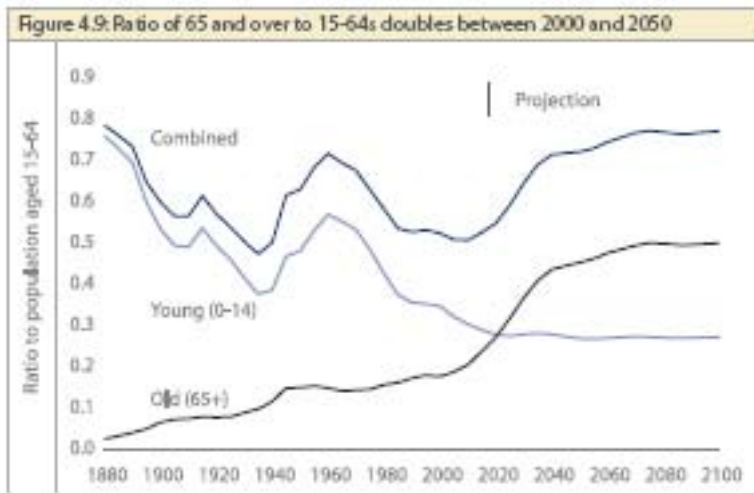
Source: Statistics New Zealand, history and Series 5 projection

Immigration might be seen as a way of maintaining a low old-age ratio. Doubling the number of net migrants from the assumed 10,000 to 20,000 each year from 2010 to 2050 results in the percentage of people aged 65 and over in the population falling from 26.2% to 24.7%. While the bulk of new immigrants are of working age, they too grow old and eventually make demands on public resources.

From another point of view, one way of keeping the aged ratio under 20% (where it is now) out to 2050 would require 300,000 net migrants per annum from 2020 onwards (4.9% of the population in 2020). In short, immigration is not a long-term solution to population ageing, although migration has many other positive features.

Capturing uncertainty with probabilistic projections

Statistics New Zealand and the Treasury are experimenting with probabilistic (or stochastic) modelling as a way of expressing the uncertainty that surrounds the demographic variables of fertility, life expectancy and migration.[26] Later Statements may extend this approach to some of the economic and fiscal variables used in the Long-Term Fiscal Model.

Probabilistic modelling typically uses historical information to calculate variability in the demographic data. It uses this variability to construct a probability distribution of outcomes. Probabilistic modelling randomly draws samples from probability distributions when projecting variables forward. This is repeated thousands of times to construct a plot showing the likelihood that certain scenarios will eventuate.

Extending probabilistic modelling to fiscal and economic variables provides an additional tool to help judge how much policy adjustment might be necessary to provide a high degree of confidence that fiscal sustainability will be achieved. It would also allow policy makers to identify and gauge the key sources of uncertainty that matter at different points in the future for particular fiscal variables. Finally, it would enable policy makers to evaluate how different policies perform in the context of uncertainty, but would require explicit assumptions to be made about the nature and size of uncertainty around each policy area.[27]
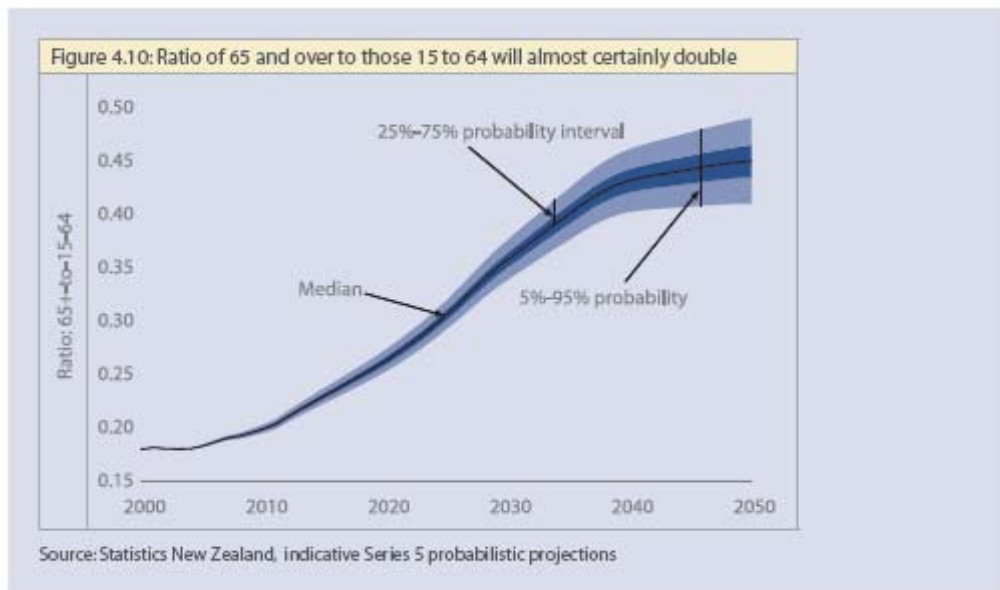
This box describes the results of modelling the uncertainty in the assumptions about fertility rates, mortality, net migration, the sex ratio at birth, and in the base-year (2004) numbers. The probabilistic projections are based on Statistics New Zealand's Series 5 deterministic projection as the median. We are not modelling uncertainty in this median projection.

In Figure 4.10, the black line is the median projection of the aged ratio, the dark shaded area indicates the 25% to 75% probability interval, and the total shaded area the 5% to 95% probability interval. Notice that uncertainty about the aged ratio increases significantly only after 20 to 25 years. This is because for the next two decades uncertainty around mortality is mainly associated with people whose births have already happened. After that, uncertainty around the aged ratio increases significantly as there is uncertainty about the births as well as the deaths of people.

The main conclusion we can take from this work is we can say with reasonable confidence that the aged ratio will double.

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26   Dunstan and Speirs (2005).

27   Bryant (2003), Lee (2004), Heller (2002), and Lee, Anderson and Tuljapurkar (2003.)

Figure 4.10: Ratio of 65 and over to those 15 to 64 will almost certainly double

Source: Statistics New Zealand, indicative Series 5 probabilistic projections

What will people be doing?

The Long-Term Fiscal Model builds projections of real GDP growth from the end of the latest macroeconomic forecast by using the size of the working-age population, labour participation rates, and assumptions about long-run unemployment and labour productivity growth. Thus, GDP is equal to:

working-age population (15+)	Population: The total number of people available for work
multiplied by	
participation rates x (1 – unemployment rate) x average hours worked	Participation: The number actually working and how much they work
multiplied by	
GDP per hour worked	Productivity: How much each person produces each hour that she or he works

Participation

Once the working-age population (in the larger sense of people 15 or above) has been calculated, the next step in constructing the projection of GDP is to calculate participation rates.

The pattern of labour force participation has been changing in New Zealand since at least the Second World War.[28] This means that it is necessary to take a view on whether there will be further changes in this pattern over time.

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28   See Hurnard (2005), Callister (2005) and Johnston (2005).

Women's participation rates have been rising since the Second World War, and women aged 25 to 54 have had a greater level of participation than their predecessors.[29]

While New Zealand does not have an obligatory retirement age, labour market participation at present drops from 60% or so for people aged 60 to 64 to 13% or so for those over 65 (both of these have risen over the past 20 years, particularly for females, because of the lift in the age of eligibility for superannuation in the 1990s).

Over the past half century, participation rates of young men and women have been falling, reflecting greater enrolment in tertiary education. Over the prime working ages (25 to 54), male participation fell as men were displaced by structural change. Through this period, prime-aged female participation rose as women moved into new areas of work, adapted to change, worked longer before having children, or decided to remain childless.

Long-Term Fiscal Model projections of labour force participation rates have divided the population into five-year age cohorts from 15 to 19 years through to 65 and older. In the past, the Long-Term Fiscal Model has taken a two-stage approach to projecting labour force participation rates. First, the model has allowed rates for each cohort to adjust over the first four years of the projections. Then the rate arrived at in the final year is held constant for the remainder of the projection period (about 35 years).

This Statement adopts the cohort method of projecting participation rates.[30] This is based on the observation that a person's labour market behaviour through life has more in common with people born at around the same time as them (their birth cohort) than with people in the same age group through time; for example, women in their 30s are participating more than their mothers in general were at that age.

The technique bases the future participation rate for any particular cohort in any five-year period on the actual experience of the previous cohort. For example, the 60- to 64-year cohort in 2005 to 2009 uses historical participation-rate data for the 55 to 59 cohort in 2000 to 2004 to estimate labour-force entry and exit probabilities and applies these probabilities to determine the appropriate rates for 2005 to 2009. Into the far future, this process continues to use participation rates in one period to project participation rates in the next.

For many age groups, this produces a rising profile further into the projection period than the previous method. As a result, the Long-Term Fiscal Model now projects slightly higher levels of GDP growth and higher revenue growth over the projection period, which improves both the expected financial performance and financial position of the Crown.

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29   This is based on participation rates derived from the census - see Hurnard (2005).

30   For further details of this method, see Burniaux et al (2005) and Productivity Commission (2005).

Figure 4.11: Prime-age female participation rises, while prime-age male labour is stable
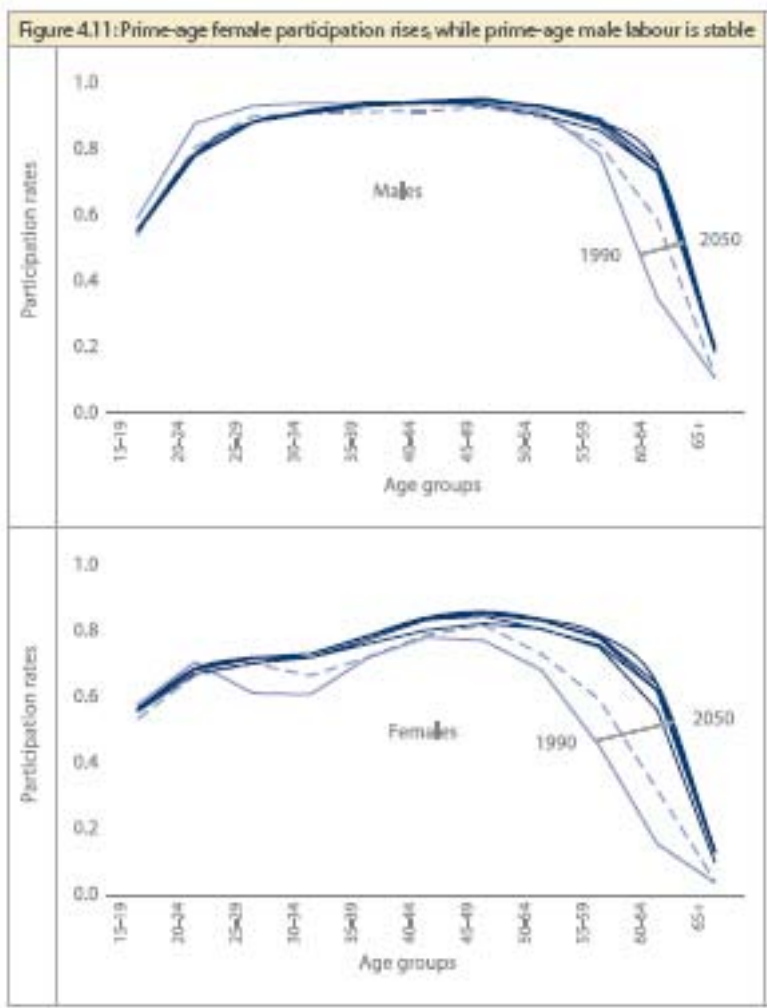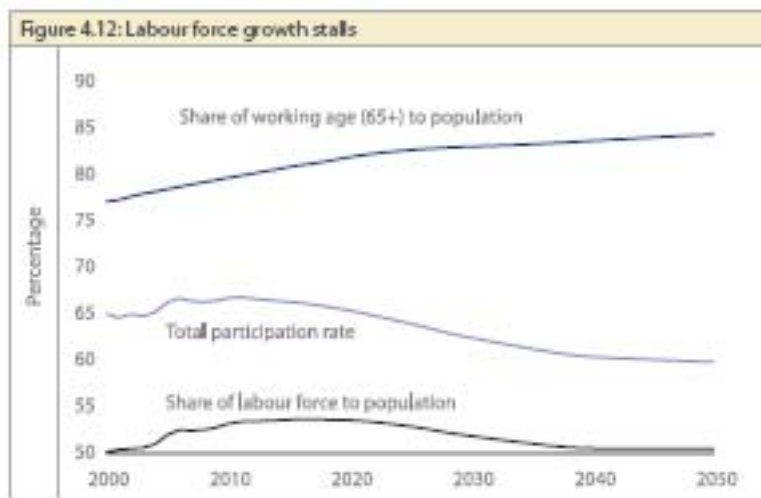

Source: The Treasury

The aggregate participation rate falls from 68% now to 60% by mid-century. The labour force grows to mid-century and then begins to decline. Even though participation of the open-ended 65-plus cohort is expected to rise, aggregate participation falls, as a greater proportion of people spills into the older age groups, where participation is lower.

Before 1980, female employment rates were inversely correlated with fertility. In the 1990s, this flipped: high female employment became correlated with high fertility, signalling a change in women's preferences (Jaumotte, 2004). So the same policies that support fertility will now support employment.

Alternative participation scenarios

New Zealand's labour force participation rates are high relative to the OECD average. Even so, there is scope for increasing participation, particularly among young women and sickness or invalid

Figure 4.12: Labour force growth stalls

Source: The Treasury

beneficiaries. A previous Treasury study[31] calculated the effect on GDP of hypothetical increases in employment from increased participation, taking into account the differences in productivity between new and existing workers. The results suggest that increasing the labour force participation of women aged 25-34 to the average, adjusted for paid maternity leave, of the top five OECD nations increases employment by 28,800, making GDP 1% higher than it actually was in the baseline year of 2001. Raising participation overall to the average of the top five OECD countries increases employment by 142,600 and generates an increase of 5.1% in GDP.

Employment and unemployment

The Budget economic forecast assumes that, by 2010, the trend unemployment rate is 4.5% of the labour force and this is assumed to remain constant throughout the projection period. Along with this, hours worked per employee are also assumed not to change after 2010.

Productivity

Empirical estimates suggest that productivity rises with age before declining after middle age.[32] This could mean that ageing could produce a (small) decline in average productivity, with the effects of a greater proportion of older workers being largely offset by relatively fewer younger ones. The present modelling, however, assumes that average labour productivity (real output per hour worked) grows by 1.5% annually for everyone over the projection period. This reflects the median growth in the output per hour worked between 1980 and 2003.

Labour productivity growth (which is assumed to equal the real wage growth in the Long-Term Fiscal Model) of 1.5% a year means that by mid-century, real incomes will have doubled.

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31   Bryant, Jacobsen, Bell and Garrett (2004).

32   Productivity Commission (2005).

Chapter 11 examines the effects on the fiscal position of changing this productivity assumption.

Inflation and bond rates

The final major assumptions in the modelling are that annual inflation over the projection period is 2%, the middle of the present Reserve Bank target range, and that the real government 10-year bond rate is 4%.
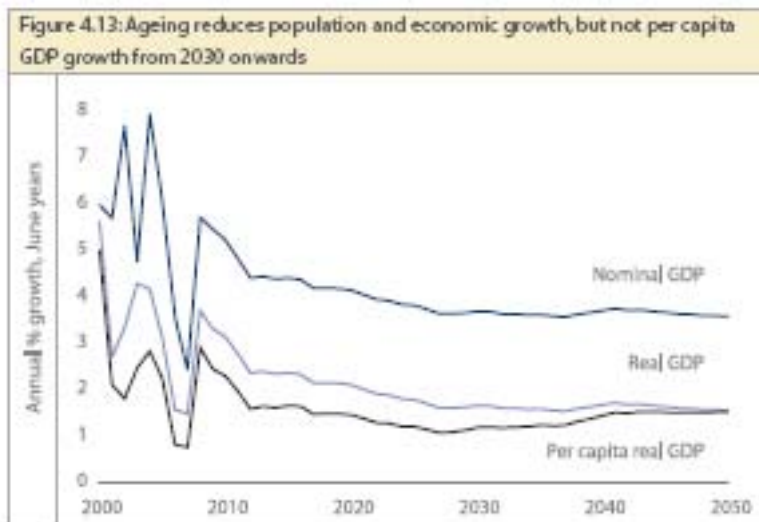
Resulting GDP projections

In growth terms, nominal GDP in any one year (Y_t) grows as follows from 2010 onwards:

$$Y_t = Y_{t-1} \times (1+g) \times (1+p) \times (1+i),$$

where

$\quad Y_{t-1} =$ GDP in the previous year,

$\quad g \quad =$ growth of labour force,

$\quad p \quad =$ labour productivity growth, and

$\quad i \quad =$ the inflation rate.

In other words, growth of nominal GDP is roughly the sum of the labour force growth, labour productivity growth and the inflation rate. This formula implicitly assumes that the employment rate and average weekly hours worked are constant after 2010.

Figure 4.13: Ageing reduces population and economic growth, but not per capita GDP growth from 2030 onwards

Source: Statistics New Zealand and Treasury projections

Table 4.2: Summary of key economic assumptions from 2010

Variable	Value
Labour productivity growth	1.5%
Inflation	2.0%
10-year real government bond rate	4.0%
Unemployment rate	4.5%
Average hours per week	38.4 hours

Combined with these assumptions, the demographic projections translate into slower labour force growth and real economic growth lowering from about a 3.2% annual average over the past decade to a 1.6% average through the 2040s. Real per capita growth is closer to labour productivity growth, but it falls below this when population growth is larger than labour force growth from 2020 onwards.

5 Taxes and Other Revenue

This chapter discusses the financing of government expenditure.

The tax system

Total tax revenue in any one year is the product of the tax base and the rate at which taxes are levied on that base. In New Zealand, the main taxes are: GST, which is levied at a constant ("flat") rate on virtually all consumption that takes place within the country; an income tax, which in turn is composed of a company tax, levied at a flat rate of 33%; and personal tax, which is levied using a progressive rate structure. In addition, the government levies excises on petroleum products (a fixed dollar amount per unit), tobacco products (fixed levy rate per kilo of tobacco) and alcoholic beverages (fixed levies per litre of alcohol, with different rates applying to beer, wine and spirits). Other sources of tax revenue include some tariffs on imports, road-user charges and some stamp duties.

For many taxes, the base is simply projected to grow in line with GDP, since this is either explicitly (eg, with income tax and GST) or implicitly (in the case of excises on petroleum products) the tax base. Tax rates are assumed constant.

In the case of the personal tax system, however, the progressive nature of the rate scale adds a complication.

Under the current rate scale, marginal rates of tax increase with income. There is currently a four-step scale (three main statutory rates of 19.5%, 33% and 39%, plus a low-income earner rebate that reduces the effective rate on incomes below $9,500 to 15%). Traditionally, the thresholds at which the different rates apply have been fixed in nominal terms, giving rise to "fiscal drag." This occurs when increases in nominal incomes result in people moving up the income tax scale, lifting their average tax rate.

Given the assumption discussed in the previous chapter that wages grow on average at 1.5% a year above increases in prices, nominal wages will increase significantly over the projection period: by 2050, the average nominal wage (QES) will rise from the current level of around $42,900 to over $200,000. After adjusting for inflation, this average wage will be over $84,000 per annum in 2050 when expressed in today's dollars. Keeping the current rate scale in place would mean people on the average wage paying tax at the top marginal tax rate. The average tax rate on this average wage would increase from 21% to 35%.

Traditionally, New Zealand governments have addressed fiscal drag by adjusting the tax scale in an ad hoc manner. In the 2005 Budget, the Government announced the introduction of an automatic system of adjusting the tax thresholds for price inflation. [33] This change has yet to be legislated.

Interaction between fiscal drag and the New Zealand Superannuation Fund

A further issue that needs to be addressed is the interaction between contributions by the government to the New Zealand Superannuation Fund and the personal rate scale.

This interaction between the tax scale and the contribution to the Fund involve a series of steps, the implications of which are not always obvious.

Under the New Zealand Superannuation and Retirement Incomes Act, the annual contributions to the New Zealand Superannuation Fund are directly related to the dollar amount of superannuation expected to be paid in the future. That dollar amount is, in turn, directly related to after-tax income, via the operation of the indexation formula in the legislation. The indexation formula says that benefits are adjusted annually by movements in the CPI, but must remain within a band of 65% to 72.5% of the average after-tax wage.[34]

The after-tax part of this formula is important. It requires the Treasury, when advising on the amount of contributions to the Fund, to form a view of the rate of tax to be paid by a person earning the average wage in each of the next 40 years.

This leads back to the issue of fiscal drag.

In operating the mechanism for calculating the contributions to the New Zealand Superannuation Fund, the Treasury has to date assumed that there is no fiscal drag and that the thresholds in the personal tax scale have been increased in line with movements in wages.[35] As noted above, this is a strong assumption, but one that is justified given the structure of New Zealand Superannuation.

Tax revenue projections

For these reasons, and for modelling simplicity, previous studies of the long-term fiscal position in New Zealand (and studies undertaken by other governments) have tended to assume that the tax-to-GDP ratio remains constant through the projection period. This tradition is continued in this Statement, with the bottom-up projections in this chapter assuming a constant ratio (see Figure 5.1). This assumption is relaxed in some of the top-down projections discussed in Chapter 11.

The impact of varying the fiscal drag assumption is also discussed below. Using the announced three-yearly price indexation of the tax thresholds means that the effects of fiscal drag would be reduced, but not eliminated.

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33   The details of the policy are that once every three years, starting in 2008, the various thresholds in the personal tax scale would be increased by the cumulative increase in the CPI over the previous three years.

34   The confidence and supply agreement between the Labour Party and the New Zealand First Party requires the floor of the band to be 66% during the current term of Parliament.

35   The recent strong growth in employment has had this effect: the number of people on benefits has fallen and the number of people in employment has increased markedly.
Fiscal drag also occurs if the distribution of earnings changes. That is, if the number of people earning higher incomes increases, then the tax-to-GDP ratio will increase even if the personal tax scales are indexed to wages.

Assuming a constant tax-to-GDP ratio is a strong assumption. It means that the effect of demographic change and other policy changes are left only on the spending side, when governments do have the option to increase taxes to finance increases in spending. But to go further and impose the precise mechanism by which the ratio is held constant may seem to be especially prescriptive.

Modelling approach

The projections of tax revenue break the tax system into three components:

» source deduction of benefits and New Zealand Superannuation

» source deductions of other income from employment

» all other taxes.

Source deductions on benefits is projected as follows:

$$T^b_t = T^b_{t-1} \times (1+\beta)$$

where T_t = tax and β = growth of benefit payments, including New Zealand Superannuation.

Benefits here include New Zealand Superannuation, Unemployment Benefit, Domestic Purposes Benefit, Invalids Benefit and Sickness Benefit.

Source deductions on all other income sources is:

$$T^o_t = T^o_{t-1} \times (1+ g),$$

where g = growth of nominal GDP.

Total source deductions is the sum of these two:

$$T_t = T^b_t + T^o_t.$$

All other tax types (such as corporate tax and GST) are modelled as follows:

$$T_t = T_{t-1} \times (1+ g),$$

where g = growth of nominal GDP. In other words, the tax-to-GDP ratio for all taxes other than source deductions on benefits remains constant from 2011 onwards.

The revenue-to-GDP ratio does move up slightly through the projection period, because of taxation on the growing payout for New Zealand Superannuation (and other benefits).

Sensitivity to assumption changes

Because of the structure of Treasury's Long-Term Fiscal Model, it is not possible simply to alter the tax scales, because taxes are estimated at too high a level of aggregation. It is possible, however, to use proxies to get an impression of the size of the effect of assuming no fiscal drag on the fiscal position.

Figure 5.1: Tax revenue as a share of GDP rises only slightly through the projection period
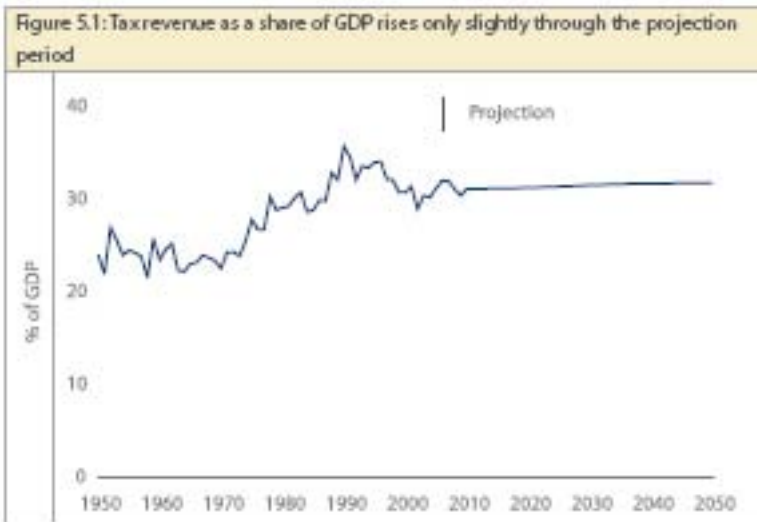
Sensitivity to assumption changes

These scenarios use tax elasticities to illustrate the effects of different tax scales. The first scenario (full fiscal drag) assumes an elasticity of personal taxes to income of 1.3; a 1.0% increase in incomes results in a 1.3% increase in taxes.[36] This estimate comes from taking the incomes from a sample of taxpayers and working out each one's tax liability based on today's personal income tax scale. All incomes are then raised by 1% and the tax liabilities recalculated using the same scale (ie, no indexation). The result is a 1.3% increase in personal tax. All other taxes are assumed to have an elasticity of 1.0 (a 1.0% increase in income increases tax revenue by 1.0%).

Under this fiscal drag scenario, the tax-to-GDP ratio is 2.4 percentage points higher than in the base case.

Figure 5.2: The effects of different indexation regimes
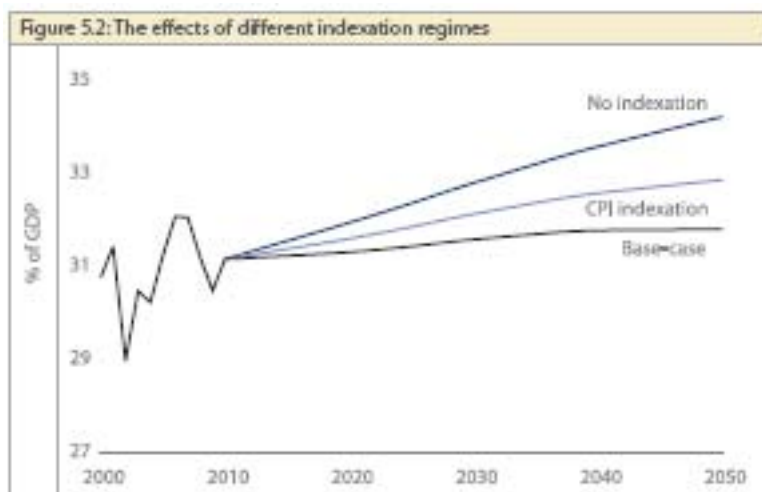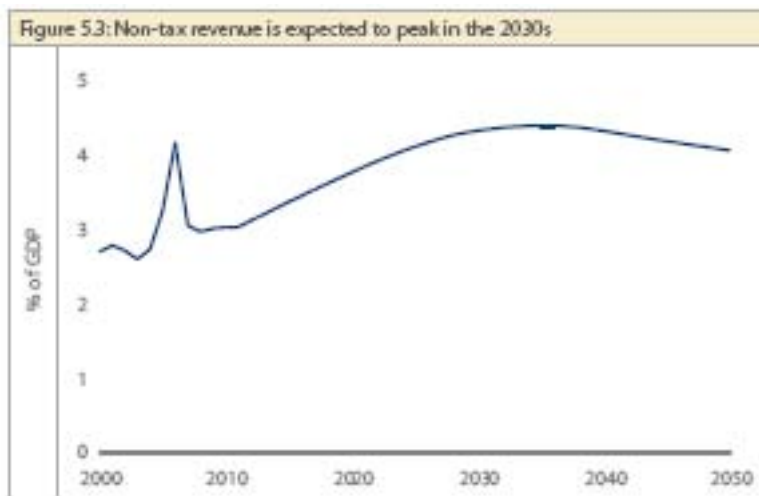
Source: The Treasury

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36   An elasticity of 1.3 is used in Treasury short-term forecasts of personal tax revenue as a proxy for fiscal drag.

The second scenario shows the impact of adjusting the brackets in the personal tax scale from 2011 onwards by the assumed rate of inflation: 2% a year. The tax elasticity estimated in this case is 1.14 for personal income, which, when weighted up with the flat taxes, gives a total tax elasticity of 1.06. The result is a tax-to-GDP ratio between the no-indexation ratio (full fiscal drag) and the largely flat ratio. In 2050, the tax-to-GDP ratio for the inflation-indexed case is 1.1 percentage points higher than the base case.

Non-tax revenue

On the non-tax side, the Government also earns revenue from its commercial and other operations. Some examples are the profits from state-owned enterprises, the investment income of funds operated by Crown entities such as the Accident Compensation Corporation and the Earthquake Commission, and income on its foreign reserves.

Increasingly, the largest source of income for the Crown is the earnings of the New Zealand Superannuation Fund. While these earnings are retained in the Fund and will be used for the purpose of paying future New Zealand Superannuation benefits, they are, legally, the income of the Crown and so are included in the Crown's accounts.

Figure 5.3: Non-tax revenue is expected to peak in the 2030s

Source: The Treasury

6 Health

Health care is a major component of government spending in New Zealand and has been rising both in real terms and as a proportion of GDP for a long time. Average per capita real growth in health spending from 1950 to the present has been 3% and has accelerated to over 4% from the early 1990s.

Figure 6.1: Government health expenditure has been rising since 1950
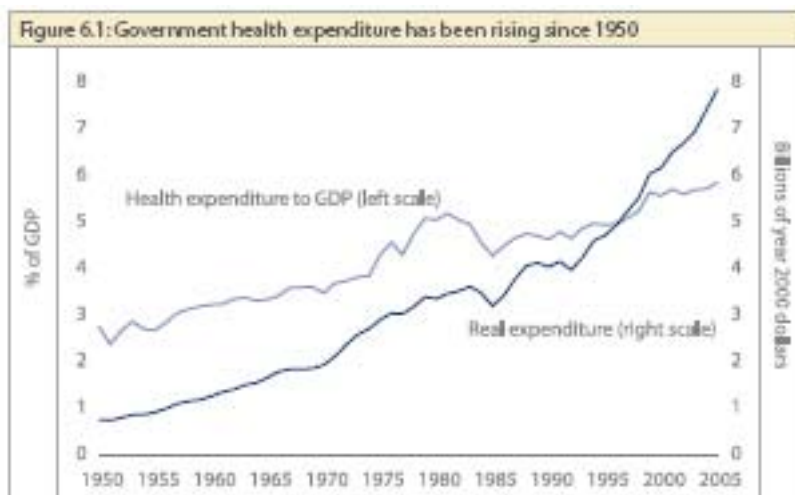
Source: The Treasury[37]

This chapter discusses what has been driving health spending decisions in the recent past, presents a base-case projection for future spending and discusses alternative scenarios for different modelling assumptions.

The future health status of the population

An understanding of the future course of the health status of the population is key to modelling future health spending.

As discussed in Chapter 4 on demographic and economic assumptions, the structure of the New Zealand population is changing. The key issue is how this change will affect health spending.

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37   Preparing a long-term data series for health spending presents definitional issues. It is not clear whether the data use the same bundle of goods and services since 1950. We are confident, however, that the data presented here do, at a high level, accurately reflect the trend in spending over the past 50 years.

In any particular year, health-care costs in OECD countries increase with age. In addition, the developed and developing worlds are undergoing population ageing. These two facts have led many to conclude that population ageing will inexorably lead to large and rapid increases in health expenditure.

Richardson and Robertson (1999), however, caution that drawing simple conclusions like this might not be a secure basis for policy development:

> . . . it is not necessarily true that future costs will be dominated by ageing and it is possible—as a matter of logic—that ageing per se may have no effect. The existence of a cross-sectional distribution of health costs . . . does not imply that over time aggregate health costs will be determined by the age composition of the population and the costs per age cohort . . . . The belief that there is a fixed medical need for each cohort of the population and that there is a well defined set of services required to meet these needs has been labeled by Evans (1984) as the "naive medical model." The deterministic view that health expenditures are defined fairly precisely by technical factors is simply wrong.

Indeed, international research has led to some uncertainty about the link between population ageing and health expenditure.[38] Econometric studies have produced mixed findings on the relationship between changes in countries' population age structure and changes in their health expenditure.

Kotlikoff and Hagist (2005) studied the growth of health spending in 10 OECD countries from 1970 to 2002. While total health spending has increased 2.5 times faster than GDP over this period in the countries studied, most of this has been due to increases in "benefit growth" (where "benefit" is defined here as health expenditures per person at a given age). They note:

> Had there been no benefit growth, healthcare spending would still have grown because of demographics, specifically changes in the age composition of healthcare beneficiaries and increases in the total number of beneficiaries. But with no benefit growth, healthcare spending in our 10 countries would have grown, on average, only one fifth as fast.[39]

More fundamentally, the focus on age structure may be misplaced, because underlying health status, rather than age, may be the real determinant of the demand for health care. More technically, it is "time-until-death" that determines the cost of health care, not age itself. Miller (2001) studied the pattern of annual spending by Medicare, the United States Government's health programme for the elderly. He showed that the average annual Medicare cost of 95-year-old Americans who were nine years from death was $2,100. In contrast, the average cost of Medicare for a 75-year-old in the last year of life was $13,500.

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38   See O'Connell (1996).

39   Kotlikoff and Hagist (2005), p. 1.

Moreover, the relationship between age and health status varies over time. This point is important. In many countries, what it means to be "old" is changing. Not only are we seeing many more people survive into old and very old age, we are seeing many more active, healthy old people. While the evidence available is still inconclusive, researchers have developed ideas that suggest that gains in longevity will translate into lower health-care costs in the future.

Theories of the future course of mortality and morbidity

There are many different theories and a consensus is yet to emerge about where mortality and morbidity are headed. Oeppen and Vaupel (2002, p. 1030) note:

> Mortality improvements result from the intricate interplay of advances in income, salubrity, nutrition, education, sanitation, and medicine, with the mix varying over age, period, cohort, place and disease.

Like many countries' official population projections, those for New Zealand assume that the recent trends in mortality reduction will eventually taper off.[40]
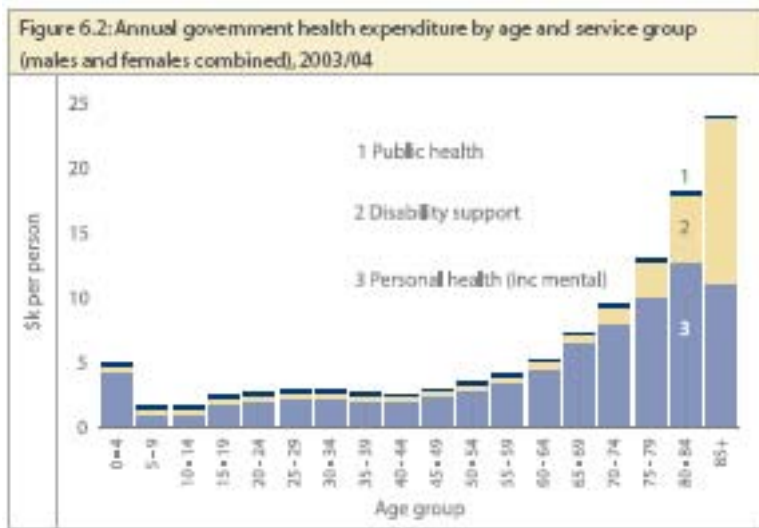
There are, however, studies in the literature that question whether this will be the case. Oeppen and Vaupel, for example, are at the optimistic end. They predict no decline in the rate of increase in life expectancy for the future, with a continuation of a rate of increase of about 2.4 years per decade. This would see life expectancy at birth reach 97.5 years by the middle of the 21st century and 109 years by 2100.

Booth and Tickle (2003), in a study undertaken for the Australian Productivity Commission's work on the economics of population ageing in Australia, have produced projections of life expectancy that are in excess of the official estimates of the Australian Bureau of Statistics (ABS). They estimate female life expectancy at birth in 2027 in Australia to be 88.1 years, compared with an ABS projection of 85.4 years.

There are also pessimists. Olshansky et al (2005) are critical of those studies that predict life expectancy on the basis of extrapolating the past. They prefer an approach that relies on trends in health and mortality that can be observed in the *current* adult population, which they suggest will lead demographers to revise *downwards* their estimates of life expectancy at birth.

Lee (2003) cites two separate stages to the decline in mortality. The first stage, starting in around 1800 in Europe, involved reductions in contagious diseases and infectious diseases spread by air or water. Personal hygiene improved (boosted by increases in income), as the germ theory of disease became more widely accepted. Improvements in nutrition were also helpful. The developed world has probably already experienced most of the potential decreases in mortality due to reductions in infectious diseases and improved nutrition. Cutler, Deaton and Lleras-Muney (2006) reach similar conclusions.

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40 The results presented here are for Statistics New Zealand's preferred projection series, which has "medium" assumptions around fertility, mortality and migration. For details of other series, see Statistics New Zealand (2005).

Figure 6.2: Annual government health expenditure by age and service group (males and females combined), 2003/04

Source: Ministry of Health

Figure 6.2 shows the relationship between age and average government health expenditure per person in New Zealand in the financial year 2003/04. Public health covers areas such as health protection, health promotion and disease control. Disability support services include items such as home support, residential care, and equipment, while personal health includes primary, secondary and tertiary medical care.

Per capita expenditure on personal health and disability support services increased with age in 2004, though the most pronounced increases occur with disability support services. For people aged 85 and over, 61% of health expenditure in 2004 was accounted for by disability support services.

Why does health expenditure increase with age? International research suggests that people in poor health need more health care than people in good health, and that the prevalence of poor health, particularly chronic disease and associated disability, rises with age.

Studies in the United States and Canada have found that, on average, people who are about to die make greater use of health services than those who are not. So "distance to death" can predict health expenditure better than "distance from birth" (age, in other words). The link between distance from death and expenditure is especially strong for acute care (Lubitz and Riley, 1993; McGrail, Green, Barer, Evans, Hertman and Normand, 2000; Miller, 2001; Yang, Norton and Stearns, 2003).

An increase in life expectancy means that there has been a change in the health status of the population. There is an unsettled debate in the literature on what is happening, and what is likely to happen in the future, to health status. The first bar in Figure 6.3 represents a life before the increase in life expectancy. There are three broad possibilities for changes in health status, which are illustrated in

a stylised form in the lower three bars. In each case, they take as given an increase in life expectancy: people are, on average, living longer. The question they seek to answer is whether those extra years of life are, to put it crudely, lived in "good" or "bad" health.[41]

The first, and most optimistic, scenario is that health is improving across the board. This is known as a "compression of morbidity": people both live longer and have fewer years of bad health.

The second is a "dynamic equilibrium" (also known as "healthy ageing"): the absolute period of bad health stays the same, but falls in relative terms as the absolute period of good health increases.

The final and most pessimistic scenario is known as an "expansion of morbidity": the absolute period of good health stays the same, with all the increased years of life expectancy being in poor health. A severe expansion of morbidity would see the absolute period of good health reducing.

It is difficult to predict the net effect of medical progress on age-specific disability rates. Some new technologies have led to increased disability rates. The standard example is coronary care, which has reduced the case fatality of heart attack, but in so doing has created an "epidemic" of heart failure.

Figure 6.3: Possible future health states in years of life
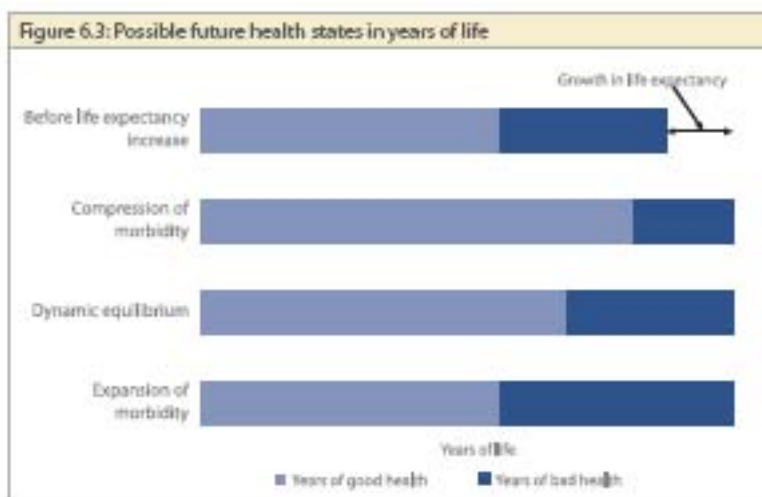
Source: The Treasury

Other technologies, however, such as drugs to reduce hypertension (the major risk factor for stroke), have helped reduce disability rates. Similarly, it is difficult to predict the net effect on disability of conflicting population health trends such as increasing obesity and declining smoking rates. The only way to resolve the uncertainty is to look at longitudinal data on disability.

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41 Figure 6.3 divides a person's life neatly into discrete periods of good and bad health. For many people, this is clearly not the case.

New Zealand evidence on disability trends

There have been two recent studies of trends in disability in New Zealand.

Graham et al (2004) use data from two observations, one in 1981 and the other in 1996, to evaluate the evidence for the three theories of health change. They find that the "dynamic equilibrium" scenario provides the best fit to the New Zealand data.

Tobias et al (2004) use data from two surveys of disability conducted in 1996 and 2001, after each census, to test for trends in health status. They find mixed evidence. Their method divides expected life into four discrete periods:

» disability-free life expectancy

» disability not requiring assistance (level 1 disability)

» disability requiring non-daily assistance (level 2 disability)

» disability requiring daily assistance (level 3 disability).

Over the five years between the two censuses, life expectancy at birth for males increased by 1.9 years, to 76.3 years; while for females, the increase was 1.5 years, to 81.1 years.

Table 6.1 breaks down the increase in expected life into the four stages. The results are different for males and females. For males, the vast bulk of the increase can be expected to be spent in the state of highest disability. This supports an "expansion of morbidity" theory. For women, however, there is actually a decline in the period spent in the highest level of disability, with increases in disability-free years as well as periods of moderate disability.

Table 6.1: Decomposition of increase in life expectancy

	Males	Females
Total	1.9	1.5
Disability-free	0.1	0.4
Level 1	0.0	0.6
Level 2	0.0	0.8
Level 3	1.8	-0.3

International evidence

Bryant, Teasdale et al (2004) report on a systematic review of international longitudinal studies.[42] Census data from Australia appear to imply that disability rates have risen. The highest-quality studies, covering the longest periods, however, have been conducted in the United States. These studies all suggest that disability rates have declined significantly.

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42   Appendix 3 of Bryant, Teasdale et al (2004).

Robine and Michel (2004) suggest that population-wide studies might be masking some significant trends through time and in sub-groups of societies. They tentatively suggest that a four-stage process can explain the apparently inconclusive evidence, as follows:

1   an initial increase in survival rates of sick people, leading to an expansion of morbidity

2   control of the progression of chronic diseases, which produces a "dynamic equilibrium" between a fall in mortality and an increase in disability

3   an improvement in the health status and behaviours of new cohorts of older people, which produces a compression of morbidity

4   the eventual emergence of very old and frail populations, which would be represented as a new expansion of morbidity.

Synthesis

Putting these competing theories and the data from New Zealand and overseas together is not an easy task. The forces at work are complex and not completely understood.

From these studies, it is reasonable to assume that, in the future, the incidence of disability will decline as the population ages, meaning that people will be living longer and healthier lives.

Modelling the future

Modelling the future course of health spending is a challenge. In contrast to the case of New Zealand Superannuation, there is not a single parameter-driven scheme in place. Rather, there is a complex set of policies, which are usually described as "the public health system."

The Government currently funds large amounts of health care provided by private suppliers (examples include: doctors visits subsidised via the Primary Health Organisation system; pharmaceuticals subsidised via the Pharmaceuticals Benefits Schedule operated by Pharmac; treatment of personal injury from accidents reimbursed - sometimes partly, sometimes completely - by the Accident Compensation Corporation scheme). It also supplies heath-care services in kind (principally through the hospitals operated by District Health Boards).

The total quantum of health spending is thus the result of a myriad of individual purchase decisions made by successive governments about what to fund and what to provide.

The model

For the purpose of developing the projections of future spending, it is assumed that the broad features of the existing health system will remain in place and that governments will continue to make purchase decisions much as they have in the past.

Under this approach, the result is that government decisions are driven by a combination of demography, cost and policy decisions. The model does not, however, separate out completely the effects of each of these three elements.

The modelling choices made draw on historical patterns and the potential demographic and non-demographic drivers of health spending in the future. The most likely settings of the modelling parameters are used in the base case. The base case is used in Chapter 11 as part of projections of the overall long-term fiscal position. The present chapter also presents a range of other scenarios to illustrate the effects of different drivers on the projections.

All health spending service groups, except disability services, grow as follows:

$$E_t = E_{t-1} \times (1+cw_t) \times (1+g)^\varepsilon \times (1+r_t),$$

where:

E = health spending,

cw = growth of $\sum_a$cost weights$_a$ x population group$_a$ (summing over age and gender groups, a),

ε = income elasticity of demand for health services,

g = nominal GDP growth (as a proxy for income), and

r = a residual growth factor.

In other words, growth in spending on health is the sum of population growth and the growth effects of ageing and health status, and the growth of demand, plus an additional growth factor (capturing relative price changes and the costs of new technologies).

This equation differs from the standard Long-Term Fiscal Model equation in that it has the residual growth term and it tracks nominal GDP growth. The major growth differences between the Long-Term Fiscal Model modelling and the present approach are in the residual growth factor and the fact that the cost profiles vary in time and depend on whether the recipient of health-care services is in the last year of life or not (is a "decedent" or a survivor).

For disability support services, following Bryant, Teasdale, et al, the incidence of disability decreases over time, roughly in line with longevity gains (falling by 0.5% a year). The provision of informal care is also related to labour participation of 50- to 64-year-old women to capture choices between provision of care and a job in the labour market: as more older women find paid work, the less likely they will be able to support disabled relatives and the greater will be the demand for formal care provided by the State.

Growth for disability support services is modelled as follows:

$$E_t = E_{t-1} \times (1+cw_t) \times (1+p) \times (1+g)^\varepsilon \times (1+r_t) \times (1+h_t),$$

where:

E = public spending on disability support services,

cw = growth of the fixed cost weights times the age and gender groups,

p = the rate at which the incidence of disability is falling,

g = growth of nominal GDP,

r = growth of the residual, and

h = growth in the participation of the 50 to 64 age group.

Data

The expenditure covered here is government health spending, which makes up about 80% of total spending on health. OECD studies of government health spending differentiate between health care and long-term care. Health care is the provision of medical goods and services to the whole population. Long-term care is the provision of goods and services to the elderly, including both medical and non-medical care, such as accommodation and food.

In New Zealand, health care and long-term care are both largely funded through Vote Health (with some funding from the Ministries of Social Development and Education) and it is therefore difficult to differentiate between them. The model does not attempt to break out a separate category of long-term care.

For historical data, a single series of current-dollar spending on Vote Health is sutured together from a number of different accounting regimes. The Ministry of Health provided 2003/04 spending profiles by five-year age groups for four categories of spending: personal health (67% of the total, covering primary, secondary and tertiary care), disability support services (24%, consisting of home support, residential care and equipment) and two final small categories, mental health (7%) and public health (2%, covering health-promotion campaigns).

Parameters of the model

Making projections of health spending requires parameters for:

» cost weights

» income elasticity of demand for health services, and

» the residual growth factor.

Nominal GDP growth is produced in the modelling of the future of the economy (see Chapter 4).

Projecting disability support services requires additional parameters relating to the incidence of disability, plus projections of the future size of various population sub-groups (which are derived from the general population projections discussed in Chapter 3).
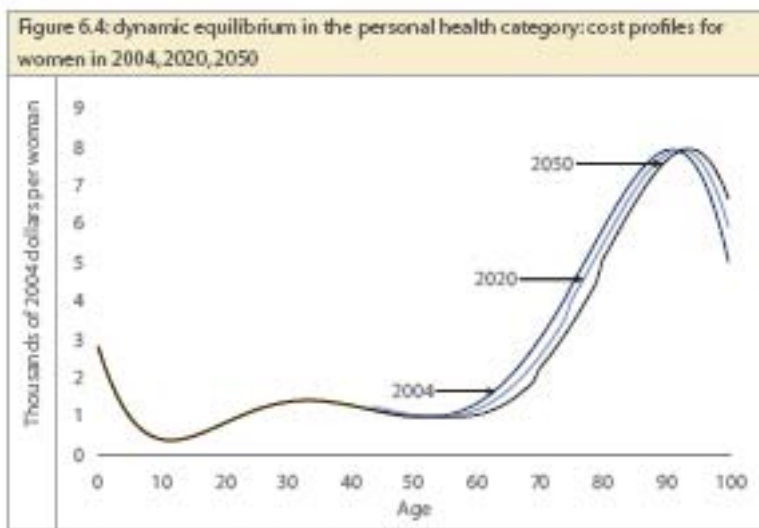
Historical data are used to derive a number of these parameters. Several assumptions are made to analyse the drivers of real per capita health spending over the period 1950 to 2005:

» the proportions of spending in the cost profiles (of the four categories added together), such as those in Figure 6.2, have remained the same over the past five decades (we have no data indicating how these might have changed through the decades)

» aggregate health spending covers roughly the same bundle of services throughout this period (admittedly this is unlikely, as, for example, disability support spending moved from Social Development to Health in the 1990s)

» the CPI is an appropriate deflator for aggregate health spending over this period

» real growth in health spending is the sum of growth due to changes in the mix of ages, rising demand (modelled by GDP) and a residual (which might be capturing the effects of relative price movements, technology, and input costs such as wages of health workers).

Running historical demographic changes through the fixed-cost age profile suggests per capita annual growth arising simply from changes in the age-mix has been around 0.2 to 0.5% a year through the period, a relatively minor contributor to the growth of real per capita health costs since the 1950s (3.0%). (This growth analysis is highly dependent on the deflator and the period covered. It is also in mild conflict with the assumption that health status is changing over the next four decades.)

Estimates in the literature of the income elasticity of demand for public health services range from 0.9 to 1.2 and centre on 1.0. Estimates of the income demand for health care depend on the level of analysis. The larger the group studied (region, country, group of countries), the higher the estimates of the income elasticity in the literature. An elasticity of 1.0 means that average growth of per capita demand for health services is the same as nominal GDP per capita (a measure of aggregate income). Using New Zealand data for the period 1950 to 2005 produced an estimate of 1.16.

Based on history, the average annual residual growth factor over the past 50 years is just over 1% when the income elasticity is set at 1.0, or 0.9% when income elasticity is equal to 1.16. Note that in the early-to-mid 1980s, real health spending contracted, forcing the residual growth to be negative. For the projection period, an income elasticity of 1.0 is assumed for the base case, but a scenario for 1.16 is also presented. Note that a higher estimate for the income elasticity requires a smaller estimate for the residual.

Figure 6.4: dynamic equilibrium in the personal health category: cost profiles for women in 2004, 2020, 2050

Source: The Treasury, based on Ministry of Health costs by 5-year age group

Table 6.2: Decomposition of historical real per capita health spending

Average real annual growth to 2005 from	1950	1960	1970	1980	1985	1990	1995	2000
Total health	3.0	2.9	3.0	2.4	3.5	3.7	4.1	3.7
Pure age effect	0.2	0.3	0.4	0.5	0.5	0.4	0.4	0.4
Age-adjusted growth	2.7	2.6	2.6	1.9	3.0	3.3	3.7	3.3
Income elasticity = 1.0								
Income effect	1.5	1.6	1.5	1.8	1.8	2.6	2.3	2.6
Residual	1.2	1.1	1.1	0.1	1.2	0.7	1.4	0.7
Income elasticity = 1.16								
Income effect	1.8	1.8	1.7	2.1	2.1	3.0	2.7	3.0
Residual	0.9	0.8	0.9	-0.2	0.9	0.3	1.0	0.3

Source: The Treasury

The dynamic equilibrium hypothesis is assumed to hold in the projection period so that longevity gains are translated into further years of good health. The life expectancy of a 65-year-old woman in 2050, for example, is almost five years more than it was in 2000 and so the health costs of that person are assumed the same as a 60-year-old in 2000. The historical 5-year-age cost profiles curves are interpolated into single years and then shifted to the right to simulate this dynamic equilibrium.

In addition, the personal health cost curves are separated into the death-related costs incurred in the last year of life and the costs of the survivors. For each age group, the proportion of those dying to those surviving is falling and this dampens health spending each year. Under these two assumptions (healthy ageing and death-related costs), the projected fall in mortality (rise in longevity) will tend to lessen the impact of ageing on public health spending.

The base-case projection assumes that the income elasticity of demand is 1, and the residual growth decreases from the historical average of 1 over the past 40 years to 0 in 2050 under the assumption of unspecified cost containment through the period.

Figure 6.5: The base-case track for core health spending shows a doubling of the ratio to GDP to 2050
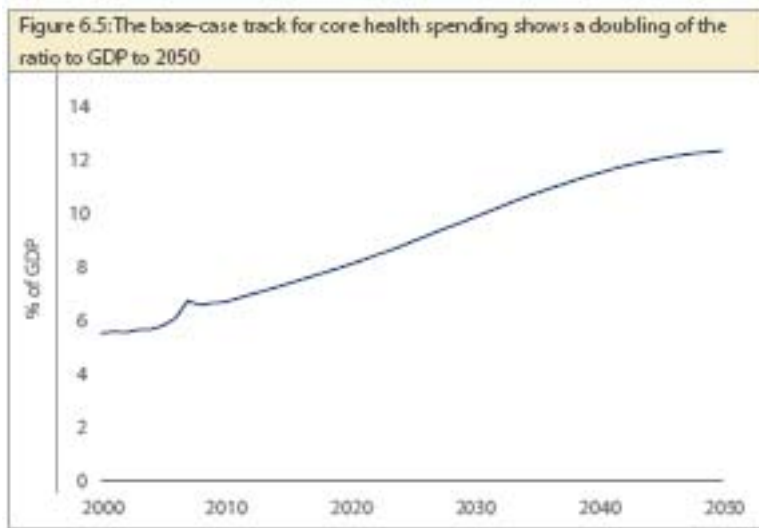
Source: The Treasury

The base-case results

The base case models total health expenditure using demographic changes, projections of healthy ageing and falling disability prevalence, distance to death, demand growth (unit elasticity), and an historically derived but diminishing residual growth factor. This residual captures changes in relative prices, technology, and so on, while the assumption of a gradual reduction represents unspecified cost containment through time.

For this projection, the average annual real per capita growth between 2005 and 2050 is around 3%, much as it was in the previous half century. The contribution to this from the changing age-mix (moderated by changing health status) is about 0.8% on average (with fixed weights, this growth is 0.9%). So ageing effects are larger in the projection period than in history, but they are not dominant. In fact, if the assumed income and residual growth effects are omitted, demographic and health status by themselves serve to lower the proportion of health spending to GDP by more than 3 percentage points.

The bulk of the growth in spending, therefore, comes from cost and coverage growth. This produces a rise in the ratio of spending to GDP of 6.6 percentage points between 2005 and 2050 and average nominal growth of 5.8%.

Alternative scenarios

Compared with superannuation, where spending depends on the number of people 65 and older and the average payment amount (growing by a preset rate), the health system is clearly not parametric. This makes modelling future public health spending a difficult proposition; the drivers of spending growth are uncertain and even when plausible parameters are selected, there is the normal

uncertainty about their projected growth rates. This section therefore looks at various scenarios with different settings of the proposed parameters.

This section lays out six alternatives to the base case. The first four show the effects of varying modelling assumptions in our base model, while the last two come from different models.

Full-cost pressure

The full-cost pressure scenario has the residual growth factor remaining constant over the whole projection period to 2050. This would happen if there were no cost-containment measures that were assumed in the base case. Health spending has grown faster than GDP over most of the past 50 years. A small part of this is due to ageing, but most is due to demand pressures and the rest is taken up with the residual.

If these extra cost pressures are not contained, this scenario suggests a higher track for health spending than the base case by 2.8 percentage points of GDP in 2050, 9.4 percentage points higher than the ratio is now.

High elasticity

In the base case, the income elasticity of demand is set at 1.0, based on overseas studies. An estimate for New Zealand is 1.16 and this is used in the second scenario (with the residual, accordingly, lower at 0.9, tapering to 0 in 2050).

The intuition behind this scenario is that New Zealanders see medical services as a "superior good" (to use the economic jargon) and demand relatively more of them as they become wealthier through time.

Stronger demand effects make this the highest-cost scenario, with the ratio to GDP in 2050 almost 10 percentage points higher than in 2005 and more than 3 percentage points more than in the base case.

Fixed-cost profiles

The base case scenario includes an element of improved health status. The third scenario examines the impact of this improvement on the projections of personal health care (as opposed to disability support services, which are covered by the next scenario). The scenario does this by keeping the personal health cost profiles and disability prevalence fixed for each age group. This captures the features of an "expansion of morbidity" (people live longer in the future, but with today's incidence of morbidity).

Compared with the base case, this scenario shows the effects of generally poorer health outcomes and indicates that health spending could grow faster than the healthy ageing base case, with a gap opening up of 1 percentage point by 2050. This scenario has health spending as a GDP share rising by 7.6 percentage points by 2050 above the present ratio.

Disability incidence unchanging

The fourth scenario isolates the effects of unchanged disability incidence on the disability support component of health spending. This reverses the base case assumption that, as a society, changes in lifestyles, earlier and potentially cheaper medical interventions and so on will reduce the rate of disability through time.

If this does not happen, then health spending increases by a half percentage point of GDP by 2050 above the base case (and by 7.2 percentage points of GDP compared with now).

Health status

The final scenario is built on the health-status modelling undertaken by the Treasury and the Ministry of Health,[43] where costs of each age and gender group depend on the numbers of people in the last year of life or not, and on the numbers disabled or not. Another difference from the base case is an assumed steady reduction in mortality (rise in life expectancy), while the base case modelling assumes a deceleration in longevity gains.

Underlying costs grow by the average seen over the past half century (but less than that seen over the past decade). As a share of GDP, health spending reaches 12% in 2050, a rise of 6.4 percentage points from the ratio now. This scenario has a similar end point to the base case, but a steadier journey in getting there.

Low-cost growth

The fifth alternative simply models the impact of the changing population structure on health spending.

In this scenario, cost profiles do not shift to the right for each age group but, in effect, move upwards with the growth of labour productivity (or the nominal wage). This assumes an expansion of morbidity, but allows only cost rises due to increases in labour costs, and not to technology or demand produced by rising incomes. This is a common approach, where no allowance is made for changes in the health status of the population: we live longer, but in poorer health.

While keeping health status constant has been used in Long-Term Fiscal Modelling in New Zealand and other countries in the past, the underlying premise - that health status is invariant - does not have much support in overseas research or work done here in New Zealand.

In the low-cost scenario, health spending as a share of GDP rises to about 10% (down on the base case by 2.7 percentage points) by 2050, up from 5.8% in 2005. The average nominal spending growth between 2005 and 2050 is 5.1%, compared with the base case's 5.8%.

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43   Bryant, Teasdale, et al (2004) has the modelling details.

The results of the scenarios compared

The results of the six scenarios, and the base case, are presented in Table 6.3 and Figure 6.6.

One striking feature of the scenarios is that they all see health expenditure increasing as a proportion of GDP. The differences are in the rate of growth and its trajectory. This is, in part, a product of the modelling technique used. Health spending in New Zealand (and the industrial world) has been increasing steadily in the past and the model of future spending is based, in part, on the historical trend.

There are, however, reasons to think that this approach might be reasonable. It is difficult to see why New Zealanders would want to spend less of our national income on health care as income increases.

While there is some evidence to support the notion that continued improvements in life expectancy will translate into lower health spending, via improvements in health status, the proportion of the population in old age and very old age is set to increase markedly over the next 50 years and it would be surprising if this did not, at least to some extent, lead to increased spending, given the relationship between age and health expenditure we see today.

Finally, the history of medicine has been one of substantial increases in the range of procedures and treatments available (coverage) and their cost. Again, it is difficult to see why this trend might suddenly come to an end.

Figure 6.6: A theme and six variations
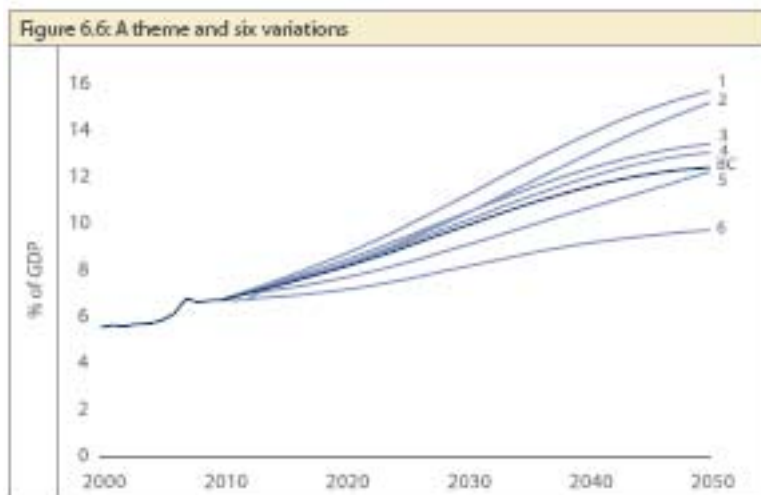
Source: The Treasury. The scenarios are numbered as in the above table and BC = base case

Table 6.3: Decade results of base-case and alternative scenarios

Scenario (% of GDP)	2005	2010	2020	2030	2040	2050
Base case	5.8	6.7	8.1	9.9	11.6	12.4
Difference from base (pp of GDP)						
1 High elasticity	0.0	0.0	0.5	1.3	2.3	3.3
2 Full-cost pressure	0.0	0.0	0.1	0.5	1.4	2.8
3 Fixed-cost profiles	0.0	0.0	0.3	0.5	0.8	1.0
4 Disability incidence unchanging	0.0	0.0	0.1	0.2	0.4	0.6
5 Health status	0.0	0.0	-0.5	-0.8	-0.9	-0.2
6 Low-cost growth	0.0	0.0	-1.0	-1.8	-2.4	-2.7

Policy lessons from these projections

As just discussed, the largest driver of spending above GDP growth is the residual growth factor, which can be thought of as a proxy for decisions around the "cost and coverage" of the public health system.

As a result, the greatest impact on future spending patterns is likely to come from a focus on non-demographic factors. In the short term, particular challenges are around:

» continuing to seek ongoing improvements in the performance of the health system and in the quality of services; that is, continually looking for ways to get better value for money

» managing the adoption of new technology (linking the demand for newer, more complex technology to evidence about its impact on health outcomes and the trade-offs involved)

» the coverage of, and access to, services; and, in particular, seeking better health outcomes through earlier and simpler interventions.

The longer-term debate should focus on the relationship between health outcomes and health spending (at the macro level), and the relationship between the quality and cost of health services (at the micro level). There is no simple relationship between total spending and health outcomes; more does not necessarily mean better (the United States is the prime example, where a high-cost health system has not produced superior health outcomes). There is some evidence that a lower-cost health system can, with smart use of resources and a focus on quality, deliver optimal health outcomes.

7 Education

Public spending on education since the Second World War has been primarily occupied first in educating the baby boomers and building schools in which to teach them and, later, in catering for the growing participation of people of pre- and post-school age in our education system.

Over the next 50 years, with demography still an important driver, declining proportions of young in the population could mean that the quality of the education system could be maintained, while at the same time resources could be freed up to help pay for the growing demand from health and superannuation. Whether there will be such a fiscal dividend from education is far from certain.

This chapter looks at some of the past drivers of education spending and touches on the issues facing the major components of each sub-sector. It then outlines the approach taken to modelling future spending by sectoral level and the sensitivity of the results to some of the risks.

Over the past half century, public spending on education has grown two-and-a-half times as a share of GDP (Figure 7.1). Annual growth has averaged 10.9% a year (4.5% real growth a year), about 1.7 percentage points faster than nominal GDP growth over this period.[44] Over the past decade, when the data are more clearly operating, rather than capital expenditure, total education spending has grown by an average of 6.2% a year.
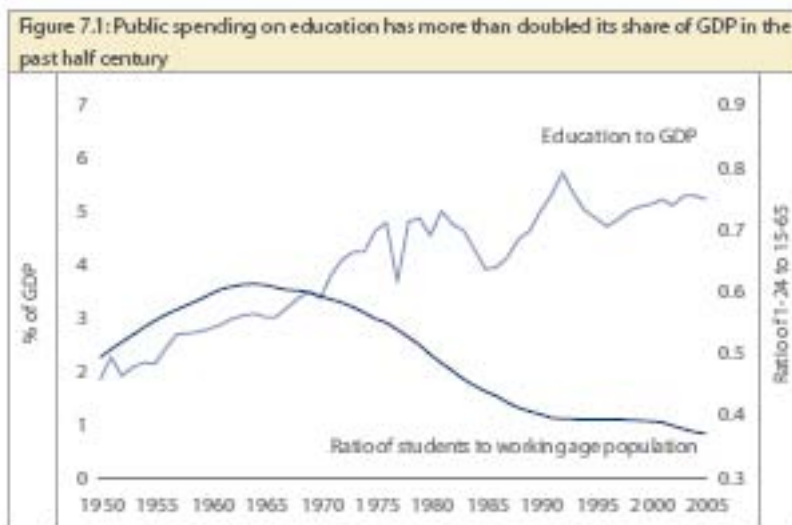
Figure 7.1 also shows that forces in addition to demography have been driving the growth in public spending on education as a share of GDP since the 1970s.

At present, spending on primary and secondary schooling takes about half of the public spending on education, while tertiary has about a third.
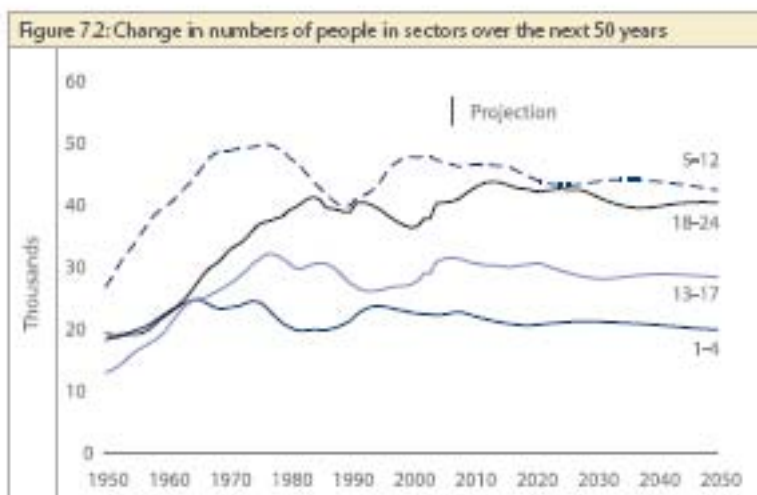
Looking ahead, demography is likely to change the shape of the education sector. Figure 7.2 shows the prime catchment ages for the different parts of the sector.

Student numbers depend on present enrolment rates and their evolution in the projection period. The number in the early childhood education pool is expected to fall by 11% between 2005 and 2050, primary by 10%, and secondary by 9%, while tertiary returns to 2005 levels after the early 1990s baby blips have completed their studies.

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44   The box in Chapter 1 about data quality is particularly pertinent here; data before 1994 may also include capital costs of building those post-war schools.

Figure 7.1: Public spending on education has more than doubled its share of GDP in the past half century

Source: Statistics New Zealand

Figure 7.2: Change in numbers of people in sectors over the next 50 years

Source: Statistics New Zealand Series 5 projection

On pure demographic grounds, spending for education services will fall over the projection period, provided costs per student stay constant (which means, in practice, teachers' pay moving in line with that of the rest of the workforce).

Other factors are, however, at play. In the short-to-medium term, the public education sector is likely to see a continuation of the trends of the recent past. Some of the issues are:

» schools built after the Second World War are now fully depreciated and the sector is facing large capital costs to replace them

» population movements mean that schools are now not always in the areas where families are. Recent experience is that it is difficult for resources to be shifted completely to where the children are

» there could be shifts in the boundary between public and private schooling, placing greater pressures on the fiscal position

» the number of students going on to tertiary education has stopped growing, perhaps because of the strong labour market

» the median age of students has risen because of growing attendance by people over 40. While these numbers are as yet small in the overall picture, they may become more significant with the ageing of the population and rising demands for moving in and out of education throughout life

» the need to improve productivity performance could place greater demand on the public sector for job-related training.

Drivers of the future and modelling assumptions

Basically, for each education sector, future public spending is just the expected cost per student times the projected number of students. More specifically, the general form for modelling each sector is:

Spending = [teachers' average wage*(teacher/student)]*[enrolment rate*population for sector].

The assumption here is that labour costs are the only, or the dominant, driver – or are a fixed proportion of total costs. In fact, labour costs make up about 80% of the operating expenses in schools. Hence, more accurately, for each education sector:

Spending = (total spending/teachers' labour costs)*average wage*(teacher/student)* enrolment rate*population for sector.

If, in the base case, the proportion of total costs to labour is assumed to be fixed and the student-teacher and enrolment ratios are fixed (including the mix of full-time and part-time tertiary students), then in growth terms:

New spending = old spending*(new wage/old wage)*(new population for sector/old population for sector).

Based on this, a simple modelling approach is used to project forward all levels of education (with a slight variation in tertiary), using the growth of the age-group base, inflation and a real per student growth factor of 1.5% each year based on the real wage of teachers. This wage is assumed to grow at the same rate as for the whole economy and be equal to productivity growth.

$E_t = E_{t-1} \times (1+i) \times (1+w) \times (1+d),$

where

E = expenditure,

i = the inflation rate,

w = real wage growth, and

d = growth of the appropriate age group.

Here the appropriate sectoral age groups are 1 to 4 for early childhood education, 5 to 17 for primary and secondary (largely the compulsory sector) and 18 to 29 for tertiary. (The tertiary age group has been expanded to the late 20s because a growing proportion of tertiary attendance is being drawn from those older than the traditional prime catchment ages of 18 to 24.) As noted above, these groupings tend to reduce in size over the next half century. The base modelling assumes that enrolment rates from each of these age groups remain as they are now. Sensitivity scenarios later examine the effect of changing this assumption.

Tertiary spending has an extra growth driver. In this case, E is tertiary spending (plus student loan write-offs) and the extra growth driver is the growth of $(1 - part_{18-29})$, where $part_{18-29}$ is the participation rate of the 18-to-29-year olds. For those aged 16 and older, working is an alternative to attendance in upper secondary and tertiary education and so rising demand from the labour market will reduce enrolment.

The student loan scheme is assumed to continue.

Figure 7.3: Projected education spending falls as a share of GDP

Source: The Treasury. The spike in 2006 is the write-off of student loans

Risks to these projections

These projections depend on the demographic projections, the risks to which are outlined in Chapter 4.

The spending per student could rise faster than the assumed labour productivity growth (wage per worker) and that would limit any gains released from the public education sector. Enrolment rates might rise, rather than remain where they are at present. More and more tertiary students could come from those middle-aged and older.

The requirement for stronger aggregate productivity growth may put on pressure for more technical training, publicly funded rather than funded privately by firms.

Rising wealth may increase the demand for life-long learning and produce an ageing of the tertiary student population.

Sensitivity tests

This section looks at three scenarios.

Rising enrolment

The first scenario tests the sensitivity of the modelling to student numbers by assuming higher enrolment in each sector. Recent European Commission modelling of long-term education spending is used as the basis of the calculations.[45]

The schools enrolment rate is assumed to rise gradually so that, by 2050, it is 6 percentage points higher and tertiary, 9 points higher, than in 2011.[46] With no guidance from EC modelling, the early childhood education enrolment rate is rather arbitrarily assumed to rise 10 percentage points by 2050.

These changes lift the spending-to-GDP ratio by 0.3 percentage points by 2030 and double that by 2050. The effect is that while spending still falls, the reduction is much smaller than in the base case.

Rising enrolment and older attendance in tertiary

Over the period from 1999 to 2003, the areas of greatest growth in tertiary attendance have been in those 40 and older (from a low base and more as part-time students). This scenario therefore applies the rising tertiary enrolment assumptions in the first scenario to people aged 18 to 64. This change lifts the spending-to-GDP ratio by 0.2 percentage points above the previous case in 2050 and 0.8 points above the base case.

Lower student/teacher ratios in schools

The second scenario looks at the effect of changing student/teacher ratios on spending.

This could be thought of a modelling an increase in the quality of the public education system (even though the evidence on the link between educational outcomes and student/teacher ratios is far from clear).[47]

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45 Montanino, Przywara and Young (2004), p 17.

46 The enrolment increase in schools is lower because compulsory education means that enrolment rates are high already. The increase here is in the post-compulsory school enrolments.

47 See, for example, Michael A. Boozer and Tim Maloney, "The Effects of Class Size on the Long-Run Growth in Reading Abilities and Early Adult Outcomes in the Christchurch Health and Development Study," Treasury Working Paper, 01/14.

The scenario lowers the student-teacher ratio gradually in primary and secondary schools so that by 2050 it is 20% lower than it is now.   This reduction is somewhat arbitrary and is equivalent to decreasing the average class size by four students by 2050.

The result is a similar increase in spending to that in the enrolment scenario.

Table 7 .1: Results of allowing changes to modelling ratios

Scenarios (% of GDP)	2005	2010	2020	2030	2040	2050
Base case	5.14	5.79	5.23	4.99	4.88	4.78
Difference from base (pp of GDP)						
1. Rising enrolment, larger tertiary pool	0.00	0.00	0.20	0.42	0.65	0.80
2. Rising enrolment	0.00	0.00	0.17	0.33	0.46	0.62
3. Falling student-teacher ratios	0.00	0.00	0.13	0.25	0.40	0.54

Figure 7.4: Small changes to assumptions can roll back fiscal gains
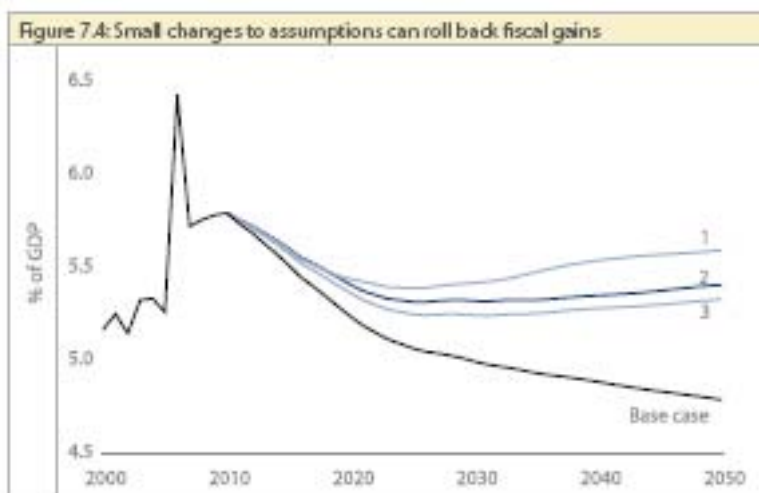
Source: The Treasury

Conclusion

The base case shows that demographic change could produce a reduction in the GDP share spent on education over the next half century. However, the scenarios in this chapter show that even small changes in some of the parameters can reduce potential savings.

With a decreasing proportion of the population in the work force and an increasing dependent population (especially those over 65), there is an open question about whether education will be primarily driven by demography.

8 Superannuation

New Zealand Superannuation, the tax-funded, universal pension scheme, is currently the largest single item of government expenditure. How expenditure on this scheme changes in the future is, therefore, one of the key drivers of the overall long-term fiscal position.

The current legislative basis for New Zealand Superannuation is the New Zealand Superannuation and Retirement Income Act 2001.

The basic structure of New Zealand Superannuation is summed up in the slogan "65 at 65"; that is, a married couple receives a combined pension equal to at least 65% of the average after-tax wage, payable from age 65.

More precisely, to qualify for New Zealand Superannuation, a person must be 65 or older, live in New Zealand when applying and have spent at least 10 years in New Zealand since turning 20 and at least five years since the age of 50.

The rates of New Zealand Superannuation (after deduction of tax at the standard rates) currently payable are:

» a single person living alone: $263.90 a week

» a single person not living alone: $243.60 a week

» a person who is married or in a civil union: $203.00 a week.

New Zealand Superannuation Fund

In 2001, the New Zealand Superannuation Fund was established. Annual contributions by the Government to the Fund are calculated over a 40-year rolling horizon. This smoothes financing the cost of New Zealand Superannuation over successive annual budgets. It is a form of tax smoothing or partial pre-funding, with the objective of assisting the Crown's finances as a whole in adjusting to significant pressures over the next few decades, mainly as a result of population ageing. [48]

Comley and McKissack (2005) have recently reviewed pre-funding strategies in OECD countries. They define a pre-funding strategy as one that involves an increase in a government's net financial asset (or net debt) position. Such a strategy raises more taxes than are required for current needs, resulting in greater financial resources in the future to deal with any additional expenditure needs. Comley and

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48   See McCulloch and Frances, TWP 01/02

McKissack identify two categories of pre-funding: "strong pre-funding countries" display evidence of past pre-funding (which would include declining net debt) and a forward-looking commitment to further pre-funding; "mild pre-funders" show less pre-funding in the past, or a forward-looking pre-funding policy that implies less pre-funding, or weaker compliance with their own policy.

Based on their analysis of net debt paths, primary balances and stated policies, New Zealand is in the strong pre-funding group, along with Belgium, Canada, Denmark, Finland, Luxembourg, Norway and Sweden. Mild pre-funders comprise Australia, Iceland, Ireland, Italy, Korea, the Netherlands and Spain.

Establishment of the New Zealand Superannuation Fund did not involve any changes to the parameters of New Zealand Superannuation payments to individuals. Hence, no effect of the New Zealand Superannuation Fund is included in these projections of levels of future New Zealand Superannuation payments, because the fund is concerned with the timing of the financing of those payments.

These timing effects should not, however, be underestimated. Part of the current strong fiscal position is the result of the build-up of the New Zealand Superannuation Fund, because current revenue is being saved (via the Fund) to be used to finance future costs. In the government accounts and in the Long-Term Fiscal Model, the gross earnings of the New Zealand Superannuation Fund are recorded as investment income to the core Crown. These flows represent a large element of the non-tax revenue discussed in Chapter 5. Part of this income is returned each year to the Crown as income tax and is available to meet spending needs. The after-tax earnings are retained in the Fund for the future benefit of the Crown.

Projecting future expenditure on New Zealand Superannuation

Assuming that the parameters of New Zealand Superannuation stay the same, it is possible to project the level of expenditure on this programme.

New Zealand Superannuation is modelled in the Long-Term Fiscal Model as follows:

$B_t = B_{t-1} \times (1+n),$

where

B = the married benefit, and

n = nominal wage growth (3.53% per annum after 2010).

If E_t is spending on New Zealand Superannuation in year t, then

$E_t = E_{t-1} \times (1+b) \times (1+r)$

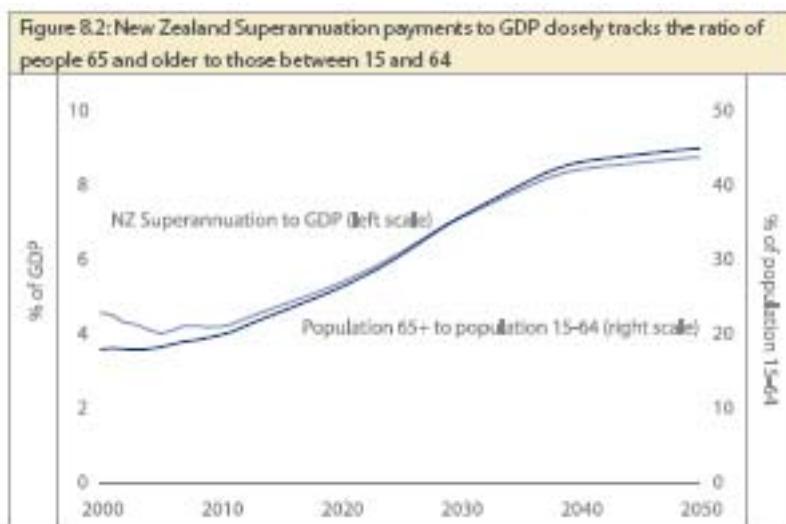Figure 8.1: New Zealand Superannuation: base-case projection under current policy

Source: The Treasury

where

b = the growth of *B* (nominal wages), and

r = the growth of the population aged 65 and over.

In line with the doubling of the numbers of people aged 65 and older between now and 2050, it is not surprising that spending on superannuation relative to GDP grows by 2¼ times (the growth of eligible population between now and 2050 divided by the growth of the labour force). Figure 8.1 shows how expenditure on New Zealand Superannuation would grow, as a percentage of GDP, if current policy settings (essentially the "65 at 65" rule) were to apply into the future.

Superannuation as a share of GDP is driven by the ratio of older people to the working-age population (the aged ratio of Chapter 4). This can be seen as follows. The annual payment of superannuation is roughly proportional to the average nominal wage times the number of people 65 and over. On

Figure 8.2: New Zealand Superannuation payments to GDP closely tracks the ratio of people 65 and older to those between 15 and 64

Source: The Treasury

the other hand, nominal GDP is proportional to nominal labour productivity (average wage) and the labour force (proxied by people aged between 15 and 64). Hence the ratio of superannuation to GDP is driven largely by people 65 and older divided by people 15 to 64: the aged ratio. In 2005, there were 469,000 people receiving New Zealand Superannuation.

Drivers of expenditure

There are two aspects of demographic change that are important for superannuation spending. One is the number of people reaching the age of eligibility and the other is how long they survive after they have become eligible.
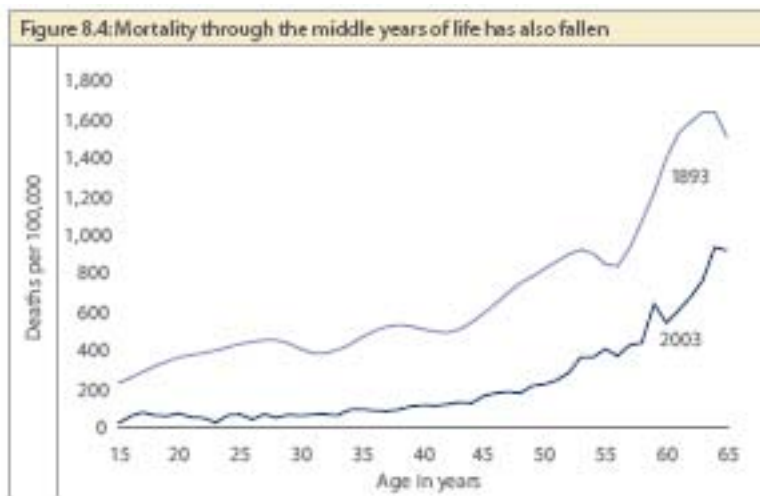
As we noted in Chapter 4 (on demography), the structural change in New Zealand's population is due to the combination of declines in both fertility and mortality. The effects of demographic change are often referred to as "population ageing" because the median age of the population is increasing. Another way of thinking about population change is in terms of survival: how many people live to what age.

What is happening in New Zealand, and the rest of the world, is that rates of survival are increasing. That is, the effect we are observing is that more people are living into old age. There has not been much increase in the oldest age to which humans can live, but there have been substantial increases in the number of people living into very old age.

This effect is illustrated in Figure 8.3, which shows the survival rates from the 1893 and 2003 New Zealand life tables. It shows, for a cohort of 100,000 people, how many are still alive at a given age.

Figure 8.3: Survival patterns have changed over the past 110 years
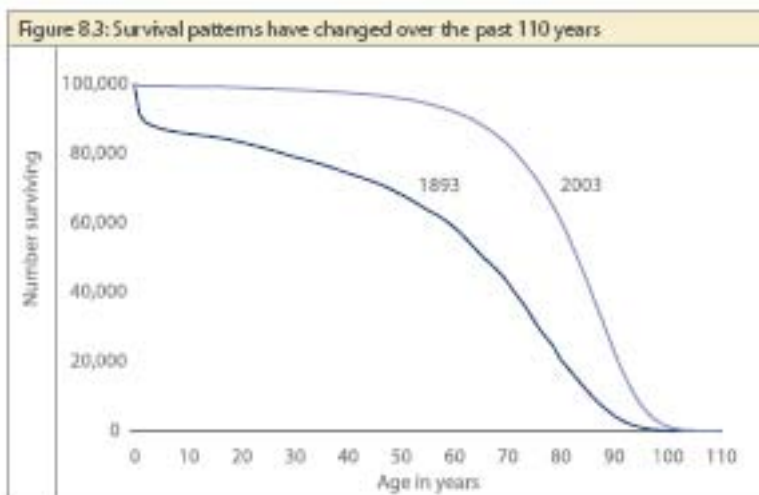
Source: Based on data for New Zealand from the Human Mortality Database, Non-Māori population

Figure 8.4: Mortality through the middle years of life has also fallen

Source: Based on data for New Zealand from the Human Mortality Database

The increase in the number of people surviving to age 65 is the cumulative result of the reductions in death rates that are occurring across all younger ages. While infant mortality rates have fallen significantly, there have also been substantial reductions in mortality at all ages up to age 65 (Figure 8.4).

Life expectancy

Another consequence of the fall in mortality is an increase in life expectancy. Life expectancy is related to survival because "average life expectancy" as calculated by demographers for a group of people born in a particular year is the total number of life-years that group will experience, divided by the number of people in the group, based on mortality rates in that year.[49] Thus, while "life expectancy" is the average age to which the population cohort will live, it must be remembered that it is the average of all the ages, including those who die young.

Importantly, the increase in life expectancy being experienced in New Zealand and other countries does not mean that there has been a large increase in the oldest age to which people live. Rather, what we are seeing is more people living to old age.

"Life expectancy at birth" is the most commonly quoted figure and it includes the whole population. However, it is also possible to calculate a figure for remaining years of life for any age. This is the average age to which people who have already survived to a specified age might be expected to live. Calculating life expectancies at different ages demonstrates the effect of early deaths on life expectancy at birth.

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49   For the technically-minded, average life expectancy at birth is the area under the survival curve, divided by 100,000.

Figure 8.5: Life expectancy at birth is increasing

Source: Based on data for New Zealand from the Human Mortality Database

In Sweden in 1751, life expectancy at birth was 38.44 years, while the expected years of life remaining for those who survived to age one was 46.71. These figures are different because the rate of infant mortality was so high in 18th century Sweden: almost 20% of babies born died before their first birthday.

In New Zealand in 2003, life expectancy at birth was 79.26 years (males and females combined), while life expectancy at age one was 78.65, meaning that those who survived to age one could expect to live a further 78.65 years (giving a total expected life of 79.65 - 78.65 plus 1).

The effect that increasing survival is having on life expectancies at birth in New Zealand is shown in Figure 8.5.

Similarly, and in some cases even more dramatically, increases in life expectancy are occurring in much of the world and have been for many years. Oeppen and Vaupel (2002) point to 160 years of history of the female life expectancy in the record-holding countries increasing at a steady rate of three months per year.

Age of eligibility

The current age of eligibility for New Zealand Superannuation is 65, the same as the age of eligibility for the first New Zealand age pension, introduced in 1893.

In 1891, the life expectancy for non-Māori males at age 65 was 13.08 years and 14.73 for non-Māori females.[50] By 2005, the life expectancy of a non-Māori male aged 65 had risen to 17.4 years and, for a non-Māori female, to 20.39 years.

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50   The Human Mortality Database, University of California, Berkeley, available at http://www.mortality.org.

Figure 8.5: Life expectancy at birth is increasing
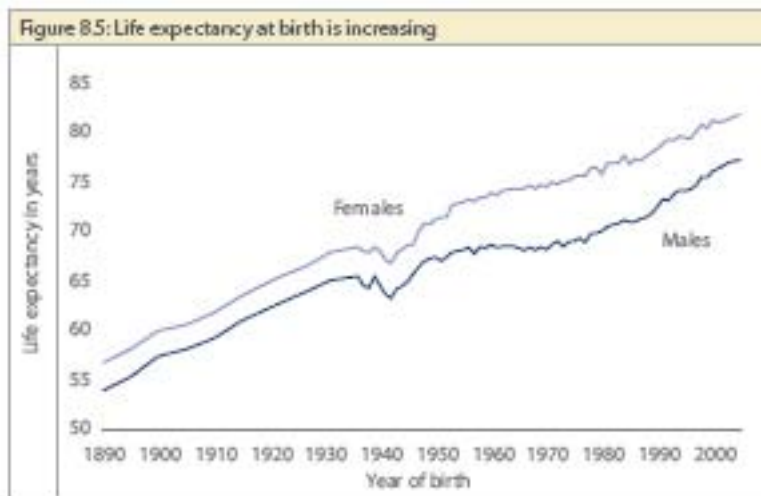
Source: Based on data for New Zealand from the Human Mortality Database

In terms of New Zealand Superannuation, this increase in life expectancy means that, on average, each person receives the pension for a far longer period. And, as noted above, increasing numbers of people are expected to live beyond 65 in the future.

It is the combination of these effects that is driving the projected increase in spending on New Zealand Superannuation.

A recent proposal by the Turner Commission illustrates the size of these effects. This Commission was appointed by the United Kingdom Government to inquire into the future of pension policy in that country.

The Turner Commission's proposal was that the age of eligibility for the age pension should be linked to life expectancy. Specifically, they suggested that, in future, one third of any increase in life expectancy should be taken in employment and two thirds in retirement. In May, the United Kingdom Government announced that the state pension age for men and women would increase to 66 in 2024, 67 in 2034 and 68 in 2044. Each rise will be phased in over two years.

As can be seen later in Figure 8.7, the United Kingdom-type approach does have a significant impact on the timing of the increase in expenditure on New Zealand Superannuation. However, the shape of the spending track in Figure 8.7 is still linked to the changing nature of the population. The only way to break the demographic link would be to change the basic nature of the scheme; for example, by increasing the number of old people who are "self-financing" their retirement. Changing New Zealand Superannuation payments will feed through to changes in the New Zealand Superannuation Fund.

Sensitivity of superannuation payments to changes in the age of eligibility

As discussed above, this section examines the possible effects of indexing the age of eligibility to projected changes in life expectancy, using the formula that is gaining some currency in Europe: one third of the gain in average life expectancy is taken in work, two thirds in leisure. If the gain in

Figure 8.7: Raising the age of eligibility to 67 over slow and fast tracks
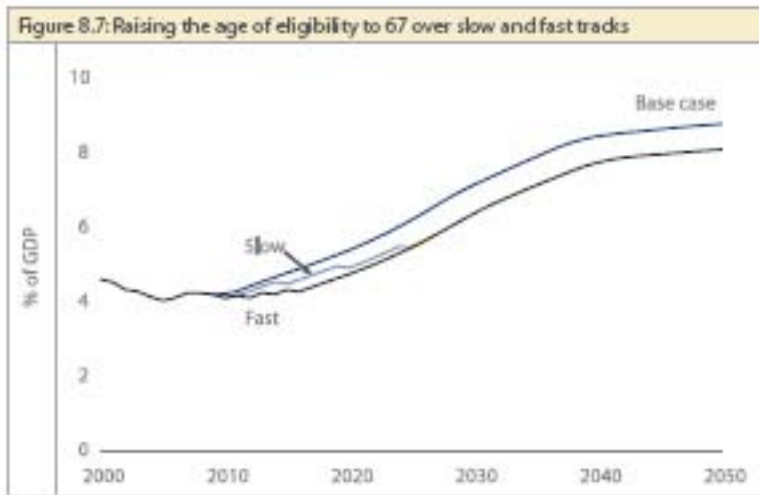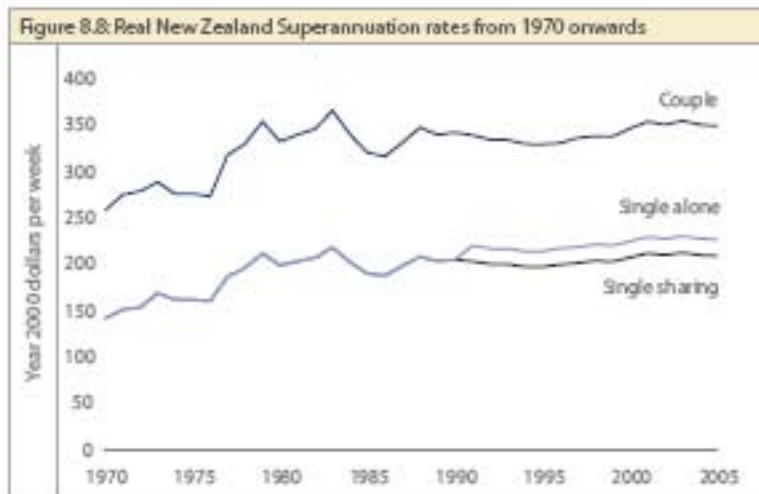

Source: The Treasury

longevity in New Zealand were almost six years between now and 2050, under this policy shift, older people would work for an extra two years, on average.

The changes during the 1990s that lifted the age of eligibility from 60 in 1992 to 65 in 2001 led to rising labour participation by people aged 50 and over through this period (Hurnard 2005).

Figure 8.7 illustrates the impact of two assumptions about when and how quickly the eligibility age might be raised to 67. The slow track lifts the eligibility age to 65.5 in 2010 and then by six months every five years. The fast track lifts the age from 65.5 in 2010 to 67 in 2016 at the rate of six months every two years (the same pace as in the 1990s).

Figure 8.8: Real New Zealand Superannuation rates from 1970 onwards

Source: The Treasury

Lifting the age of eligibility results in a reduction in spending on New Zealand Superannuation of 0.7 percentage points of GDP by 2050. Because of the cumulative effect on debt, the two tracks have different effects on debt by 2050. The fast track reduces the base-case debt by 22 percentage points in 2050, while the slow track lowers debt by 17 percentage points.

Indexation

New Zealand Superannuation is currently indexed by changes in prices (as measured by the CPI), but is constrained for a married couple to the equivalent of 65% to 72.5% of average weekly earnings. This policy was formally adopted in 1993.

For modelling the long-term fiscal cost of New Zealand Superannuation, payments are assumed to be set at the level of 65% of average wages. This is because New Zealand Superannuation is currently close to the floor (rates from 1 April 2006 are about 66%) and wages are assumed in the modelling to be always, on average, increasing faster than prices.

Indexation by prices means that the retired can continue to purchase the same bundle of goods and services as they did when they retired.

Indexation by wages, on the other hand, means that the bundle of goods and services that can be purchased can be increased each year.

Put another way, and based on the proposition that it is increases in productivity (economic growth) that lead to increased wages, wage indexation means that (part of) the national dividend from economic growth also accrues to the retired. Price indexation, on the other hand, means that few, if any, of the gains from growth go to the retired.[51]

Thus, the decision whether to index by wages or prices can be seen as one about to whom the benefits of economic growth should accrue.

Given the long-term nature of this Statement, the cumulative effects of different indexation arrangements can be marked. Indexing New Zealand Superannuation to prices, not wages, over a 50-year period would result in the combined married rate falling from the current 66% of average weekly earnings to about 32%.

Indexation to prices over such a long period would shift New Zealand Superannuation even further towards meeting only a poverty-relief objective. It is an open question whether such a marked reduction in relative standards of living between those in employment and those retired would be acceptable, especially given the notion proposed by the 1972 Royal Commission of Inquiry into Social Security, which still seems current, that the objective of the welfare system was to allow recipients of government income support to "belong and participate."

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51 Retirees would benefit from any technological change that led to lower prices of any particular good or service, for example.

Sensitivity of superannuation payments to changes in the indexation regime

Two alternatives to the base wage indexation case are growing superannuation payments by the rate of CPI inflation and by CPI inflation plus 1%. Other options could include mixed indexation: increasing the payments for first-time recipients by the growth of the average weekly wage, but then growing those payments by CPI inflation. Figure 8.9 illustrates the large effects of changes in indexation from 2011 onwards. Changing from wage to CPI indexation lowers spending by 4 percentage points of GDP, while CPI+1% reduces it by 1.6 percentage points.

Figure 8.9: Changes in the path of New Zealand Superannuation payments under different indexation regimes

Source: The Treasury

9 Other Benefits

The Government currently spends about $7.5 billion in transfer payments and other benefits to New Zealanders.

From the 1846 Destitute Persons Ordinance, which required the near relatives of destitute persons to make provision for their up-keep, to today, New Zealand has developed an elaborate social welfare system. In March 2006, New Zealand had 283,584 people aged 18 to 64 years who were receiving an income-tested benefit.[52] A further 470,000 received New Zealand Superannuation, which is the subject of Chapter 8.

Main types of income support

The current system of social welfare benefits in New Zealand dates, in large measure, from the work of the 1972 Royal Commission on Social Welfare, although core elements do date back to earlier periods.

The current system comprises the following main income-tested benefits:

» the Unemployment Benefit, for people who are able to work but do not have a job

» the Domestic Purposes Benefit, paid to parents caring for children without the support of a partner

» the Sickness Benefit, for those with short-term medical conditions that prevent them from working

» the Invalid's Benefit, paid to people with long-term disabilities that prevent them from working.

The number of working-age sickness and invalid beneficiaries has been increasing since the mid-1990s. In March 2006, 120,473 working-age people were receiving a Sickness Benefit or Invalid Benefit, compared with 116,075 in March 2005.

The number of people receiving the Domestic Purposes Benefit has decreased over the last eight years, after peaking at 114,665 in March 1998. In March 2006, figures show that 103,362 working-age clients were Domestic Purposes Benefit recipients.

The Government also operates a system of targeted financial assistance to working people with children, currently under the rubric of the Working for Families scheme.

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52   All figures on beneficiary numbers in this section are from the Ministry of Social Development's 2006/07 *Statement of Intent.*

Modelling welfare spending

Projections of spending on non-superannuation benefits are driven by beneficiary numbers, which are calculated from assumptions about unemployment and other benefit take-up rates, population growth and an indexation regime.

Spending on the Unemployment Benefit is given by the formula:

$N = s \times l \times u,$

where

N =   numbers receiving Unemployment Benefits,

s =   Unemployment Benefit recipients as a share of those seeking employment,

l =   labour force, and

u =   unemployment rate.

Here s is fixed at the last forecast rate (77.1%). If E_t is spending on Unemployment Benefits in year t, then:

$E_t = E_{t-1} \times (1+n) \times (1+i) \times (1+b),$

where

n =   growth of Unemployment Benefit numbers, $N,$

i =   the inflation rate, and

b =   real benefit growth.

In line with current policy, b is assumed to be zero, meaning that benefits are indexed only for increases in prices (via the CPI). Hence the growth of the Unemployment Benefit equals the growth of the labour force (as the other factors in the Unemployment Benefit equation are constant) plus inflation.

In the long run, this means that spending as a proportion of GDP steadily falls.

For other benefits such as the Domestic Purposes Benefit,

$E_t = E_{t-1} \times (1+i) \times (1+b) \times (1+b),$

where

E_t =   spending on benefits,

i =   the inflation rate,

b =   real benefit growth, and

c =   growth of $\sum_a$ benefit proportions$_a$ x age groups$_a$.

This will tend to grow more slowly than nominal GDP, as the proportions of Domestic Purposes Benefit going to each age group are fixed and the population is ageing (proportionately fewer people require the Domestic Purposes Benefit).

Figure 9.1: Other benefits projections are generally shrinking as a share of GDP
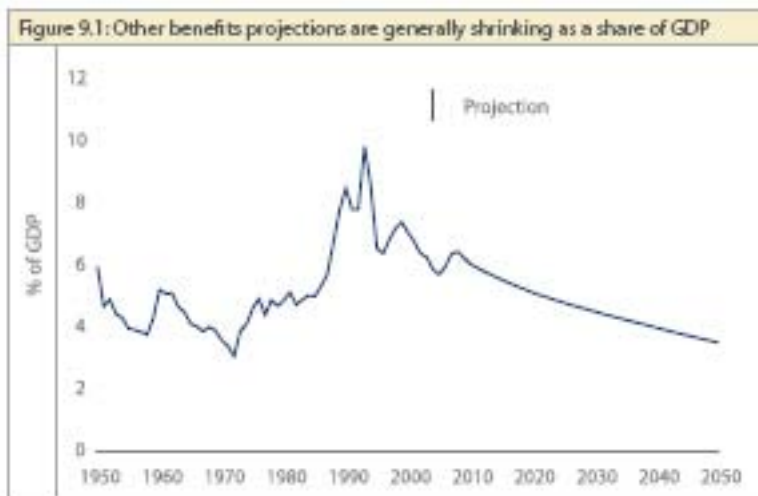
Source: The Treasury

Key drivers and assumptions

The key assumption underlying the projections is the regime for indexing social welfare benefits.

Under current law, benefits are adjusted annually in accordance with movement in the CPI. This has been the policy since the early 1990s. As Figure 9.2 shows, the clear trend in New Zealand since the early 1970s has been for the level of benefits to be maintained in real terms (ie, price indexed) apart from the discrete changes in the late 1970s and 1991. Since 1991, benefits have been CPI-indexed and thus have retained their real level.

Figure 9.2: Real Unemployment Benefit payments have trended down since early 1970s
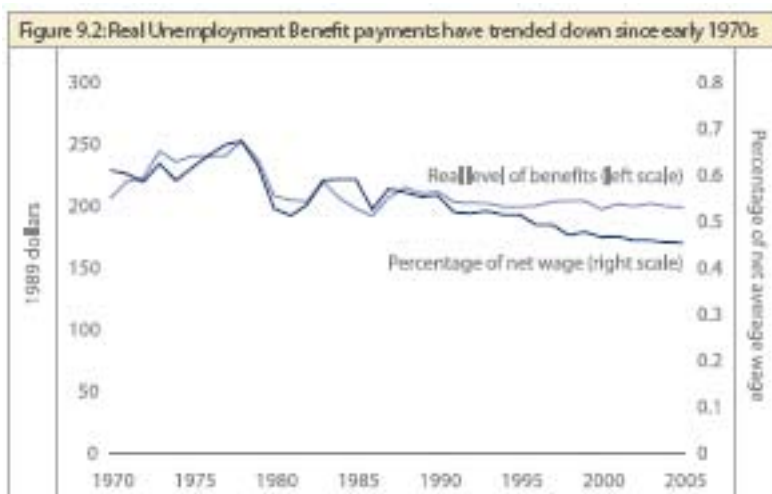
Source: The Treasury

During this period, however, real wages have steadily increased. This means that benefits have been steadily falling as a percentage of wages.

Put another way, price indexation maintains the real purchasing power of beneficiaries, meaning that they can continue to buy the same bundle of goods and services in the face of changing prices. What it does not allow them to do is expand their consumption through time, as is the case with workers, whose wages grow.

It is, therefore, a strong assumption to continue to index benefits only for prices, especially over as long a period as covered by this Statement, even though there is support in history for this idea.

Alternative indexation regimes

Presented below are the fiscal effects of some alternative indexation regimes.

The first is to use the regime that applies to New Zealand Superannuation, which is CPI indexation, but within a wage-related floor and ceiling. The projections assume that benefits are increased at the same rates as wages are assumed to grow, namely 1.5% per year more than the rate of inflation.

Figure 9.3 shows that this alternative would have a substantial fiscal effect: rather than falling steadily as a proportion of GDP, spending remains largely constant.

A "middle course" assumption is to increase benefits by more than the CPI, but not as much as wages. The alternative modelled here is "CPI + 1%", where benefits are increased by one percentage point more than CPI growth.

Figure 9.3: Effects of alternative indexation regimes on welfare benefits
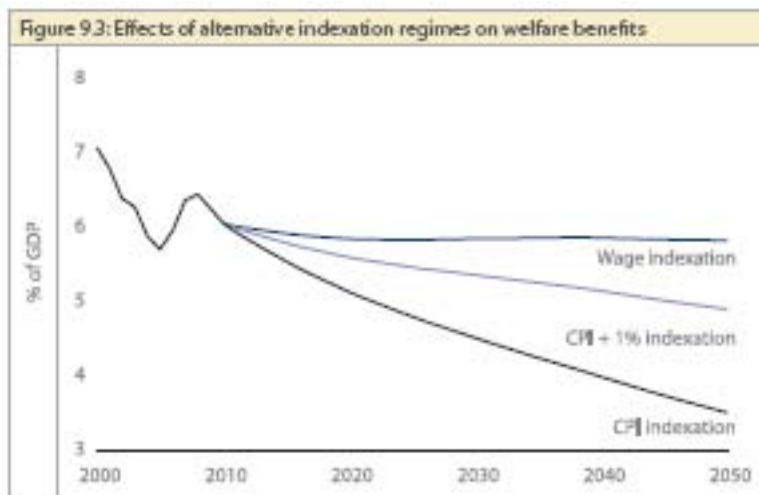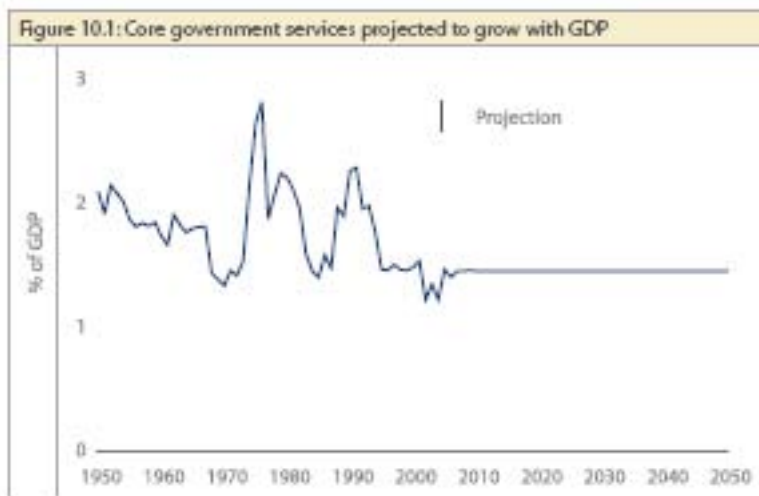
Source: The Treasury

10 Other Spending Areas

This chapter contains projections for all other areas of operating expenditure, together with a discussion of capital spending. The general approach taken for other spending areas is to leave them constant as a share of GDP at their 2010 levels.

Core government services

Core government services expenditure includes the costs of running departments, such as Inland Revenue, State Services Commission, Ministry of Foreign Affairs, the Treasury and Statistics New Zealand, and other spending such as Overseas Development Assistance. This area of spending has no clear relation to demographics.

Figure 10.1: Core government services projected to grow with GDP

Source: The Treasury

Spending on core government services is modelled so that it depends on the number of public servants times the average nominal wage. The number of public servants is assumed to be a fixed proportion of total employment. Because total employment tracks the labour force, the ratio of spending to GDP is fixed.

$E_t = E_{t-1}$ x $(1+i)$ x $(1+w)$ x $(1+n_t)$,

where

E_t =   spending,

i =   the inflation rate,

w =   real wage growth, which is fixed at 1.5% per annum, and

n_t =   growth in employment.

Transport and communication

Until 2002, operational spending on transportation and communications had been trending down as a share of GDP for the past half century. More recently, it has boosted its share of GDP. In the projection period, the assumption is that it grows essentially by nominal GDP (as the real growth rate is the same as labour productivity growth) and hence the ratio to GDP is constant.

$E_t = E_{t-1}$ x $(1+l)$ x $(1+i)$ x $(1+g)$,

where

E_t =   spending,

l =   growth in the labour force,

i =   the inflation rate, and

g =   real expense growth, which is fixed at 1.5% per annum.

Figure 10.2: Transport and communications grows with nominal GDP

Source: The Treasury

Defence

The share of GDP spent on defence fell to around 1% in the 1990s after hovering around 1.7% over the previous three decades. This share is projected out by a nominal rate of 3.5% a year (which settles down to the growth of nominal GDP, making the ratio to GDP eventually constant, as growth of the labour force slows).
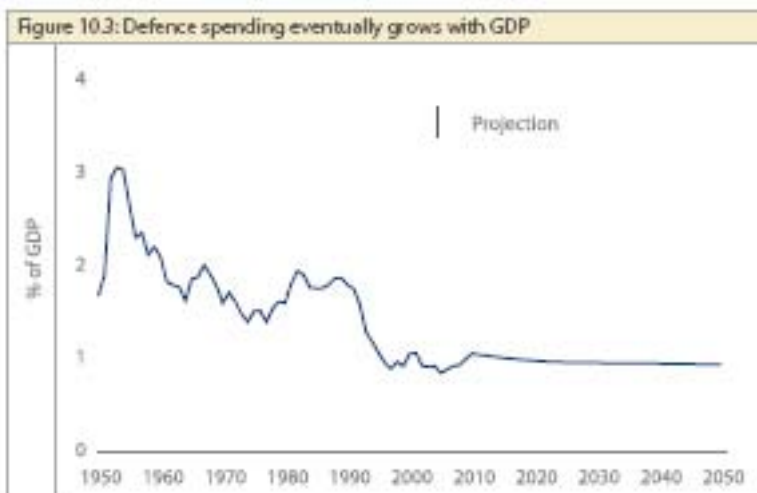
$$E_t = E_{t-1} \times (1+i) \times (1+g),$$

where

E_t = spending,

i = the inflation rate, and

g = real expense growth, which is fixed at 1.5% per annum.

These projections include the Defence Sustainability Initiative (operational spending) for the years 2006 to 2015 as announced in the 2005 Budget.

Figure 10.3: Defence spending eventually grows with GDP

Source: The Treasury

Law and order

A reverse pattern occurs in this spending area. Spending on law and order rose as a share of GDP until the 1990s, held at around 1.3% until 2005 and, based on the 2006 Budget, is forecast to climb to 1.6% of GDP by 2009. In the projection period, it is modelled to grow with total population growth, inflation and a real growth factor. This produces a small rise in its share of GDP (as population growth is faster than labour force growth because of the ageing population).
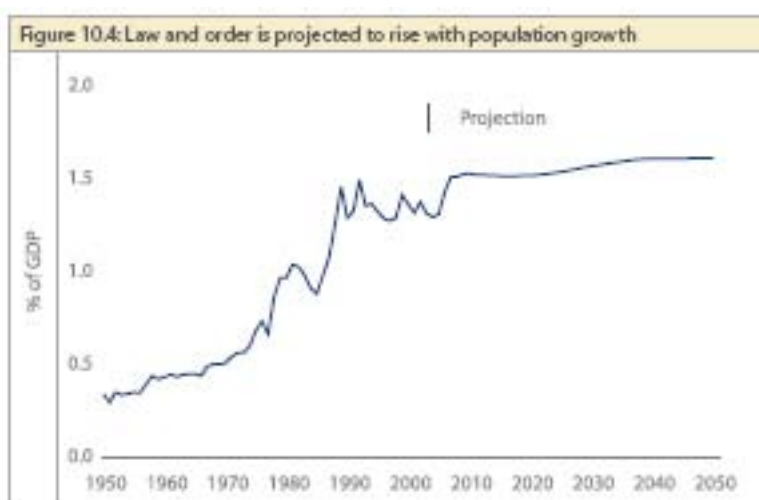
$E_t = E_{t-1}$ x $(1+p)$ x $(1+i)$ x $(1+g)$,

where

$\quad$ E_t $\quad=\quad$ spending,

$\quad$ p $\quad=\quad$ population growth,

$\quad$ i $\quad=\quad$ the inflation rate, and

$\quad$ g $\quad=\quad$ real expense growth, which is fixed at 1.5% per annum.

Figure 10.4: Law and order is projected to rise with population growth

Source: The Treasury

Capital spending and other significant balance sheet assumptions

Transport, defence, and law and order have capital spending aspects that are discussed in this section. This section also describes the assumptions behind other drivers of significant balance sheet components across the projection period.

Core Crown property, plant and equipment

This component of the balance sheet covers core Crown physical assets, including prisons, courts, police stations, defence equipment, conservation estate and some educational property. It is grown with inflation and a growth factor (currently set to labour productivity growth). This is a simplifying assumption as, over a 50-year period, the actual path of capital expenditure on property, plant and equipment will be "lumpy" and alternate between different priorities (eg, between defence equipment and courts) through time.

The growth in this component should be viewed in the context of a large proportion of the assets' value (in particular, the conservation estate and other assets) remaining constant (this part would increase only by revaluations, which are not forecast). This means that, as a percentage of GDP, this part of property, plant and equipment would decrease slightly over time.

In the modelling of property, plant and equipment, the Long-term Fiscal Model does not include depreciation. The model assumes that depreciation will be fully used to replace existing asset bases and the growth in property, plant and equipment represents the growth over and above depreciation.

State-owned enterprises and Crown entities

A large portion of the initial asset value is in areas where future investment by the core Crown is not likely. These include the start-up capital for state-owned enterprises, which is modelled to keep capital expansion such that their borrowing will remain a constant proportion of their net worth. Growth in state-owned enterprises' net worth comes from their operating balance (growing with GDP).

Growth in the net worth of Crown entities comes from their operating balance, primarily driven by the surpluses of the Earthquake Commission, Accident Compensation Corporation and Transit New Zealand. In addition, net worth is also grown by the increase in core Crown investments. The growth in net worth then generates increased property, plant and equipment in the Crown entity segment.

The transport component is different to the other Crown entity components, as all transport funding is received as operating revenue by Transit New Zealand and the surplus of this entity reflects the level of capital spending undertaken. The Transit surplus is assumed to grow with inflation, whereas the transport expense is growing with GDP (see above). This assumption means that, over time, a higher proportion will be spent on road maintenance rather than on capital spending. Over a 50-year period, the split between operating and capital is likely to fluctuate. However, while this split could affect the final operating balance, it does not affect gross sovereign-issued debt, as the amount spent in total on both operating and capital is the same.

Core Crown investments and advances

The core Crown investments category covers the investment into Crown entities including Tertiary Educational Institutions, Housing Corporation and District Health Boards. The growth factor applied to this category is an average of the increase over the forecast horizon (which is affected by the scenario allocation of the capital allowance within the forecast horizon) and grows with GDP.

The core Crown advances category covers student loans and advances to Housing Corporation and District Health Boards. This category is mainly driven by the student loan track as per the forecasts contained in the 2006 *Budget Economic and Fiscal Update*. The remaining advances grow with inflation to keep them constant in real terms. This growth represents debt funding of Crown entity capital; the rest is funded through equity via "investments in Crown entities" described above. Both are recorded as assets for the core Crown and hence the mix is not important for projections of gross sovereign debt and the operating balance. The initial level of advances for Housing Corporation and District Health Boards is determined by the allocation of the capital provision through the scenarios allocation.

11 Overall Results

This chapter presents projections of the overall long-term fiscal position. A range of different scenarios is presented, reflecting the fact that governments will have many choices about how they meet their policy objectives. The chapter also contains illustrations of the sensitivity of the results to some of the underlying assumptions.

The chapter focuses on the results for the core Crown (as distinct from Total Crown), because the core Crown more closely reflects government budget decisions and captures funding to areas such as health and education.[53] The projections assume that the current institutional form is maintained over the projection period. The drivers of the state-owned enterprises and Crown entities components are detailed in Chapter 10. In the main, these are projected to evolve in a manner that would see figures for the Total Crown mimic developments in the core Crown.

The starting point for these projections is the New Zealand Government's current strong fiscal position. Debt is low, assets are being built up to provide a buffer against future events and tax and spending rates have been stable and predictable.

Figure 11.1: Core Crown spending changes between 2005 and 2050
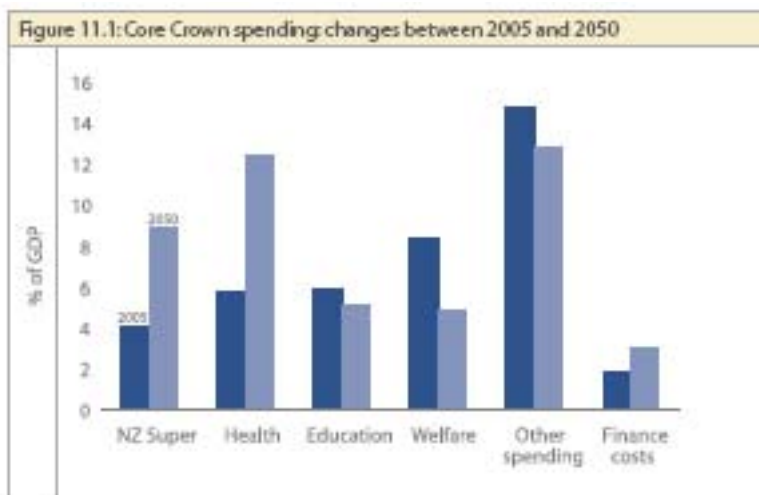
Source: The Treasury

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53   The core Crown part of the state sector covers government departments, the Reserve Bank and the New Zealand Superannuation Fund. Total Crown includes the core Crown but also includes Crown entities (such as councils, commissions, boards, Television New Zealand and tertiary institutions) and state-owned enterprises (for example, Mighty River Power, Meridian Energy, Genesis Power, Transpower New Zealand Limited and New Zealand Post Limited).

Two different approaches

Two approaches are used to project the future fiscal position, as outlined in Chapter 3: bottom-up and top-down. The demographic and economic assumptions underpinning these projections are described in Chapter 4, while the details of the spending and revenue assumptions are laid out in Chapters 5 to 10. Both approaches include projections of contributions to, and withdrawals from, the New Zealand Superannuation Fund, as set out in the 2006 *Budget Economic and Fiscal Update*.

The bottom-up projections

These use the base-case projections of spending discussed in previous chapters. Spending on health and New Zealand Superannuation more than doubles as a share of GDP, while the shares going to education, social welfare benefits and other spending fall (Figure 11.1).

The aggregate primary spending for the core Crown (spending excluding finance costs) is projected to rise by around 7 percentage points of GDP to 37% in 2050. For the next 15 years, spending is relatively flat before rising steadily as demographic change really begins to impact.

Combined with the projection of core Crown revenue outlined in Chapter 5 (incorporating a broadly constant tax-to-GDP ratio), the core Crown primary operating balance[54] is expected to move eventually from surplus to deficit (Figure 11.2). This is projected to take place in the late 2030s.

Figure 11.2: Core Crown primary spending, revenue and primary operating balance
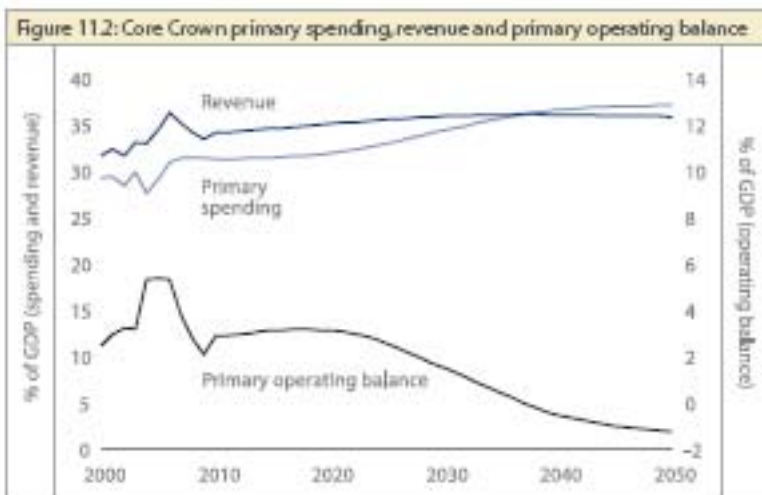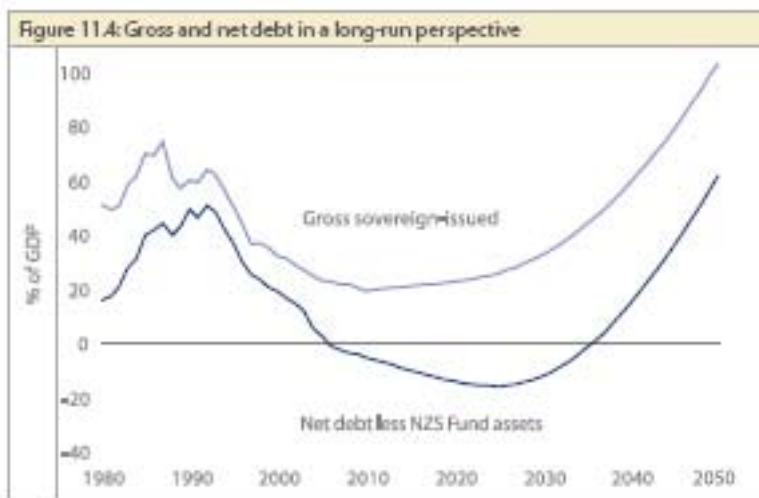
Source: The Treasury

Under this set of assumptions, government gross sovereign-issued debt will begin to rise and eventually lead to higher finance costs. The rise in finance costs will reinforce the upward pressure on spending coming from higher primary spending and accentuate the impact on the overall operating balance and the move from surplus to deficit (this occurs earlier than in Figure 11.2 because of debt-servicing costs).

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54   The primary operating balance is defined here as revenue less spending excluding finance costs for the core Crown.

Figure 11.3: The core Crown operating balance moves from surplus to deficit in the early 2030s
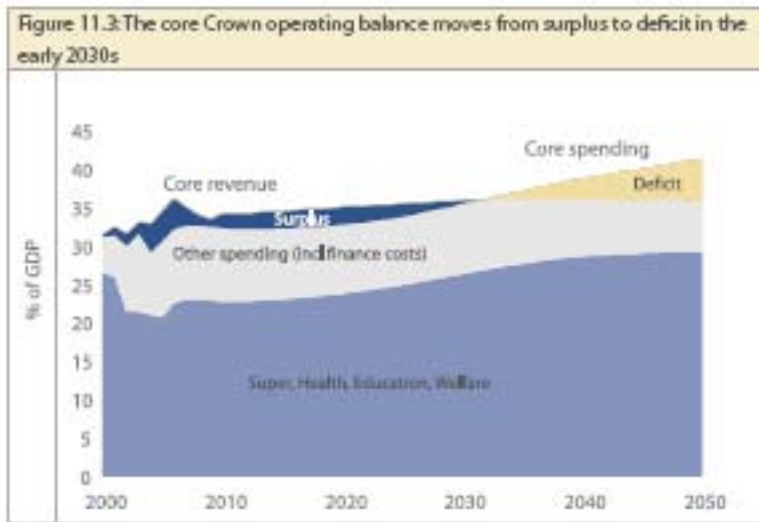
Source: The Treasury

After remaining at around 20% of GDP until 2020, gross debt under these assumptions is projected to rise to about 30% over the following decade and approach 100% of GDP by 2050. This compares with a previous peak in gross debt to GDP of 75% in 1987.

Figure 11.4: Gross and net debt in a long-run perspective

Source: The Treasury

The projected rise in New Zealand Superannuation Fund assets would provide a significant offset to the rise in gross debt, so that the net debt position of the government at the end of the projection period would be just above the level it was at in the early 1990s, despite gross debt being higher. The debt position and, more particularly, its upward trajectory, however, are not consistent with the principles of responsible fiscal management. Moreover, without some policy change, the debt position would continue to deteriorate beyond 2050.

Such outcomes are unlikely. Governments will act to adjust spending or taxes, or both, in order to stop debt-to-GDP moving onto an ever-increasing path, in part because of the responsible fiscal management aspects of the Public Finance Act discussed in Chapter 3. This is why the top-down approach discussed in the next section represents an important addition to the ways of looking at the future fiscal position.

The top-down approach

The top-down approach asks what might need to happen to spending and taxes, or some mix of them, in order to meet a set of top-down fiscal objectives such as a more stable path for debt. This approach gives some sense of the magnitude of change that could be required to meet such an objective.

Because of the many different components that make up total government spending and taxes, the top-down projections have another layer of uncertainty to that of the bottom-up approach: over which categories of spending or revenue should the constraint be placed? This uncertainty is captured here by presenting a range of scenarios, each showing a different way in which governments might adjust overall spending and taxes to meet different long-term fiscal objectives.

Stable debt scenarios

The first set of top-down scenarios look at the options governments would have if they decided to roll out the long-term debt objective set out in the 2006 *Fiscal Strategy Report* indefinitely. This would mean that gross sovereign-issued debt would be kept broadly stable at around 20% of GDP over the entire projection period. The gross debt path and associated net asset position are illustrated in Figure 11.5.

Figure 11.5: Gross sovereign-issued debt constrained to around 20% of GDP
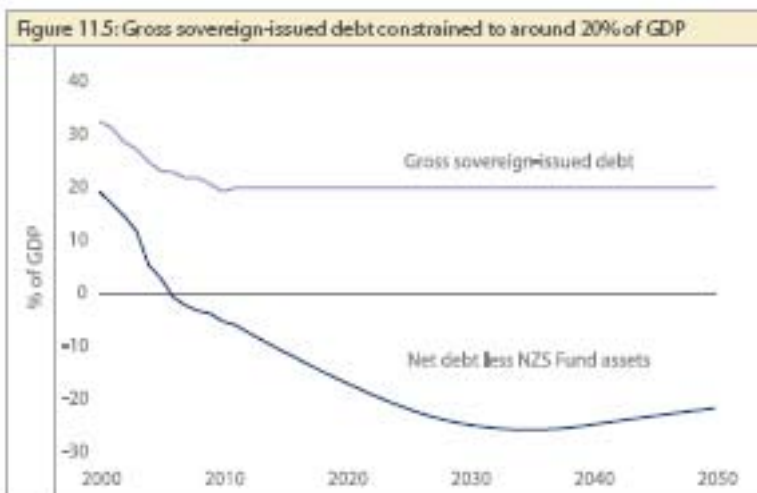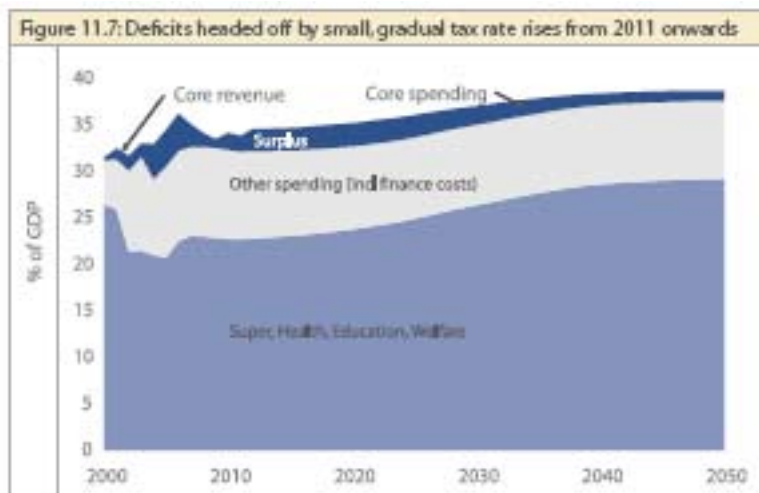
Source: The Treasury

Such a debt track would require the operating balance to remain in small surplus over the projection period. This is because the government is also making contributions to the New Zealand Superannuation Fund and other capital investments alongside its operating decisions.

If all the adjustment was to occur on the spending side, one scenario might have spending in the four major areas of health, education, New Zealand Superannuation and social welfare benefits projected as in the bottom-up projections, with other spending (including financial costs) acting as the residual.

Figure 11.6: Effect of reducing other spending to maintain small surpluses and stable debt
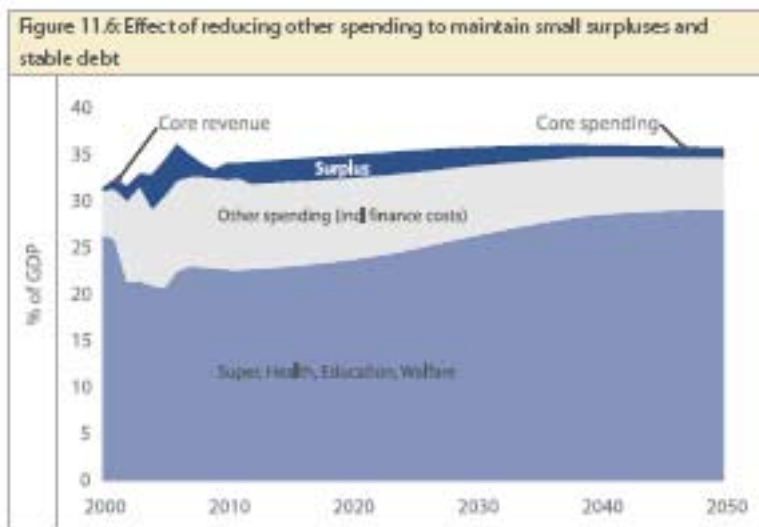
Source: The Treasury

This selection of policies has been made for illustrative purposes and does not imply that spending in these four categories should be regarded as unchangeable. In such a case, other spending would have to decline as a proportion of GDP in the medium-to-long term, from the current 10% of GDP to 5.5% (Figure 11.6).

Figure 11.7: Deficits headed off by small, gradual tax rate rises from 2011 onwards
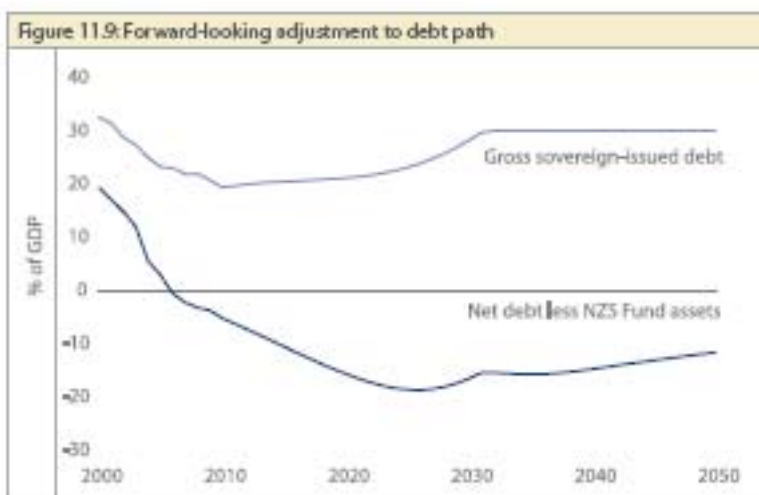

Source: The Treasury

If all the adjustment was to occur on the tax side, the tax-to-GDP ratio would have to increase to about 35% at the end of the projection period, up from the current level of around 32%. Total revenue would rise from about 36% now to around 39% of GDP in 2050.

The impact of debt is one of the main differences between the bottom-up and top-down approaches. Debt dynamics are such that small, persistent changes to spending or revenue can have very large

Figure 11.8: Health spending slowed to limit debt to 20% of GDP
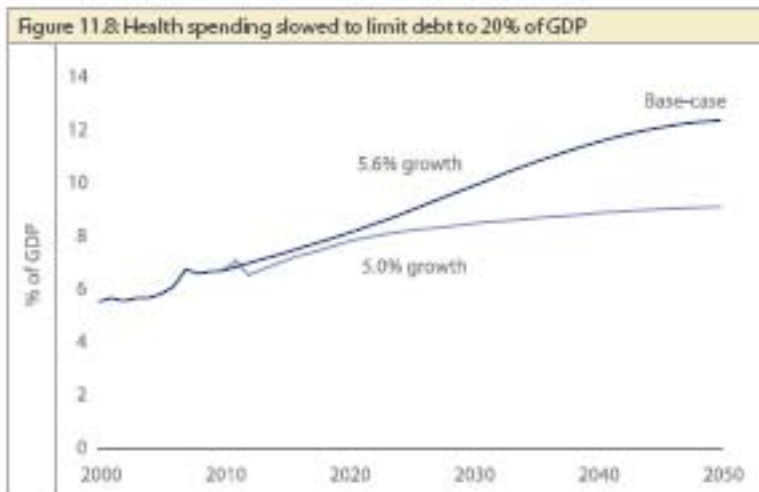
Source: The Treasury

effects if they accumulate over a long period of time. For example, if health spending were to grow each year at 0.6 percentage points slower than the average 5.6% used in the bottom-up approach, and nothing else changed, then debt would remain at around 20% of GDP. Health spending as a share of GDP would be around 9% compared with 12% (Figure 11.8).
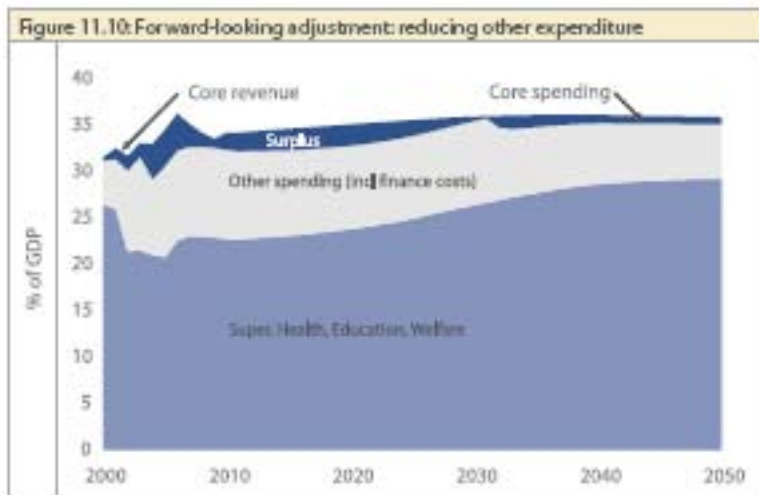
Figure 11.9: Forward-looking adjustment to debt path

Source: The Treasury

Later adjustment scenarios

The first group of top-down scenarios involved future governments acting early to keep debt stable as a share of GDP.

Governments could, however, wait and start to adjust their fiscal polices only when the fiscal position began to head toward a deteriorating track.

The following scenarios show what would happen if the bottom-up projections applied until the early 2030s, which is about when spending is projected to exceed revenue, and then a policy adjustment was made. This is illustrated in Figure 11.9.

Figure 11.10: Forward-looking adjustment: reducing other expenditure

Source: The Treasury

Figure 11.11: Forward-looking adjustment: taxes
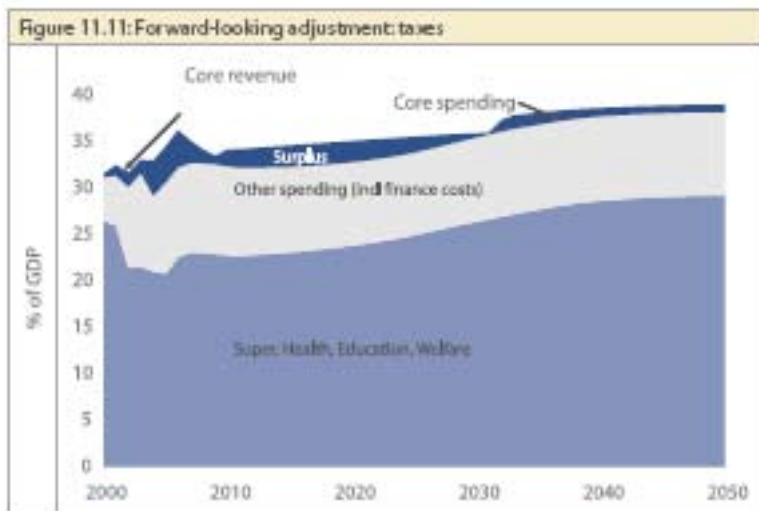
Source: The Treasury

This scenario assumes that after the core Crown operating balance went into deficit, the government of the day would adjust "other spending" from then onwards to ensure that debt did not rise above 30% of GDP. Making this delayed adjustment would result in spending needing to fall in nominal terms (a baseline cut) before then being allowed to rise slowly again. The increase in other spending would be lower than the rate of GDP growth, with spending falling from the current level of 10% of GDP to 4% of GDP (in contrast with the case where an earlier adjustment led to a decrease from the current level of 10% to 5.5% of GDP).

In the final scenario, a late adjustment is made, this time through the tax system. Making a late adjustment will result in tax revenue increasing to around 34% of GDP in the year of adjustment rather than slowly rising as in the scenario where change was incremental from 2010.

Sensitivity of results to changed economic assumptions

Projecting the future is inherently difficult, and there is a high degree of uncertainty around the base projections set out above. They are sensitive to some of the assumptions made. The effects of changes in assumptions about individual spending and tax components are reviewed in earlier chapters. This section looks at the effects of changes to key economic variables on the main fiscal aggregates, using the bottom-up projections from earlier in the chapter.

Fertility rates

Fertility rates are assumed in the base case to stabilise at 1.85, below the level of 2.1 required to replace the population. If fertility rates were to continue to fall to much lower levels (as they already have in some countries such as Italy, Japan and Korea), then a more marked ageing of the population would happen. In the short term, the number of school-age children would decline more than projected in the base case. In the medium term, the working-age population would be smaller than the rest of the population, thus reducing the size of the economy and the tax base. Eventually, the number of old people would also decline.

This is illustrated with the cases of fertility converging to 2.10 (replacement, labelled high) and 1.6 (low). The low fertility case has much more ageing than the base case: the ratio of aged to working age reaches 48% in 2050, compared with 45% in the base case, while for the high fertility case, it is 42%.

The table below shows the difference between these two cases and the base for education spending, primary core spending (without finance costs), the operating balance and debt (as percentage points of GDP).

Table 11.1: Differences of high (2.1) and low (1.6) fertility cases from the base (1.85)

(Percentage points of GDP)		2010	2020	2030	2040	2050
Education	Low	-0.0	-0.2	-0.3	-0.4	-0.4
	High	0.0	0.2	0.3	0.4	0.4
Primary spending	Low	0.0	-0.4	-0.6	-0.5	-0.2
	High	0.0	0.2	0.2	0.1	-0.1
Operating balance	Low	0.0	0.6	1.2	1.7	2.1
	High	0.0	-0.2	-0.5	-0.6	-0.6
Gross-sovereign issued debt	Low	0.0	-1.9	-8.2	-17.4	-28.6
	High	0.0	0.0	2.2	5.4	8.8

Lower fertility initially reduces spending on education and increases the operating balance. Eventually, lower fertility produces a smaller labour force and a lower GDP track (down by 5.4% in 2050). The overall result in 2050 of these changes is much less debt (again, illustrating the power of debt dynamics). Higher fertility produces higher spending across most areas, and a lower operating balance, but not significantly so. On the debt side, this results in a slightly higher track.

Life expectancy

Assumptions about mortality (or its counterpart, life expectancy) also have effects on GDP growth and public spending.

Higher life expectancy (lower mortality) produces a higher ratio of the old to the working aged and hence higher superannuation costs and higher health spending (the old-to-working ratio reaches 49% in this case). This higher spending feeds through to reductions in the operating balance, compounding to higher debt.

Table 11.2: Differences of high (87.5) and low (83.0) life expectancy cases from the base (85.2)

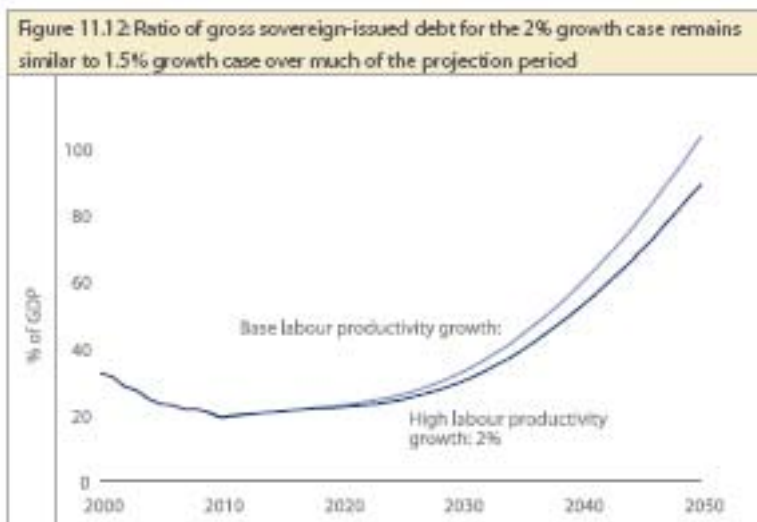| (Percentage points of GDP)		2010	2020	2030	2040	2050
Superannuation	Low	0.0	-0.1	-0.2	-0.4	-0.5
	High	0.0	0.1	0.2	0.4	0.5
Primary spending	Low	0.0	-0.3	-0.6	-1.1	-1.5
	High	0.0	0.0	0.3	0.7	1.0
Operating balance	Low	0.0	0.3	0.9	1.8	3.3
	High	0.0	0.1	-0.2	-0.8	-1.8
Gross sovereign-issued-debt	Low	0.0	-2.8	-8.0	-16.8	-30.9
	High	0.0	0.8	2.0	5.2	11.9

Productivity

One key assumption is about the impact of economic growth on the fiscal outcomes.

Demand for many publicly provided goods and services increases with income, meaning that growth leads to pressure for greater spending, not less. Some programmes are directly linked to economic growth, through things like indexation regimes.

Policies that explicitly or implicitly link spending to economic growth mean that spending as a proportion of GDP remains about the same regardless of the level of economic growth. For example, New Zealand Superannuation is linked to wages and therefore is not affected by growth. In contrast, welfare benefits are linked to prices and therefore will fall (as a proportion of GDP) if growth increases. Health spending, both in New Zealand and in most OECD countries, seems to be strongly linked to economic growth.

The effects of a change in the growth assumption can be seen in Table 11.3, which is based on a full set of bottom-up projections with one assumption changed: that productivity growth is 2% per year, rather than the 1.5% assumed above. This shows that spending on health and superannuation, as shares of GDP, are unaffected by the assumption of higher productivity growth. Primary spending is reduced a little (because of CPI indexation of non-superannuation benefits) and this eventually improves the operating balance and lowers debt's share of GDP by 14 percentage points by 2050. Figure 11.12 shows the effect of this higher growth assumption on government debt.


Figure 11.12 Ratio of gross sovereign-issued debt for the 2% growth case remains similar to 1.5% growth case over much of the projection period

Source: The Treasury

Table 11.3: Differences of high (2%) productivity growth case from the base (1.5%)

(Percentage points of GDP)		2010	2020	2030	2040	2050
Superannuation	High	0.0	0.0	0.0	0.0	0.0
Health	High	0.0	0.0	0.0	0.0	0.0
Welfare benefits	High	0.0	-0.2	-0.4	-0.5	-0.5
Primary spending	High	0.0	-0.2	-0.4	-0.5	-0.5
Tax	High	0.0	0.0	0.0	0.0	0.0
Operating balance	High	0.0	0.2	0.4	0.7	1.1
Gross-sovereign-issued-debt	High	0.0	-0.5	-2.7	-6.9	-14.1

Participation rates

The base case uses age-group participation rates based on the so-called cohort method, which projects age-group participation rates using recent cohort entry and exit probabilities. The result is generally age-group participation rates that are higher than results from holding age-group rates static from about 2014 onwards (labelled "static").

A further case ("high") is considered where the participation rates of older age groups are raised above the base case: for age groups 55 to 59 and 60 to 64, from 2015 to 2025, half the gap between the base case and the next younger age group is closed, and for the 65 and older age groups, from 2015 participation is lifted so that by 2025 it is 20% higher than base-case values. This could happen with labour market changes brought about by greater workplace flexibility and changes in attitudes towards the retention of older workers as population ageing slows the growth of the traditional labour force.

Figure 11.13: Aggregate participation – three views
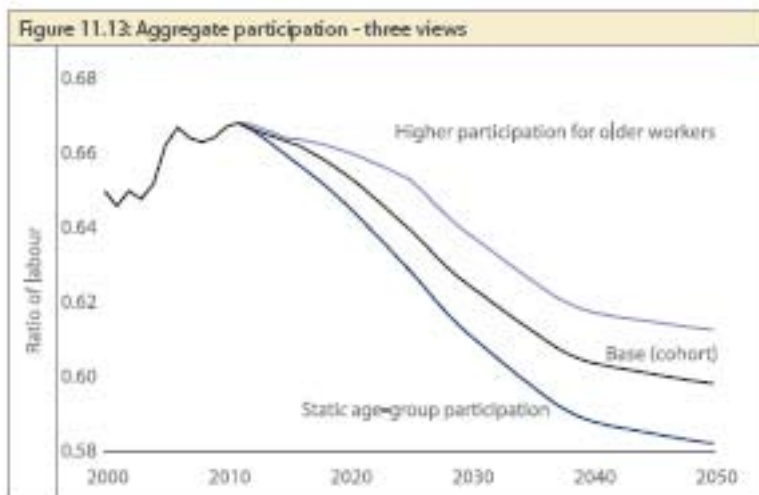
Source: The Treasury

These two alternative cases, static and high, respectively lift (and lower) GDP by about 2½% of the base-case level in 2050 and create a rise (and a reduction) in primary spending to GDP. The rising wedge is amplified by debt servicing costs, which are cumulated into a difference in debt of some 24 percentage points by 2050. The increased labour market contribution by older workers, while increasing their own wealth, also benefits the fiscal position through reductions in social spending relative to GDP.

Table 11.4: Differences of cases of static and higher rates for older workers from base-case

(Percentage points of GDP)		2010	2020	2030	2040	2050
Primary spending	Static	0.0	0.3	0.5	0.7	0.7
	High	0.0	-0.3	-0.6	-0.6	-0.6
Tax	Static	0.0	0.0	0.0	0.0	0.1
	High	0.0	0.0	0.0	0.0	0.0
Operating balance	Static	0.0	-0.2	-0.7	-1.2	-1.8
	High	0.0	0.3	0.8	1.2	1.7
Gross-sovereign-issued-debt	Static	0.0	2.0	6.7	14.2	23.7
	High	0.0	-1.7	-7.5	-14.7	-23.5

Conclusion

The starting point for preparing this Statement of the Long-term Fiscal position is the strong current fiscal position of the New Zealand Government.

Debt is low, by both historical and international standards, and the Government has started to build up assets in the New Zealand Superannuation Fund as a further buffer against future events.

This strong fiscal position has not just happened by chance. Since the early 1990s, and reinforced by the passage of the Fiscal Responsibility Act (now Part 2 of the Public Finance Act), successive New Zealand governments have worked hard to place New Zealand's public finances on a sound footing. Since 1994, governments have run an operating surplus.

In the 2006 *Fiscal Strategy Report*, the Government stated its view that, at around 20% of GDP, gross debt had reached prudent levels (one of the principles of responsible financial management), meaning that it was now appropriate to see debt kept at around that level.

This Statement goes beyond the traditional "bottom-up" approach of using current policy as the sole basis of constructing the projections of the long-term fiscal position.

The "bottom-up" approach, which involves projecting future expenditure and taxes on the basis that current policy in each area will continue, is a powerful tool for examining the impact of changes in the population on individual policies. It is the approach that has been used in many studies of the fiscal position in New Zealand. It is also an approach commonly used by other countries; for example, the European Commission has recently published a set of bottom-up long-term fiscal projections for four expenditure categories for all 25 members of the European Union.

In an advance on previous New Zealand studies, the Statement uses projections made on a "top-down" basis. As the name implies, this projection method seeks to impose an overall set of fiscal constraints on the government and then looks at what various combinations of policies might meet these constraints.

The top-down approach more closely mirrors how governments actually prepare their budgets each year, as they seek to meet all the demands upon the revenue, including the requirement to follow the principles of responsible financial management set out in Part 2 of the Public Finance Act.

These projections, which are based on history, current policy and judgements, show that the Government's strong fiscal position is likely to continue for a long time.

In common with many other countries, New Zealand is experiencing a shift in the structure of the population. We have completed a transition from a condition of high fertility/high mortality to one of low fertility/low mortality.

This transition is not a demographic bulge that will correct itself at some time in the future and is not just the result of the post-Second World War baby boom.

In time, the number of old people will increase as a proportion of the total population and, correspondingly, the number of young and working-age people will fall.

These projections show a continuation of solid economic growth, which means that the tax base also grows through time, giving governments the means to finance expenditures.

The combination of the projected structural change to the population and present policy settings is likely to lead to growing challenges to the fiscal position, and these pressures will accelerate in the 2030s.

These projections also assume that governments will continue to follow the principles of responsible fiscal management contained in the Public Finance Act. This means that they will act before this time to ensure that the fiscal position remains sound.

The largest single driver of the fiscal position is the policy choices governments make and this means that governments have the capacity to make the necessary changes.

The size of any policy adjustment need not be large. A number of small adjustments, starting early, will be sufficient to maintain the fiscal position. We are already seeing governments take a long-term view in setting policy and this trend is likely to continue.

Publishing a Statement on the long-term fiscal position is not an end in itself. What has been done here is present information that will allow readers to develop scenarios consistent with what they define as desirable fiscal results.

Annex 1: Key Assumptions

This annex contains a list of the major assumptions used in the Statement.

Demographic assumptions

The base-case projection uses Statistics New Zealand's mid-range Series 5 demographic projection (Statistics New Zealand, 2004). It assumes a total fertility rate of 1.85 children per woman from 2016 onwards. Female life expectancy at birth rises at a slowing rate to 87 years, male to 83.5 years in 2050. Net migration settles at 10,000 people from 2009 onwards (Chapter 4).

Economic assumptions

Economic projections follow the medium-term Budget 2006 forecasts to 2010. After that, the following economic trend settings are assumed (Chapter 4).

Variable	Value
Labour productivity growth	1.5%
Inflation	2.0%
10-year real government bond rate	4.0%
Unemployment rate	4.5%
Average hours per week	38.4 hours

Fiscal assumptions

The assumptions used in the base-case are listed in Chapters 5 to 10. The key assumptions are:

» tax-to-GDP is broadly held constant from 2010 onwards

» health status: the "healthy ageing" hypothesis is assumed to hold in the projection period so that longevity gains are translated into further years of good health. Similarly, the incidence of disability is assumed to fall by 0.5% a year

» 1% growth in nominal income results in 1% growth in health spending

» some cost-containment measures apply to health spending from 2010 onwards

» the cost per student grows with the average wage from 2010 onwards

» New Zealand Superannuation modelling assumes the current parameters: "65 at 65" – the pension grows with the average wage and is payable at age 65

» welfare benefits are assumed to grow at the same rate as the CPI

» all other spending areas largely grow at the rate of nominal GDP.

Annex 2: Previous Studies

While the legislative requirement for the Treasury to produce a long-term fiscal statement is new, this is not by any means the first time that the issue has been placed in the public arena.

Many reports by the Treasury and by other agencies over the past 15 years have focused on New Zealand's long-term fiscal position. Some have focused on the impact of population ageing, while others have looked at a wider range of drivers of the fiscal position.

Some notable examples are:

» the first Todd Taskforce on private provision of retirement incomes, published in 1992. The Taskforce included a section in its report on the long-term affordability of National Superannuation, using their own model

» Treasury's 1993 *Briefing to the incoming government,* which contained estimates of the long-term fiscal position looking out to 2049

» the New Zealand Institute of Economic Research's *The Fiscal Impacts of an Ageing Population*, a report to the Office of the Retirement Commissioner, October 1995. This was an update of work the Institute carried out for the Todd Taskforce, looking at the overall fiscal position, not just superannuation

» Hana Polackova's *Population Aging and Financing of Government Liabilities in New Zealand*, World Bank Policy Research Working Paper 1703, February 1997, which used the Treasury Long-term Fiscal Model to explore the fiscal effects of an ageing population in New Zealand

» the second Todd Periodic Report Group's report on retirement incomes. Its 1997 Interim Report included an extensive discussion on population ageing, modelling the long-term fiscal position and the sustainability of public provision of retirement incomes

» *You and Your Retirement Savings*, the document outlining the proposed compulsory Retirement Savings Scheme, published in 1997, which contained detailed analysis of the government's long-term fiscal position (not just that relating to public provision of retirement income) with and without the Scheme.

» *Pre-funding New Zealand Superannuation* (Treasury Working Document), June 2000, which discusses the establishment of the New Zealand Superannuation Fund and its fiscal implications and affordability

» John Janssen's *Long-term Fiscal Projections and their Relationship with the Intertemporal Budget Constraint: An Application to New Zealand,* Treasury Working Paper 2002/04

» the Treasury's *The Fiscal Implications of Population Ageing in New Zealand. A* report to the 2003 Periodic Report Group. This provided a summary of work undertaken by the New Zealand Treasury on the fiscal implications of population ageing, with a particular focus on New Zealand Superannuation.

The common approach of these studies (which is also seen in official studies undertaken in other countries) is to project the path of expenditure and taxes based on some notion of "current policy." The idea is to investigate the impact of external drivers – often demographic, but sometimes economic, like the cost of health care – on the overall fiscal position. They have commonly indexed social security benefits to wages and have assumed that in the long term, taxes are a fixed proportion of GDP.

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