Economic *Roundup*

Winter 2005

ISBN 0 642 74295 2

The views expressed in the Economic Roundup are commentary only, and should not be considered as advice. You should not act in reliance upon the views expressed in the publication, but should seek independent professional advice in relation to these issues and any proposed actions.

The Commonwealth and the authors disclaim responsibility for loss or damage suffered by any person relying, directly or indirectly, on this publication, including in relation to negligence or any other default.

Copies of this publication may be purchased either as an annual subscription or a single issue.

Annual Subscriptions: $47.30. (including postage and GST).

Rates shown include postage within Australia and surface postage overseas. Annual subscriptions are payable in advance and should be sent to:

> NMM — The Treasury
> National Mailing and Marketing Pty Ltd
> PO Box 7077
> Canberra BC, ACT 2610

For further information regarding subscriptions, contact Roundup Publications Officer, National Mailing and Marketing Pty Ltd, on 02 6269 1000.

Single Issue: $19.00. Copies may be purchased through CanPrint Infoservices. Purchase details are as follows:

> Over the counter at: 16 Nyrang St Fyshwick ACT.
> CanPrint (Infoservices) Telesales: Toll Free 1300 889 873
> CanPrint (Infoservices) Mail Order Sales, PO Box 7456 Canberra MC ACT 2610

A copy of this document appears on the Treasury Website:
http://www.treasury.gov.au

Printed by CanPrint Communications Pty Limited.

CONTENTS

Fiscal sustainability and pre-funding strategies in OECD countries

Adam McKissack and Blair Comley[1]

This article summarises a paper prepared by the authors for the Banca d'Italia conference on fiscal policy held in Perugia, Italy from 31 March to 2 April 2005. The paper discusses pre-funding strategies being adopted by OECD countries to address demographic pressures and compares this with Australia's experience. The full paper will soon be published in a volume with other papers presented at the conference, and will be available on the Banca d'Italia web site, http://www.bancaditalia.it/

1 The authors are from Macroeconomic Policy Division of the Australian Treasury and the Australian delegation to the OECD, respectively. This article has benefited from comments and suggestions provided by Paul O'Mara and David Parker. The views in this article are those of the authors and not necessarily those of the Australian Treasury.

Introduction

Australia's demographic challenges and associated fiscal pressures are now well known.[2] The 2005-06 Budget set out the Government's ongoing strategy for addressing these fiscal pressures through the continuation of budget surpluses while growth prospects remain sound, the accumulation of net worth through the establishment of the Future Fund and policies to raise productivity and participation in the Australian economy.

Other OECD countries face similar fiscal pressures. Indeed, many OECD countries face an increasingly difficult fiscal challenge in comparison to that faced by Australia. Governments can adopt a number of strategies in response, including modifying expenditure plans, taking steps to raise economic growth rates, raising taxes in the future or undertaking activities to pre-fund the future liabilities. While the Australian Government's approach is centred around pro-growth policies and balance sheet consolidation, the appropriate policy response for other countries will depend on their particular circumstances. This paper focuses on the different approaches to the pre-funding option.

Definition of pre-funding

A country is said to be pre-funding when the government's net financial asset position is improving.[3] The flow equivalent of this stock concept is the achievement of primary surpluses (where the primary surplus equals receipts less non-interest payments).[4] When net public debt interest is positive, attainment of a primary surplus will be easier than achieving a headline surplus, as the latter requires revenues also to cover interest expenses. Primary balances have attracted relatively little attention in Australian policy debates, partly due to Australia's low debt level. However, for countries with higher debt levels, they are generally more instructive in explaining the evolution of

2 See in particular Australian Government (2002).

3 Comley and McKissack (2005) demonstrate that this definition of pre-funding is consistent with ensuring fiscal sustainability. The technical definition of fiscal sustainability is that all obligations, current and future, can be met without changing current policy settings. Comley and McKissack (2005) define the fiscal position as meeting a weak sustainability criterion when the government's net financial asset position is stable over a period of time. Over a longer time horizon the criterion becomes stronger as a broader set of cash flows must be considered. As discussed in Comley and McKissack (2005) the criterion does not represent full sustainability, partly due to the limitations of focusing on net financial assets which are a subset of broader measures such as net worth and partly due to the lack of an infinite time horizon.

4 This relationship holds if the economy grows at a rate similar to the rate of interest. This assumption holds for most OECD countries in recent times (see Comley and McKissack, 2005).

net financial assets than other cash concepts such as the headline balance or the underlying cash balance.

For the purposes of this analysis, pre-funding has been defined relative to the initial financial asset position. A country with high net debt that is taking steps to reduce that debt is defined as a pre-funder, but a country with a low but stable net debt level is not classified as a pre-funder. From a policy perspective, the question examined in this paper is how governments are responding to the fiscal challenge, not how favourable their initial fiscal position may be. If governments improve their net financial asset position, then they reduce future financing costs and create additional flexibility compared with the initial starting point (whatever that may be).

It follows from this that having a strong pre-funding strategy does not necessarily imply a stronger fiscal position than other countries that are pre-funding less. It may simply reflect a bigger fiscal challenge resulting from a more unfavourable starting point (either due to the initial financial asset position or higher expected increases in expenditures).

Australia's fiscal strategy

The Australian Government (2005, pp. 1-5) has set out a multi-pronged strategy for addressing demographic challenges involving elements of pre-funding, lowering expenditure and growing the economy faster to maintain a stable fiscal position into the future.

This strategy is complemented by an approach to budget reporting which includes both cash and accrual reporting. Moreover, the fiscal strategy now explicitly identifies government net worth as a target of policy, in light of the fact that this measure gives a broader indication of improvements in the government balance sheet.

The Government's fiscal strategy, introduced in 1996, is to maintain budget balance, on average, over the economic cycle (Australian Government, 2005, pp. 1-5). To date this has involved significant primary surpluses and reductions in net debt as a percentage of GDP (Table 1), consistent with the definition of pre-funding described above. Net debt is expected to fall by $90 billion from 1995-96 to 2005-06, with surpluses contributing $51.9 billion and privatisation receipts contributing the remainder. Australian Government net worth is expected to increase by around 9 per cent of GDP over this period.

Looking forward the Australian Government has a pre-funding strategy, targeted at pre-funding public sector employee superannuation liabilities. To this end the Government has announced the establishment of a Future Fund. The Government has announced that Fund earnings will be reinvested and excluded from the calculation of

the underlying cash balance (Australian Government, 2005, pp. 1-6). Accordingly Fund earnings will contribute to improving net worth.

Table 1: Australian Government general government sector underlying cash balance, primary balance and net debt (per cent of GDP)

	Underlying cash balance	Primary balance	Net debt
1995-96	-2.0	-0.5	19.1
1996-97	-1.0	0.6	18.2
1997-98	0.2	1.5	14.8
1998-99	0.7	1.9	11.9
1999-00	2.1	3.1	8.6
2000-01	0.9	1.6	6.4
2001-02	-0.1	0.5	5.3
2002-03	1.0	1.5	3.9
2003-04	1.0	1.4	2.9
2004-05(a)	1.1	1.3	1.9
2005-06(a)	1.0	1.3	0.7

(a) Estimate.

Empirical results for other countries

To examine the pre-funding experience of other countries, countries are identified that have declining liabilities and/or are targeting positive primary fiscal balances. The experience of different countries is then examined in some detail to ensure that there are not other factors that have been obscured by the data. Forward-looking intentions are also taken into account as embodied in announced policy.

To facilitate comparisons across countries, the analysis is based on cash concepts. This is a limitation of the analysis as broader balance sheet measures would be needed to identify more fully the impact of policy changes on fiscal sustainability. However, the accrual budgeting methods adopted in Australia to capture these balance sheet effects better are not widely used in the OECD.

In light of the above, countries are not classified purely on the basis of changes in the cash position of the budget. An on-balance decision is made as to the pre-funding intention and practice of a country, giving particular weight to the forward-looking intentions of countries. In this respect two separate groups of countries are identified. The first are 'strong pre-funders' and the second 'mild pre-funders'. The 'strong pre-funders' are identified by clear evidence of past pre-funding and a forward-looking commitment to further pre-funding. The second group are characterised by 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.

Australia is characterised as a mild pre-funder notwithstanding the substantial reductions in net debt that have occurred in the last decade and the fact that Australia has demonstrated strong compliance with its own medium-term fiscal framework. The reason that Australia is not defined as a strong pre-funder is that its forward-looking strategy is based on a 'balance over the cycle' objective. Similarly Ireland is defined as a mild pre-funder notwithstanding the dramatic reduction in gross financial liabilities (a reduction of over 70 per cent of GDP) over the last 15 years. The mild pre-funder classification reflects Ireland's implied forward-looking strategy, which does not seem to call for any significant further reduction in debt levels.

In many cases, the forward strategy adopted by countries reflects the nature of the underlying fiscal challenge. Australia, which has made significant progress in reducing its net debt, does not face as difficult a challenge as many other countries.

A further point to note is that the pre-funding definition tends to pick up both countries that are seeking to fund expenditures that are yet to occur (in particular, those associated with demographic pressures) and countries that are funding liabilities that have already been accrued. However, consistent with abstracting from the initial starting point (for the reasons provided above) this article does not draw this distinction.

It should also be noted that the following analysis compares the consolidated general government position of countries. It therefore reflects the financial position of both the central government and sub-national governments (and in the case of Australia therefore includes the States and Territories).

Tables 2 to 4 set out the countries identified as pre-funders and provide some key fiscal indicators for these countries as they stood at 1995 and 2000. The first group of countries represent the strong pre-funding countries (Table 2). The second group represent the mild pre-funding countries (Table 3). Table 4 summarises the characteristics of these countries compared with the other OECD countries that do not have a pre-funding strategy.

Table 2: Fiscal positions of strong pre-funding countries (per cent of GDP)

Country	Gross financial liabilities		Net financial liabilities		Tax/GDP
	2000	1995	2000	1995	2000
Belgium	115.0	138.8	102.5	125.6	49.5
Canada	81.8	100.8	44.8	69.3	44.1
Denmark	54.4	78.4	8.7	25.9	57.4
Finland	53.2	65.7	-31.5	-3.8	56.1
Luxembourg	5.5	6.7	n/a	n/a	44.7
New Zealand	44.7	56.9	20.7	34.7	41.3
Norway	30.0	34.4	-60.6	-32.6	58.2
Sweden	64.2	82.2	1.4	25.3	62.4
Average	56.2	70.5	12.3	34.9	51.7

Table 3: Fiscal positions of mild pre-funding countries (per cent of GDP)

Country	Gross financial liabilities		Net financial liabilities		Tax/GDP
	2000	1995	2000	1995	2000
Australia	25.2	44.6	9.9	28.2	36.5
Iceland	41.9	60.3	24.0	40.4	45.6
Ireland	38.3	81.9	n/a	n/a	36.4
Italy	124.5	133.5	98.9	109.2	46.2
Korea	16.3	5.5	-27.0	-17.4	29.3
Netherlands	66.7	90.8	35.1	54.1	47.5
Spain	67.3	70.3	43.3	48.9	39.1
Average	54.3	69.6	30.7	43.9	40.1

Table 4: Summary (per cent of GDP)

Country	Gross financial liabilities		Net financial liabilities		Tax/GDP
	2000	1995	2000	1995	2000
Strong pre-funder	56.2	70.5	12.3	34.9	51.7
Mild pre-funder	54.3	69.6	30.7	43.9	40.1
Non pre-funder	64.9	73.2	39.2	39.0	42.7
OECD (unweighted)	59.5	71.2	27.8	41.3	44.8

Source: General government gross financial liabilities, general government net financial liabilities and total tax and non-tax receipts are from the *OECD Economic Outlook 76* Database.

The data indicate that in 2000 the average gross general government financial liabilities of the strong pre-funding countries were around 9 per cent of GDP lower than the average of the non pre-funding countries, with net liabilities around 15 per cent lower for the strong pre-funding countries. To some extent, this is not surprising given that these countries have been chosen on the basis that they have implemented a pre-funding strategy. In 1995, there was little difference between the strong pre-funding countries and the non pre-funding countries in the gross or net financial asset positions.

Accordingly, as a group, the initial asset position does not appear to provide a strong explanation for the decision to pre-fund. That said, high initial debt positions were probably influential in some individual countries. For example, the initial debt positions of Belgium, Canada and Italy do appear to have been a significant factor in their decisions to pre-fund. In the case of Belgium and Italy, broader European considerations (in particular adoption of the Euro) also played a significant part.

A more important variable appears to be the initial tax position of the pre-funding countries. As indicated in Table 4, there appears to be a significant difference between the average tax-to-GDP ratio of the strong pre-funding countries and other OECD countries. The strong pre-funding countries in 2000 had an average tax-to-GDP ratio of 51.7 per cent. This compares with an average of 40.1 per cent for the mild pre-funding countries and 42.7 per cent for those OECD countries that are not identified as pre-funders.

There are two major efficiency motivations for pre-funding: tax smoothing over time and avoiding interest rate risk premia associated with high and rising levels of public debt. The magnitude of the benefits of tax smoothing depends in part on the initial level of taxation. The observation that countries with high initial tax rates tend to undertake more pre-funding is therefore consistent with these efficiency considerations. That said, high-tax countries may also be motivated by other factors, in particular political constraints. Further, it is possible that high-tax countries may have institutional arrangements that make it difficult to revise the terms of the social contract, as discussed below. In this respect it may be better to characterise these strong pre-funding countries as 'high-expenditure' rather than high-tax.

It should also be noted that the causality is unlikely to run the other way, that is higher taxes are not caused by pre-funding. Most of the strong pre-funding countries are pre-funding in the order of 1 to 2 per cent of GDP per year (Norway is the exception given oil revenue). This compares with a tax-to-GDP ratio of more than 10 per cent higher than the OECD average. In addition, the strong pre-funding countries face slightly higher increases in expenditure from their current high base.

In light of the above, there is some evidence that the initial tax-to-GDP ratio influences the likelihood of a country pre-funding. Notwithstanding this general conclusion, there are some high-taxing countries that are not pursuing pre-funding strategies, such as Austria and Germany (with tax-to-GDP ratios of 49.8 and 51.1 per cent respectively). There are also countries that are strong pre-funders, such as New Zealand and Canada, that do not have especially high tax-to-GDP ratios. Moreover, the mild pre-funding countries have a lower tax-to-GDP ratio than the non pre-funding countries. This suggests that there are likely to be other factors at work.

Table 5 sets out estimates of the relative spending pressures of OECD countries. The average estimated increase in old age pension spending for the strong pre-funding countries is 4.5 per cent of GDP and the average of the mild pre-funding countries is 4.2 per cent of GDP. This compares with an OECD average of 3.8 per cent. Given the differences in methodologies for calculating these figures and the inherent uncertainty associated with long-term projections of this kind, we would not want to over-interpret this information. That said, the data are consistent with the proposition that the magnitude of expected increases in pension expenditure is related to pre-funding.

Table 5: Spending pressures (percentage points of GDP)

Country	Change in old age pension spending 2000-2050	Change in health spending 2000-2050
Belgium	3.7	3.0
Canada	5.8	4.2
Denmark	3.6	2.7
Finland	4.8	3.8
Luxembourg	2.0	n/a
New Zealand	5.7	4.0
Norway	8.2	3.5
Sweden	2.2	3.2
Average of strong pre-funders	4.5	3.5
Australia	1.6	6.2
Iceland	0.5	3.5
Ireland	4.4	3.5
Italy	1.7	2.1
Korea	8.0	0.8
Netherlands	5.3	4.8
Spain	8.0	n/a
Average of mild pre-funders	4.2	3.5
OECD average	3.8	3.3

Source: Comley and McKissack (2005).

It is clear, however, that there are many countries with strong pension funding pressures that are choosing not to pre-fund. Germany, for example, expects to see old age pension spending increase by 5 per cent of GDP but as yet has not adopted a pre-funding strategy. Instead, it is seeking to reconsider some of its expenditure programmes.

These differences between countries may be better explained by the qualitative issue of differences in funding commitments. A way of thinking about these qualitative issues is to consider the nature of the contract between the government and the general public to fund a certain commitment. These commitments may be considered as

forming a spectrum, with the strongest being contracts at law. For example, many public sector employee pension schemes are contractual in nature, and governments have an obligation to fund them. However, many public services are covered by less well defined 'social contracts' by the government to provide services into the future. For example, broader commitments to support a level of retirement income for the community at large may fall more within the terms of a social contract which is subject to renegotiation, with the strength of that social contract varying between countries.

Many of the countries in the strong pre-funding category could be said to have strong social contracts which bind their governments to provide a certain standard of income support into the future — a feature in particular of the Nordic countries. Other countries may be more inclined to pursue strategies to renegotiate the social contract.

In contrast to the information on expected changes in pension expenditure, there appears little evidence that expected changes in health expenditure explain differences in the tendency to pre-fund. The average estimated increase in health expenditure is 3.5 per cent of GDP for both the strong and mild pre-funding countries, similar to the OECD average. Furthermore, the health estimates should be treated with an even greater degree of caution than the pension estimates as the methodologies differ more and there are more countries where there are no data. That said, there is no particular reason to believe that the countries identified as pre-funders would systematically have estimated health costs that are higher than the OECD average.

Consideration of the nature of the social contract in respect of health care may suggest a different policy response than applies to pensions. In many countries, expected increases in health expenditures are as much a function of improvements in technology as they are of demographic factors. While demographic factors suggest an increasing cost in delivering an existing service, public provision of new, higher cost medical technologies would appear to represent new services which require future renegotiation of the social contract.

Conclusion

Comley and McKissack (2005) develop a framework for analysing pre-funding among OECD countries. This framework is consistent with concepts of fiscal sustainability which require that a government can meet its inter-temporal budget constraint on the basis of current policies.

A number of OECD countries are pursuing pre-funding strategies to address demographic pressures. Those with the strongest pre-funding strategies tend to be high-tax/high-expenditure countries with relatively less fiscal flexibility to adjust taxes and expenditure into the future. However, some of the stronger pre-funders may be

simply addressing poor periods of fiscal management in the past to prepare their countries for future pressures.

Australia is in a middle group of countries. It has pre-funding as part of its fiscal strategy, but has not needed to pursue strategies as aggressive as those pursued in other countries. While the analysis has abstracted from country starting points, it is clear that Australia's current fiscal position puts it in a favourable position to meet future challenges compared with many other OECD countries.

Another notable feature of the analysis is the range of larger OECD countries that are not pursuing pre-funding strategies, including the US, Japan, Germany, France and the UK. This may suggest that alternative fiscal strategies are being pursued (such as implicit renegotiation of the social contract to provide government services) but could also suggest an emerging need for sharper fiscal adjustments in these countries once demographic pressures begin to bite.

References

Australian Government 2002, Budget Paper No. 5, *Intergenerational Report 2002-03*, Commonwealth of Australia, Canberra.

Australian Government 2004, Budget Paper No. 1, *Budget Strategy and Outlook 2004-05*, Commonwealth of Australia, Canberra.

Australian Government 2005, Budget Paper No. 1, *Budget Strategy and Outlook 2005-06*, Commonwealth of Australia, Canberra.

Comley B and McKissack A 2005 'Expenditure Growth, Fiscal Sustainability and Pre-funding Strategies in OECD Countries', in Banca D'Italia (forthcoming), *Public Expenditure*, Rome.

IGSS 2002, *Report General sur le Systeme de Pension* 2002, Luxembourg.

OECD 2001, 'Fiscal implications of ageing: projections of age-related spending', *OECD Economic Outlook No. 69.*

OECD 2003, Economic Surveys (various), Paris.

OECD 2004, Economic Surveys (various), Paris.

Health promotion

Janine Murphy[1]

'The function of protecting and developing health must rank even above that of restoring it when it is impaired.' Hippocrates

The health of the workforce is an important factor in sustaining and potentially enhancing participation. Ill health is a major factor in cessation from paid employment and decisions around early retirement. As the population ages, improving and maintaining health will become increasingly important for personal wellbeing, improving labour force participation and productivity as well as containing the growth in health expenditure.

On current trends, health costs will become an increasing share of the economy as health costs increase with rising real incomes and as the population ages. More sophisticated treatments and diagnostic techniques have enhanced both the length and quality of life for people, particularly the elderly, but are expensive and add to cost pressures.

Using diabetes Type 2 as a case study, this paper focuses on the argument that greater emphasis on population-based measures to prevent, reduce or delay the onset of lifestyle-related chronic illness is likely to enhance and extend labour force participation and increase productivity as the population ages and thereby increase economic growth. Moreover, by enhancing the general health and independence of the ageing population such measures may also contain the associated projected growth in health and aged care expenditure.

---

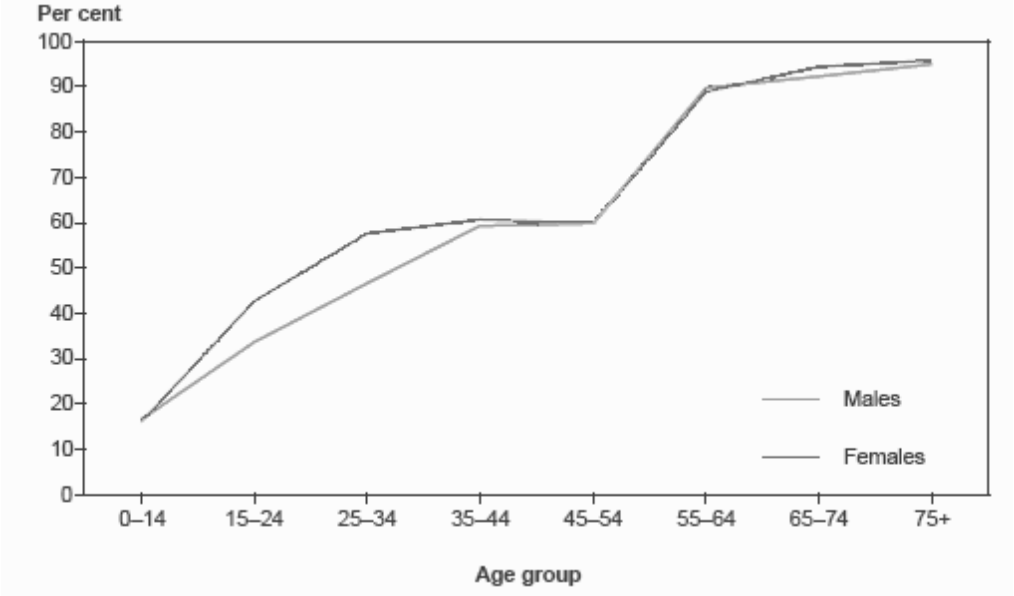
1 The author is from the Macroeconomic Policy Division of the Australian Treasury. The article draws on previous research and analysis undertaken by Ben Dolman of the division. The author acknowledges and thanks officers of the Strategic Planning Branch, Population Health Division, the Australian Government Department of Health and Ageing for their input and suggestions. The paper has also benefited from comments and suggestions from other Treasury officers including, in particular, Graeme Davis, David de Carvalho and Joseph Castellino. The views in this article are those of the author and not necessarily those of the Australian Treasury.

Introduction

Health is among the most important contributors to the wellbeing of the Australian people. Good health provides the capability to undertake employment, engage with friends, family and society more generally and enjoy recreational opportunities. Good health extends the expected length of life available, making new long-term goals achievable and long-term investments desirable, and reduces uncertainty.

This paper examines the impact of ill health on workforce participation and productivity. It highlights the increasing incidence of lifestyle-related chronic disease within the population. As chronic conditions tend to develop and progress with age (Figure 1) they are a significant cause of reduced labour force participation among mature workers, leading to early retirement. In addition, if unchecked, those diseases are likely to become major contributors to the projected growing cost of health care as the population ages.

Figure 1: Age-specific reporting of two or more long-term conditions, 2001



Source: Australian Institute of Health and Welfare, 2004 Australia's Health 2004, p. 35.

Using Type 2 diabetes as a case study the paper draws out some direct relationships between the lifestyle-related causes of the disease, its progression and the impact on workforce participation, productivity and health care costs. It provides evidence that expenditure that focuses on reducing the lifestyle-related causes of the disease is likely to be more cost-effective than treating the disease once it has been diagnosed. Moreover, preventing the disease, by reducing the lifestyle-related causes, will have additional benefits for labour force participation and productivity.

Health and labour force participation and productivity

From a macroeconomic perspective, good general health raises income by increasing the proportion of society that is capable of participating in the labour force and by boosting labour productivity, both directly and indirectly, by encouraging investment in human and physical capital. In that sense the development of human capital through investment in health (both personal and formal health care) is considered analogous to investment in education. Both act to increase productivity in both market and leisure activities. The key differences are that good health also extends the healthy lifespan of an individual and probably reduces the rate at which people discount the future, at least at older ages.

The theoretical effect of health on labour market outcomes is fairly ambiguous. The theory suggests that healthy workers should be more productive and so receive higher wages. However, health also increases the return from leisure and other non-market activities so there need not be a strong substitution to paid labour. In Australia, the existence of an income support safety net, publicly provided health care and legislated minimum wages, while providing valuable assistance to those with poor health, can also act as a disincentive for them to participate in the labour force.

Theory suggests that health is also a key driver of retirement decisions. Given an initial level of wealth, those that are healthier would be expected to work for longer in order to fund a longer retirement. While the theory seems sound, this is difficult to observe in the data because wealth is typically closely correlated with health.

Deteriorating health is probably a better predictor of labour force participation at older ages than poor health *per se* since many of those that have suffered poor health over extended periods have already adjusted their lives and careers accordingly (Bound et al, 1998 and Chan and Stevens, 1999). Deterioration in health significantly influences the retirement expectations of those currently working and for the average older worker the effect is far stronger than other variables such as changes over time in income or wealth (McGarry, 2002). In Australia the means-tested age pension, which is equivalent to 25 per cent of male total average weekly earnings, and access to other income support payments and/or superannuation savings before age pension age, frequently enable even the less wealthy to retire early, particularly if their health deteriorates.

The relationship between deteriorating health and participation also depends in part on the worker's skills and occupation. High-stress occupations, for example, are more likely to lead to those with ill health leaving the workforce. However workers with well-developed and portable skills may more easily move into jobs that are more accommodative of their health issues than those with few skills or with job-specific skills only. International studies suggest that, for the same level of disability, those in

less skilled occupations show a greater rate of departure from the labour force, as do those in more physically demanding occupations (Berkowitz and Johnson, 1974 and Grady and Hayward, 1986).

For these reasons, in Australia we would expect to see a stronger negative relationship between labour force participation rates and health within older age groups than within younger age groups. Consistent with this hypothesis, Table 1 presents recent data from the Household, Income and Labour Dynamics in Australia (HILDA) survey. While there are only modest differences between the participation rates of those with excellent, very good or good health, those with fair or poor health have far lower rates of participation. This trend is more pronounced for those in older age groups and is more pronounced for women than for men.

Table 1: Participation rates by age, gender and self-assessed health status

	Not in labour force for health reasons %	Self-assessed health of those in labour force* %				
		Excellent	Very Good	Good	Fair	Poor
Males						
Aged 15-49	29.0	96.2	96.8	94.5	82.6	43.1
Aged 50-64	39.0	79.6	86.0	77.1	43.8	25.0
Females						
Aged 15-49	14.0	79.5	78.5	72.3	59.3	37.2
Aged 50-60	21.0	74.2	75.5	60.0	37.1	8.9

* In labour force includes employed and unemployed.
Source: Cai and Kalb 2004, Table 1 and related text.

There is growing evidence that individuals with chronic diseases have difficulty in securing employment and are more likely to drop out of the labour force (Crotty et al, 2002). Analysis of three National Health Surveys derived the odds of non-participation in the labour force of mature aged people (44 to 60 years) with chronic illness or health risk factors as summarised in Table 2 (Jose et al, 2004). The odds ratios show for example that, among women, asthma sufferers are 1.26 times more likely not to be in the labour force than non-asthma sufferers. Among men, diabetes sufferers are 2.47 times more likely not to be in the labour force than men who do not have diabetes. The results for exercise are less clear and require further study. They may perhaps reflect the fact that working makes it more difficult for some to find the time to undertake moderate or vigorous exercise compared to those not in the labour force.

Table 2: Odds ratios for non-participation in the labour force by selected health variables based on pooled data from National Health Surveys (1989-90, 1995, 2001)*

Variables	Women aged 44-60 years	Men aged 44-60 years
Hypertension	1.30	1.25
Asthma	1.26	1.36
Arthritis	1.25	2.05
Diabetes	1.84	2.47
Cancer	1.47	1.09
Anxiety	1.07	3.75
Never smoked	1.00	1.00
Current smoker	1.28	2.02
Ex-smoker	0.82	1.23
Underweight	1.02	2.18
Acceptable weight	1.00	1.00
Overweight	1.17	0.99
Obese	1.30	1.25
Low exercise	0.95	0.71
Moderate exercise	1.00	1.00
High exercise	1.22	0.96

* All variables are statistically significant at 5 per cent level of significance.
Source: Jose, Ravindiran & Abello 2004, Table 1.

In addition to the link between health and labour force participation, good health raises incomes by contributing to productivity in a number of ways (Bloom and Canning, 2001). Healthy workers may have more physical and mental energy and also require fewer days off to cope with health issues. Longer, healthy life expectancy encourages investment in education and healthier children are better able to attend and engage in schooling, thereby improving the effectiveness of schooling. Longer life expectancy also encourages saving for retirement and hence capital accumulation. Finally, healthier populations require less health care, so resources can be devoted to other areas of the economy.

Those suppositions are generally supported empirically. Research in the European Union concludes that those in the workforce who have a chronic health problem face restrictions on the kind or amount of work they can undertake (Gannon and Nolan, 2004). A summary of the results is shown in Table 3. In addition, wages are typically significantly lower for workers with disabilities, which is indicative of lower productivity.[2]

2 Some have argued that only a portion of this differential is able to be explained by differential productivity, suggesting discrimination against disabled workers.

Table 3: Chronic health problems and work restrictions of Irish people aged 15 to 64

Type of condition	Restricts kind of work			Restricts amount of work		
	Considerably	Some extent	No	Considerably	Some extent	No
	%	%	%	%	%	%
Chest or breathing	20.0	22.9	57.1	18.3	19.3	62.4
Diabetes	16.7	20.1	63.1	16.2	23.0	60.7
Heart, blood pressure/circulation	42.2	20.2	37.6	40.6	21.4	37.8
Mental, nervous or emotional	72.4	14.5	13.1	69.4	16.2	14.4
Stomach, liver, kidney or digestive	32.0	18.7	48.7	30.9	19.7	49.0

Source: Gannon and Nolan, 2004, Table 4.5.

Moreover people with chronic health problems also reported in a separate survey that their conditions hampered them in undertaking their daily activities (see Table 4 for a summary of the results).

Table 4: Impact of chronic illness on daily lives for people aged 15 to 64 in Living in Ireland Survey 2000

Type of condition	Hampered in daily activities		
	Severely %	Some extent %	No %
Neoplasms (cancers)	35.6	18.4	45.9
Circulatory system disorders	8.2	55.3	36.5
Respiratory system	6.5	32.3	61.2
Musculoskeletal system	23.7	61.6	14.7
Depression	9.0	68.7	22.3

Source: Gannon and Nolan, 2004, Table 4.12.

Time off due to illness may be particularly important since it reduces both the output of the individual and the productivity of entire workplaces due to the need to duplicate skills and knowledge so that others can fill the gap. Not surprisingly, those with long-term illnesses and disabilities are more likely to be absent from work due to illness and the length of absence is likely to be longer (Kidd, Sloane and Ferko, 2000).

Causes of ill health in Australia

Lifestyle-related and largely preventable non-communicable diseases are among the leading causes of burden of disease in Australia as measured by Disability Adjusted Life Years (DALYs).[3] While age, genetic make-up and lifestyle are independent risk factors for chronic disease, they also interact resulting in a cumulative impact over the lifecourse.

Table 5 gives the percentage distribution of DALYs in 1996 among the main disease and injury groups for the entire population and for each of five age groups. However, as Table 5 implies, if we were able to slow or reverse the increased burden of these diseases as the population ages through cost-effective lifestyle changes there would be potential at least to slow the projected growth in health expenditure associated with them, while also improving labour force participation and productivity.

Table 5: Burden of disease by age group and health expenditure

Disease category	Per cent of total DALYs 1996						Total health expenditure 2000-01
	Persons	0-14	15-34	35-54	55-74	75+	$ million
Neoplasms (cancers)	19.4	2.5	4.1	20.5	30.9	19.2	2,764
Cardiovascular disease	21.0	1.1	2.4	13.1	27.7	41.1	5,393
Mental disorders	13.2	15.9	44.4	19.5	2.8	0.4	3,018
Nervous system disorders including Alzheimer's and other dementias	9.4	4.3	2.8	4.0	10.8	18.1	4,858
Chronic respiratory disease	7.1	20.2	4.6	5.1	7.0	6.0	3,533
Musculoskeletal disease	3.6	1.1	2.2	6.3	4.8	1.6	4,725
Diabetes*	3.0	1.0	1.0	5.1	3.6	2.4	836
Digestive system diseases	2.6	0.9	2.2	3.4	2.7	2.5	2,821
Genitourinary diseases	2.5	0.2	3.5	2.5	2.5	2.5	2,081
Injuries	8.4	11.2	23.5	11.7	3.0	1.9	4,061
All other diseases	9.8	41.6	9.3	8.8	4.2	4.3	15084
Total	100.0	100.0	100.0	100.0	100.0	100.0	49,174

* Includes both Type 1 and Type 2 diabetes of which the latter accounts for 85-90 per cent of all diabetes cases in Australia.

Sources: Derived from data in Mathers et al, 1999 and AIHW, 2004.

3 Burden of disease is a measurement of the difference between current health status and the ideal of living into old age free of disease and disability. One DALY is equivalent to one lost year of 'healthy' life and is calculated as a combination of years of life lost due to premature mortality (YLL) and equivalent 'healthy' years of life lost due to disability (YLD). The total burden of disease and injury in Australia in 1996 was estimated to be 2.5 million DALYs or 137 DALYs lost per 1,000 population.

Risk factors for lifestyle-related chronic disease

The onset, maintenance and prognosis of chronic diseases are influenced by:

- behavioural risk factors (in particular smoking, poor nutrition, high-risk alcohol use and physical inactivity);
- biomedical risk factors (impaired glucose metabolism, high blood pressure, high blood cholesterol, excess weight); and
- broad influences (age, genetics, psycho-social and environmental factors).

As noted these risk factors tend to coexist and interact in their effect. A number of behavioural and biomedical risk factors are avoidable and modifiable. There is therefore potential for health gains to be achieved from early intervention or appropriate management. These risk factors can be identified and managed for individuals, however a broader population approach can be more cost-effective because the risk factors are widespread across the population and cumulative over an individual's lifespan. The nature of these lifestyle-related chronic diseases underscores the added benefits of promoting good behaviours from an early age (Rose, 1992).

Risk factors such as smoking, physical inactivity, obesity, high blood pressure and high cholesterol are significant contributors to lifestyle-related chronic disease and are therefore responsible for a sizeable proportion of the total burden of disease in Australia as shown in Table 6. The WHO notes that through attention to improving diet and increasing exercise many of these chronic diseases would be largely preventable (WHO, 2004).

Table 6: Burden of disease attributable to 10 major risk factors — 1996

	% of total disability-adjusted life years (DALYs)		
Risk factor	Males	Females	Persons
Tobacco	12.1	6.8	9.7
Physical inactivity	6.0	7.5	6.7
High blood pressure	5.1	5.8	5.4
Alcohol harm	6.6	3.1	4.9
Alcohol benefit	-2.4	-3.2	-2.8
Obesity	4.3	4.3	4.3
Lack of fruit and vegetables	3.0	2.4	2.7
High blood cholesterol level	3.2	1.9	2.6
Illicit drugs	2.2	1.3	1.8
Occupation	2.4	1.0	1.7
Unsafe sex	1.1	0.7	0.9

Source: Mathers et al, 2000, Table 7.

Poor diet, physical inactivity and excess weight are common risk factors for non-communicable diseases such as coronary heart disease, stroke, colorectal cancer, Type 2 diabetes and osteoporosis. For example the relative risk of coronary heart disease associated with physical inactivity ranges from 1.5 to 2.4, an increase in risk comparable to that observed for high blood cholesterol, high blood pressure, or smoking (Pate et al, 1995). Diet and physical activity may also interact with other risk factors such as tobacco-smoking and depression, which themselves are significant causes of disease and death.[4] [5]

Rose suggested that for many chronic illnesses a population strategy aimed at changing social attitudes would lower the mean level of risk factors and shift the whole distribution of exposure in a favourable direction. Such a strategy would be more cost-effective than treating those who go on to develop disease. This is because the strategy aims to remove or reduce the underlying causes that make the disease common and therefore expensive to treat. As Rose notes:

'Once a social norm of behaviour has become accepted and (as in the case of diet) once the supply industries have adapted themselves to the new pattern, then the maintenance of that situation no longer requires effort from individuals. The health education phase aimed at changing individuals is, we hope, a temporary necessity, pending changes in the norms of what is socially acceptable.' (Rose, 1985)

A clear example of this is the decline in the number of smokers and the change in the social acceptability of smoking, as a result of the wide dissemination of the results of research as to the health implications of smoking and living and working in an environment polluted by tobacco smoke.

Another well-documented case is that of North Karelia in Finland where from 1972 a concerted effort was made to change the high-fat diet of the population. Dietary habits were deeply rooted in the community through its cultural, agricultural and economic features, so the strategy involved media campaigns, collaboration with the food industry and agricultural reforms. After a five-year pilot programme in North Karelia the programme was extended throughout Finland.

Some 25 years after the programme's inception there were significant changes in dietary habits and serum cholesterol levels in North Karelia were reduced by 18 per cent. The age-adjusted coronary heart disease mortality declined by 73 per cent

4 US studies show that people who exercise are less likely to smoke. Several studies have confirmed that if you are a smoker and find it difficult to quit, exercise can still be beneficial. In fact, smokers who are active may have a lower risk of heart disease than non-smokers who are sedentary.

5 For a literature review see Landers (1997).

among 35 to 64 year old men and all-cause mortality was reduced by 50 per cent in the working age population over the same period (Puska, 1999).

Type 2 diabetes case study

The rapid increase in Type 2 diabetes in Australia and other countries reflects the rising impact of the risk factors discussed above.

An individual's risk of developing Type 2 diabetes increases as a result of ageing and genetic predisposition. However, behavioural risk factors including overweight and obesity, physical inactivity and poor nutrition also contribute to the development of the disease.

The 1999-00 Australian Diabetes, Obesity and Lifestyle Study estimated that 7 per cent of Australians aged 25 and over (around 900,000 people) had Type 2 diabetes, and only 50 per cent of those who tested positive knew they had the condition (Dunstan et al, 2002). The incidence of Type 2 diabetes in the Indigenous population is significantly higher (see Box 1).

One in four Australians over the age of 25 years has impaired glucose metabolism, either impaired fasting glucose (IFG) or impaired glucose tolerance (IGT). Both IFG and IGT are known precursors to developing Type 2 diabetes and it is estimated that people with IFG or IGT usually convert to Type 2 diabetes at a rate of 5 to 10 per cent per year (Medicine Australia). Harris and Zimmet (1992) found that although many people with IGT may revert to normal glucose tolerance, one in three is likely to develop Type 2 diabetes within 10 years. A separate study that describes the incidence of different stages of glucose tolerance in a population from Mauritius found that of those known to have IFG in 1987, 38 per cent developed diabetes after 11 years. The corresponding figure for IGT was 46 per cent (Soderberg et al, 2004).

Growth in prevalence of diabetes

Before the 1999-00 Australian Diabetes, Obesity and Lifestyle Study there had only been two previous population-based studies of diabetes prevalence based on the oral glucose tolerance test. A 1981 study from Busselton, WA, showed a prevalence of 3.4 per cent (2.5 per cent known cases and 0.9 per cent newly diagnosed) in subjects aged 25 years or more. Diabetes prevalence has more than doubled since 1981, and this is only partially explained by changes in age profile and obesity (Dunstan et al 2002).

The International Diabetes Federation estimated that the number of people with diabetes worldwide for 2003 was 194 million and forecasts that this will increase to 334 million by 2025. The resulting prevalence of people aged 20 to 79 with diabetes is

expected to increase from 5.1 per cent to 6.3 per cent (International Diabetes Foundation, 2003).

Box 1: Prevalence of Type 2 diabetes in the Indigenous populations

The prevalence of Type 2 diabetes is considerably higher among Aboriginal and Torres Strait Islander peoples than for the whole of the Australian population. In the 2001 Indigenous supplement to the National Health Survey, diabetes was reported by 5 per cent of the Indigenous population.

After adjusting for age, Indigenous Australians were more than three times as likely as the non Indigenous population to have diabetes (11 per cent compared with 3 per cent). Indigenous people living in remote areas had a significantly higher rate of diabetes than those living in non remote areas (16 per cent compared to 9 per cent) (ABS Cat. No. 4715.0, 2001). Studies suggest that the prevalence may be as high as 30 per cent in some Aboriginal communities (de Courten et al 1998).

Based on self reported information obtained in 2001, 20 per cent of Indigenous Australians aged 45 to 54 years and 29 per cent aged 55 and over had diabetes. On the basis that diabetes is likely to be undiagnosed in 50 per cent of those with the disease, Indigenous Australians aged 55 and over are more likely to have diabetes than not. Moreover diabetes has a far greater impact on mortality of the Indigenous population. Over the period 1999 to 2001 diabetes was responsible for 8.5 per cent of total Indigenous deaths compared to 2.3 per cent of total Australian deaths (ABS Cat. No. 4704.0, 2003).

Complications of Type 2 diabetes

While Type 2 diabetes can be debilitating in itself, it can lead to other significant health complications such as coronary heart disease, stroke and kidney disease, nerve damage, foot ulcers, blindness and amputations, for which the risks often increase with the duration of diabetes. The longer Type 2 diabetes progresses unrecognised and untreated the more likely sufferers will develop one or more of these related, more serious health complications. There is some concern for example that the significant reductions in coronary heart disease achieved in Australia through the sustained anti-smoking campaign may be unwound due to the increasing incidence of Type 2 diabetes.

As noted in Table 5 above, Type 2 diabetes is one of the ten leading causes of burden of disease and injury in Australia. It was implicated in over 8 per cent of all deaths in Australia in 2002 (AIHW 2005). Moreover the odds ratios for non-participation in the labour force for men and women aged 44 to 60 years with diabetes are 2.47 and 1.84 to one respectively (see Table 2).

Because diabetes can lead to other health complications, its proper management may involve a complex mix of changes in lifestyle, medications and involvement of a range of health professionals, including diabetes educators, GPs, endocrinologists, podiatrists, ophthalmologists and optometrists, kidney specialists and dieticians. It is therefore a relatively expensive disease to manage and accounted directly for around $784 million or 1.7 per cent of total allocatable recurrent government health expenditure in 2000-01 (see Table 7).

Table 7: Direct health expenditure on diabetes, by age group, 2000-01 ($millions)

Sector	0-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75+	All ages
Admitted hospital patients*	1.0	4.8	6.0	6.6	12.2	24.9	40.3	60.9	74.2	230.9
Non-admitted hospital patients	0.0	1.9	0.0	0.0	0.0	2.6	23.5	16.9	13.2	58.0
Total hospital	1.0	6.7	6.0	6.6	12.2	27.5	63.8	77.8	87.4	289.0
Out-of-hospital medical services	0.3	0.6	1.9	5.1	13.4	34.5	39.8	51.0	36.3	182.8
Other professional services	0.0	0.0	0.4	0.1	3.6	3.4	8.5	8.8	11.1	35.9
Pharmaceuticals	0.6	2.2	5.0	8.8	16.3	30.0	45.0	57.4	38.4	203.6
Aged care homes	0.0	0.0	0.0	0.0	0.0	2.5	2.8	3.5	28.8	37.7
Research	0.1	0.5	0.6	0.9	2.1	4.7	7.6	9.2	9.1	34.6
Total expenditure	2.0	10.0	13.9	21.5	47.5	102.5	167.7	207.6	211.0	783.6

* Includes an estimate of in-hospital private medical services.
Source: AIHW Disease Expenditure Data Base reported in AIHW Bulletin 26, April 2005, Costs of Diabetes in Australia, 2000-01, Table 1.

Treatment for complications of diabetes may incur substantial costs that are not fully accounted for in this estimate. For example dialysis for end-stage renal disease, the most common cause of which is diabetes, may incur hospital costs of an average $67,000 per person treated over one year. When complications and associated diseases are accounted for, the total health system expenditure attributed to diabetes increases significantly.

A 2002 national study of the burden of Type 2 diabetes estimated that when the associated complications were taken into account the average annual health cost per person was $5,360 plus $5,540 in benefits such as pensions and sickness benefits, yielding a total cost per annum of $3 billion (Australian Diabetes Society, 2002). The health cost per person increases with the onset of complications (see Table 8). The subjects in the study were predominantly elderly with a mean age of 65 years and relatively few were employed. This would have imposed a significant upward bias in the Government subsidies, but they nevertheless increased for those who develop associated complications.

Table 8: Costs per person with diabetes

Cost	Overall	Complications			
		None	Microvascular	Macrovascular	Both
Health costs	$	$	$	$	$
Direct	5,325	3,990	6,990	8,985	9,610
Indirect	35	35	35	70	35
Total	5,350	4,025	7,025	9,055	9,645
Government subsidies	5,540	5,075	6,200	6,120	6,240

Source: Australian Diabetes Society, 2002, Table 5.

Health promotion, lifestyle modification strategies for delaying and possibly preventing diabetes

Overweight and obesity and lack of physical activity significantly increase the likelihood of developing Type 2 diabetes. Overweight adults are three times more likely and obese adults possibly 10 times more likely to develop the disease. In 2001, 77.1 per cent of people aged over 15 years with diabetes were inactive compared with 68.2 per cent of those without diabetes. Some 54.9 per cent of diabetics were overweight or obese and sedentary compared with 33.6 per cent of non-diabetics (National Centre for Monitoring Diabetes, 2002).

Theory as espoused by Rose (1992) and clinical trials suggest that strategies aimed at reducing weight and increasing physical activity across the general population would be effective in minimising a person's risk of developing Type 2 diabetes.

For example, in the US, the Diabetes Prevention Programme (2002) undertook a trial involving 3,234 overweight people with impaired glucose tolerance (a pre-diabetic condition), a mean age of 51 years and a mean body mass index (BMI) of 34.0.[6]

The participants were randomly assigned to one of three groups. The first group undertook an intensive lifestyle modification programme involving lowered intake of fat and calories with the goal of at least a 7 per cent weight loss and to exercise at moderate intensity (usually by walking an average 30 minutes a day) on five days a week. The intervention involved 16 one-on-one culturally sensitive and individualized lessons covering diet, exercise and behaviour modification designed to achieve a modest and maintained 5 to 7 per cent weight loss. The second group took metformin (Glucophage) and was given standard lifestyle recommendations. The third group was given a placebo and standard lifestyle recommendations. The participants were followed up on average after 2.8 years (range 1.8 to 4.6 years).

6 Body mass index (BMI) is calculated as the ratio of an individual's weight divided by their height squared. A BMI in the range 20-24.9 kg/m^2 is generally regarded as healthy, 25-29.9 kg/m^2 is overweight and 30+ kg/m^2 is obese.

The incidence of Type 2 diabetes per 100 was 4.8 cases for Group 1, 7.8 cases for Group 2 and 11 for Group 3. Thus compared with the control group the intensive lifestyle intervention reduced the incidence of Type 2 diabetes by 58 per cent (95 per cent confidence interval, 48-66 per cent). The metformin group members reduced their incidence of Type 2 diabetes by 31 per cent (95 per cent confidence interval 17-43 per cent).

Participants assigned to Group 1 had much greater weight loss and a greater increase in leisure physical activity than did the other participants. Fifty per cent had achieved the weight loss goal of at least 7 per cent at 24 weeks, but that had reduced to 38 per cent at the latest visit. The average weight loss was 5.6 kg, 2.1 kg and 0.1 kg for Groups 1 to 3 respectively. At 24 weeks, 74 per cent of Group 1 participants were physically active for at least 150 minutes per week, reducing to 58 per cent at the last visit. However those in Group 1 increased their physical activity much more that those in the other groups.

On the basis of these results the estimated number of people who would need to be treated for three years to prevent one case of diabetes is 7 using the intensive lifestyle intervention and 14 using the metformin. Relative to the placebo intervention, the in-trial costs for each case of diabetes prevented in the US study was US$15,700 for lifestyle intervention and US$31,300 for metformin. [7] Costs per QALY (quality adjusted life-year) gained was US$31,500 and US$99,600 for the lifestyle and metformin interventions respectively. Thus the US data suggests that intensive lifestyle intervention was approximately two to three times as cost-effective as the metformin intervention.

Similar results have been observed in comparable studies undertaken in Sweden, China and Finland. [8]

In the Finnish study there were two groups - those that were given an intensive lifestyle intervention and the control group which received only general health advice. Participants in both groups were ranked according to their success in achieving the goals of the intensive intervention. The success rates after one year for each goal are shown in Table 9.

7 The Diabetes Prevention Program Group. Within-Trial cost-effectiveness of lifestyle intervention or metformin for the primary prevention of type 2 diabetes. Diabetes Care 2003:26:9: pp. 2518-2523

8 For Sweden see Eriksson and Lindgarde, (1991). For China see Pan et al, (1997). For Finland see Tuomilehto et al, (2001).

Table 9: Success in achieving the goals of intervention after one year

Goal	Intervention Group	Control Group
	% of subjects	
Weight reduction > 5%	43	13
Fat intake < 30% of energy intake	47	26
Saturated fat intake < 10% of energy intake	26	11
Fibre intake ≥15g/1000kcal	25	12
Exercise >4hr/week	86	71

Source: Tuomilehto et al, 2001, Table 4.

There was a strong inverse correlation between the success score and the incidence of Type 2 diabetes. Thirteen subjects in the intervention group and 48 in the control group did not achieve any of the goals; diabetes developed in 38 and 31 per cent of these subjects respectively over the duration of the study. On the other hand diabetes had not developed in any of the subjects who reached four or five of the goals (49 in the intervention group and 15 in the control group). As-yet-unpublished data following the intervention and control groups over ten years indicates that while the cumulative probability of remaining free of Type 2 diabetes declined steadily in both groups, the rate of decline was slower in the intervention group. At the end of ten years the probability of a member of the intervention group remaining free of diabetes was around 65 per cent compared with around 45 per cent for the control group (Tuomilehto 2004).

More intensive interventions to reduce weight and increase physical activity for people at high risk of developing Type 2 diabetes would clearly also have secondary benefits, through reducing their risk of developing other diseases associated with overweight and a sedentary lifestyle.

Overweight and obesity

Studies of overweight and obese employees have shown that obese employees take more sick leave than non-obese employees and are twice as likely to have high-level absenteeism (seven or more health-related absences during the last six months) (Burton et al, 1998 and Tucker et al, 1998).

Overweight and obesity are believed to be associated with many chronic disorders (see Table 10). In the US, research has shown that obesity may account for as much as a 36 per cent increase in costs for inpatient and ambulatory care for individuals, which is a greater increase than that attributed to ageing 20 years, smoking or problem drinking (Heithoff et al, 1997).

Table 10: Overweight and obesity raise the risk for:

Type 2 diabetes	Poor female reproductive health
High blood pressure	complications of pregnancy
High cholesterol levels	menstrual irregularities
Coronary heart disease	infertility
Congestive heart failure	irregular ovulation
Angina pectoris	Cancers of the
Stroke	uterus
Asthma	breast
Osteoarthritis	prostate
Musculoskeletal disorders	kidney
Gall bladder disease	liver
Sleep apnea and respiratory problems	pancreas
Gout	oesophagus
Bladder control problems	colon and rectum

Source: United States Department of Health and Human Services, *Prevention Makes Common 'Cents'*, September 2003, page 5.

Overweight, and in particular obesity, are acknowledged to be at epidemic levels worldwide, with Australia being one of the worst affected nations. The 2001 Australian Bureau of Statistics (ABS) National Health Survey (NHS), showed that more than 7 million Australian adults (aged 18 years and over) were overweight (based on self-reported data) (Dixon and Waters 2003). The combined rate of overweight and obesity is 67 per cent for men aged 25 to 64 years and 52 per cent for women in the same age group.

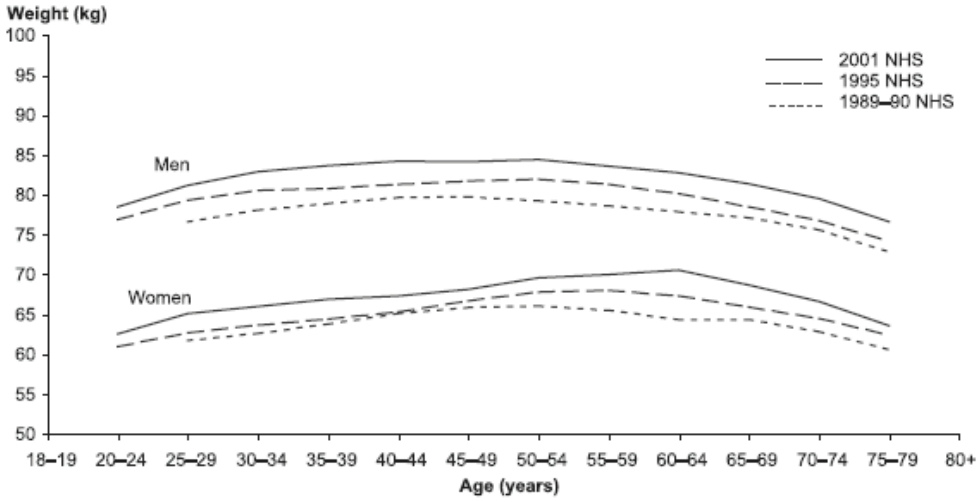
There have been significant increases over the past 15 years in the proportions of overweight and obese Australians (see Table 11 and Figures 2 and 3).

Table 11: Prevalence of overweight and obesity[(a)] among men and women aged 25-64 years[(b)], 1980 to 1999-2000, measured in various surveys

Sex	Year	Overweight but not obese	Obese	Overweight
		Per cent [(c)]		
Men	1980 (RFPS) [(d)]	37.9	9.4	47.4
	1983 (RFPS) [(d)]	40.4	8.9	49.3
	1989 (RFPS) [(d)]	43.0	10.4	53.4
	1995 (ABS:NNS)	48.7	19.6	68.2
	1999-2000 (AusDiab)	48.8	16.9	65.7
Women	1980 (RFPS) [(d)]	19.3	7.9	27.2
	1983 (RFPS) [(d)]	21.8	10.4	32.2
	1989 (RFPS) [(d)]	24.5	12.5	36.9
	1995 (ABS:NNS)	30.1	19.2	49.3
	1999-2000 (AusDiab)	26.7	19.8	46.5

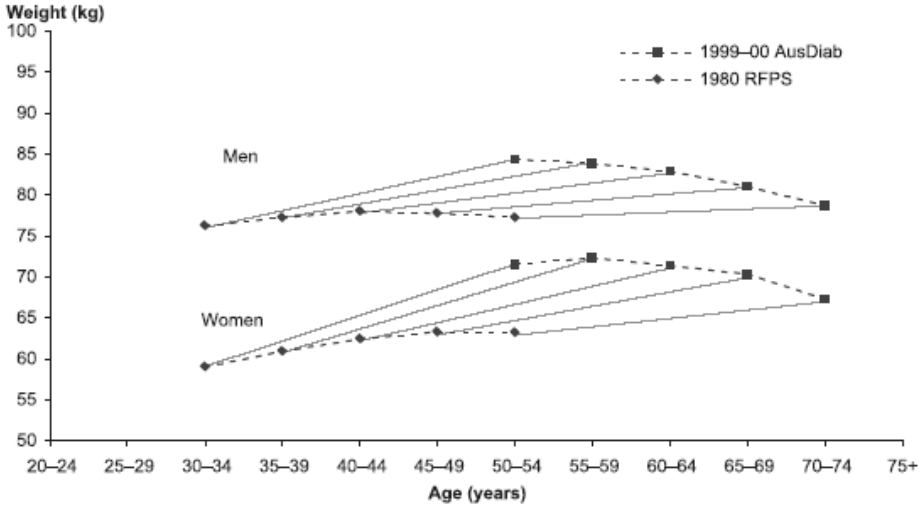
(a) Based on measured height and weight.
(b) Living in capital cities and urban areas only.
(c) Age-standardised to the 2001 Australian population.
(d) Risk Factor Prevalence Survey conducted by National Heart Foundation.
Sources: NHF 1980, 1983 and 1989 Risk Factor Prevalence Surveys; ABS 1995 National Nutrition Survey; 1999-2000 Australian Diabetes, Obesity and Lifestyle Study (AusDiab); Reported in AIHW 2003. Indicators of health risk factors: the AIHW view. AIHW Cat. No. PHE 47, Canberra.

Figure 2: Average weight (self-reported) across the adult life span, 1989 to 2001



Source: AIHW analysis of the 1989-90, 1995 and 2001 National Health Surveys.
Published in: Bennett, SA et al 2004.

Figure 3: Trends in weight (measured) by age cohort, 1980 to 2000



Sources: AIHW analysis of the 1980 Risk Factor Prevalence Survey; 1999-2000 Australian Diabetes, Obesity and Lifestyle Study (AusDiab).
Published in: Bennett SA et al 2004.

The rates of childhood overweight or obesity in Australia have increased from around 5 per cent in the 1960s to around 25 per cent today. In 1995 compared with other developed countries there was a relatively high percentage (21 per cent) of Australian children who were considered overweight or obese. Childhood obesity in Australia has been estimated to be rising at an annual rate of 1 per cent, meaning that half of all young Australians could be overweight by the year 2025 (Australasian Society for the Study of Obesity 2004). Research also shows that people who are overweight or obese as children are likely to be overweight as adults.

Unless we can slow, halt, or ideally reverse the current trend, we will have a much larger percentage of working-age and elderly people who are overweight or obese in future, with an associated decrease in labour force participation and an increase in health expenditure, particularly for those who go on to develop associated chronic illnesses. Moreover a more overweight and obese elderly population will place an additional physical burden on aged carers and health workers, potentially leading to more work-related injury.

Physical Inactivity

The Australian Institute of Health and Welfare (1999) reported that:

'There is strong epidemiological evidence that physical inactivity is causally associated with increased risk of mortality and incidence for a number of diseases and injury. Physical activity reduces the risk of coronary heart disease. People who do not

participate in regular physical activity are almost twice as likely to die from coronary heart disease as those who participate. The evidence also suggests that physical activity may also play a protective role against stroke as leisure-time physical activity and vigorous work-related physical activity have been shown to lower the incidence of stroke.

Insufficient physical activity tends to occur with other risk factors for cardiovascular disease such as obesity, high blood pressure, high blood cholesterol and HDL cholesterol. There is also evidence that people who increase their level of physical activity will reduce their levels of these risk factors.'

Table 12 provides a measure of the increase in risk of disease and injury associated with reduced physical activity, compared with those who undertake vigorous exercise.

Table 12: Relative risks for disease and injuries associated with physical inactivity

Cause	Relative risk at ages under 65				Relative risk at ages 65 and over			
	Sedentary	Low	Moderate	Vigorous	Sedentary	Low	Moderate	Vigorous
Colorectal cancer	1.70	1.70	1.21	1.00	1.70	1.70	1.21	1.00
Breast cancer	1.40	1.40	1.27	1.00				1.00
Hypertension	1.50	1.50	1.00	1.00	1.25	1.25	1.00	1.00
Ischaemic heart disease - mortality	1.90	1.50	1.36	1.00	1.45	1.25	1.18	1.00
Ischaemic heart disease - incidence	1.50	1.50	1.00	1.00	1.25	1.25	1.00	1.00
Stroke	2.00	2.00	1.00	1.00	1.50	1.50	1.00	1.00
Type 2 diabetes	1.30	1.30	1.00	1.00	1.15	1.15	1.00	1.00
Falls	2.50	2.50	1.79	1.00	2.50	2.50	1.79	1.00
Depression	1.30	1.30	1.00	1.00	1.30	1.30	1.00	1.00

Source: Australian Institute of Health and Welfare, 1999, Table 7.16.

As reported by the US Department of Health and Human Services (2002) researchers at the US Center for Disease Control and Prevention found that physically active people had, on average, lower annual direct medical costs than did inactive people. Moreover they found that

> 'physically active people had fewer hospital stays and physician visits and used less medication than physically inactive people. The cost savings were consistent for men and women and even for smokers and non-smokers.'

Additional research also concluded that 'workplace physical activity programmes can reduce short-term sick leave by 6 to 32 per cent and increase productivity by 2 to 52 per cent'.

Conclusion

In Australia common and preventable risk factors, primarily tobacco-smoking, risky alcohol use, poor diet, overweight and insufficient exercise play a large part in lowering labour force participation and productivity and are principal causes of chronic non-communicable disease leading to high morbidity, mortality and significant health care costs.

National and international evidence increasingly shows that health promotion activities can be highly cost-effective in improving lifestyles and reducing the risks of developing chronic diseases such as Type 2 diabetes. Further, the Type 2 diabetes case studies and the theory espoused by Rose (1992) and endorsed by the WHO (2004) suggest that success in encouraging greater physical activity and reversing population weight gain is maximised through intensive and consistent strategies applied across the entire population.

Australia has recently begun to put in place a wide range of national disease prevention strategies. For example the strategic focus of *Be Active Australia: A framework for health sector action for physical activity 2005-2010* is on building public policy and creating supportive environments that enhance the capacity of individuals and communities for physical activity. In raising the profile of physical activity as a major health problem, action will be taken to improve the capacity of the health sector to respond to community needs and contribute to sustainable health improvements. The *Eat Well Australia: An agenda for action in public health nutrition 2000-2010* is a national approach for the prevention and management of diet-related disease and the Prime Minister's 2004 *Building a Healthy, Active Australia* initiative establishes an after-school physical activity programme for about 150,000 children.

In November 2002 Australian Health Ministers agreed that the problem of overweight, obesity and a sedentary lifestyle required an Australia-wide response and they established the National Obesity Taskforce (see Annex) to:

- develop a national action plan for tacking overweight and obesity which encompasses both immediate investments as well as longer term investments, drawing on existing strategies and structures and developing new approaches where necessary;

- develop and agree on roles and responsibilities for implementing a range of initiatives;

- lead communication within sectors and jurisdictions about implementation of the action plan; and

- bring forward proposals on how the obesity and health weight agenda might continue to be developed beyond the life of the Taskforce (Healthy Weight 2008).

Central to the success of these objectives will be the sustained and coordinated commitment of resources to plan, implement and pursue agreed strategies over many years. The Australian and state and territory governments have an interest in funding the strategy, given the long-term benefits of a healthier population in terms of labour force participation, productivity and health outlays.

Businesses also have an interest as they will benefit from the improved participation and productivity associated with a healthier workforce. Many will also need to adapt to changes in demand that are likely to flow from a successful change in population lifestyles. Accordingly the National Obesity Taskforce has established a Consultative Forum (see Annex) to provide a cross-sectoral perspective and to build on collaboration with other sectors that have a role to play in reducing overweight and obesity and increasing physical activity.

In this way Australia might look forward to reducing the rising incidence of overweight and obesity and physical inactivity that are contributing to the growing burden of Type 2 diabetes and other lifestyle-related chronic diseases. A focus on health promotion that leads to an overall healthier population will increase labour force participation rates and labour productivity, thereby improving the wellbeing of Australians and putting health care expenditure on a more sustainable path as the population ages.

Ideally, over time healthy eating and exercise will become the socially accepted norm in much the same way as not smoking is now regarded as the social norm in Australia.

References

Australasian Society for the Study of Obesity, 2004 *Obesity in Australian Children.*

Australian Bureau of Statistics (ABS) 2001, Cat. No. 4715.0, *National Health Survey: Aboriginal and Torres Strait Islander Results*, Australia, 2001.

Australian Bureau of Statistics (ABS) 2003, Cat. No. 4704.0, *The Health and Welfare of Australia's Aboriginal and Torres Strait Islander Peoples* Australia, 2003.

Australian Diabetes Society, 2002, *DiabCost Australia: Assessing the Burden of Type 2 Diabetes in Australia* — Australian Diabetes Educators Association Annual Scientific Meeting, 26 September 2002, Adelaide.

Australian Institute of Health and Welfare (AIHW) 1999, *The Burden of Disease and Injury in Australia*, November 1999, pp. 124-6.

Australian Institute of Health and Welfare (AIHW) 2002, *Diabetes: Australian Facts 2002*, AIHW Cat. No. CVD 20, Canberra.

Australian Institute of Health and Welfare (AIHW) 2004, *Australia's Health 2004*, Canberra.

Australian Institute of Health and Welfare (AIHW) 2004, *Health system expenditure on disease and injury in Australia, 2000-01*, Health and Welfare Expenditure Series No. 19, May 2004.

Australian Institute of Health and Welfare (AIHW) 2005, *Costs of Diabetes in Australia, 2000-01,* AIHW Bulletin 26 April 2005

Bennett SA, Magnus P and Gibson D 2004, *Obesity trends in older Australians*, AIHW Bulletin No. 12, Cat. No. AUS 42, Canberra.

Berkowitz M and Johnson W 1974, 'Health and labor force participation', *Journal of Human Resources* Vol. 9 No. 1, pp. 117-28.

Bloom D and Canning D 2001, 'The effect of health on economic growth: Theory and evidence', *NBER working paper* No. 8587.

Bound J, Schoenbaum M, Stinebrickner T and Waidmann T 1998, 'The dynamic effects of health on the labor force transitions of older workers', *NBER working paper* No. 6777.

Burton WN, et al 1998, 'The economic costs associated with body mass index in a workplace', *Journal of Occupational and Environmental Medicine* 1998, Sep 40(9) pp. 786-792, reported in *Prevention Makes Common 'Cents'*, US Department of Health and Human Services, September 2003.

Cai L and Kalb G 2004, 'Health Status and Labour Force Participation: Evidence from the HILDA Data', *Melbourne Institute Working Paper* No. 4/04.

Chan S and Stevens A 1999, 'Employment and retirement following a late-career job loss', *American Economic Review* Vol. 89 No. 2, pp. 211-6.

Crotty M, Giles LC, Cameron ID and Brooks PM 2002, 'Musculoskeletal disability, chronic disease and labour force participation in Australia', *International Journal of Disability, Community & Rehabilitation*, Vol. 03.

de Courten M et al 1998, Review of the Epidemiology, Aetiology, Pathogenesis and Preventability of Diabetes in Aboriginal and Torres Strait Islander Populations, Office of Aboriginal and Torres Strait Islander Health, Commonwealth Department of Health and Family Services, Canberra.

Diabetes Prevention Programme Research Group, 2002, 'Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin', *New England Journal of Medicine* 2002, pp. 393-403, reported in Medicine Australia, *Landmark studies in diabetes prevention* at www.medicineau.net.au, accessed on 13 July 2005.

Dixon T and Waters AM 2003, 'A growing problem: trends and patterns in overweight and obesity among Australian adults, 1980-2001', *AIHW Bulletin*, No. 8 Cat. No. AUS 36, Canberra.

Dunstan D, Zimmet P, Welborn T, de Courten M, Cameron A, Sicree R et al 2002, 'The rising prevalence of diabetes and impaired glucose intolerance: the Australian diabetes, obesity and lifestyle study', *Diabetes Care,* 25, pp. 829-34.

Eriksson KF and Lindgarde F 1991, 'Prevention of type 2 (non-insulin dependent) diabetes mellitus by diet and physical exercise: the 6-year Malmo feasibility study', *Diabetologia*, 34(12), pp. 891-898.

Harris MI and Zimmet PZ 1992, 'Classification of diabetes mellitus and other categories of glucose intolerance, in Keen H et al (eds), *The international textbook of diabetes mellitus*, London, John Wiley, pp. 3-18, Reported in AIHW 2002.

Gannon B and Nolan B 2004, *Disability and Labour Market Participation*, The Economic and Social Research Institute.

Grady R and Hayward M 1986, 'The occupational retention and recruitment of older men: the influence of structural characteristics of work', *Social Forces,* Vol. 64 No. 3.

Healthy Weight 2008, *Australia's Future, The National Action Agenda for Children and Young People and their Families*, Commonwealth of Australia, 2003.

Heithoff KA, Cuffel BJ, Kennedy S, Peters J 1997, 'The association between body mass and health care expenditures', *Clinical Therapy*, Jul-Aug 19(4) pp. 811-820, reported in *Prevention Makes Common 'Cents'*, US Department of Health and Human Services, Sep 2003.

International Diabetes Federation 2003, *Diabetes Atlas*, 2nd Edition, Belgium.

Jose A, Ravindiran R and Abello R 2004, 'Health status labour force non-participation nexus: Evidence from pooled NHS data.' Paper prepared for the 12th Biennial Conference of the Australian Population Association, 15-17 September, Canberra.

Kidd M, Sloane P and Ferko I 2000, 'Disability and the labour market: an analysis of British males', *Journal of Health Economics*, Vol. 19, Issue 6, pp. 961-81.

Landers DM 1997, 'The Influence of Exercise on Mental Health', Arizona State University, reported in *President's Council on Physical Fitness and Sports (PCPFS) Research Digest,* Series 2, No. 12.

Mathers C, Vos T and Steveson C 1999, 'The burden of disease and injury in Australia', November 1999, AIHW, Canberra.

Mathers C, Vos T, Stevenson C and Begg S 2000, 'The Australian Burden of Disease Study: measuring the loss of health from diseases, injuries and risk factors', *The Medical Journal of Australia*, Vol. 172, 19 June 2000 as reported in *ABS Year Book 2002*, Health Special Article — Chronic diseases and risk factors.

McGarry K 2002 'Health and retirement: Do changes in health affect retirement expectations?', *NBER working paper* No. 9317.

Medicine Australia, '*Landmark studies in diabetes prevention*'; available from www.medicineau.net.au, accessed on 13 July 2005.

National Centre for Monitoring Diabetes, 2002, *Diabetes: Australian Facts*, November 2002.

Pan XR, Li GW, Hu YH et al 1997, 'Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance: the Da Qing IGT and Diabetes Study', *Diabetes Care,* 20 pp. 537-44.

Pate RR et al 1995, 'Physical Activity and Public Health', JAMA 273 pp. 402-407, reported in *Prevention Makes Common 'Cents'*, US Department of Health and Human Services, Sep 2003.

Puska P 1999, 'The North Karelia Project: from community intervention to national activity in lowering cholesterol levels and CHD risk', *European Heart Journal Supplements* (S).

Rose G 1985, 'Sick individuals and sick populations', *International Journal of Epidemiology*, 14, pp. 32-8.

Rose G 1992, *The Strategy of Preventive Medicine*, Oxford Medical publication, Oxford University Press.

Soderberg S et al 2004, 'High incidence of type 2 diabetes and increasing conversion rates from impaired fasting glucose and impaired glucose tolerance to diabetes in Mauritius', *Journal of Internal Medicine*, 256: pp. 1-37.

Tucker LA et al 1998, 'Obesity and Absenteeism: an epidemiologic study of 10,825 employed adults', *American Journal of Health Promotion,* 12(3) pp. 202-207, reported in *Prevention Makes Common 'Cents'*, US Department of Health and Human Services, Sep 2003.

Tuomilehto J et al 2001, 'Prevention of Type 2 Diabetes Mellitus by Change in Lifestyle among Subjects with Impaired Glucose Tolerance', *The New England Journal of Medicine*, Vol 344, No.18, 3 May 2001, pp. 1343-50.

Tuomilehto, J 2004, Unpublished data presented to the Department of Health and Ageing, 8 December 2004. Six year data was reported in *New England Journal of Medicine* 2001, 344, pp. 1343-50.

US Dept of Health and Human Services, 2002, '*Physical Activity Fundamental to Preventing Disease*', 20 June 2002.

World Health Organisation 2004, *Global strategy on diet, physical activity and health*, Report by the Secretariat to 57th World Health Assembly, A57/9, 17 April.

Annex

National Obesity Taskforce (2003)

Membership comprises: Secretary, Australian Government Department of Health and Ageing (Chair), State Health Department representatives from NSW, Victoria and Tasmania, Chair of the National Public Health Partnership (from WA), Chair of the Strategic InterGovernmental Nutritional Alliance, Chair of the Strategic InterGovernmental forum on Physical Activity and Health; and a Scientific Adviser.

National Obesity Taskforce, Consultative Forum

Membership comprises representatives from: Australian Chronic Disease Prevention Alliance, Australian Consumers' Association, Australian Council on Health, Physical Education and Recreation, Australian Council of State School Organisations/Parents and Citizens Association, Australian Association of National Advertisers, Australian Chamber of Commerce and Industry, Australian Divisions of General Practice, Australian Food and Grocery Council, Australian Medical Association, Australian Principals Association Professional Development Council, Australian Retailers Association, Commercial Television Australia, The Coalition on Food Advertising to Children, Early Childhood Australia, Fitness Australia, Horticulture Australia Limited, McDonald's Association, National Aboriginal Community Controlled Health Organisations, Planning Institute of Australia , Public Health Association of Australia, Royal Australian College of General Practitioners, Standing Committee on Recreation and Sport, Scientific Reference Group, Food Security representative NSW Centre for Public Health Nutrition.

Net tax thresholds for Australian families

Kerrie Bremner[1]

A net tax threshold (NTT) is the maximum amount of private income a family or person can have before their income tax liability exceeds their government cash benefits entitlement. This study compares NTTs and disposable incomes for different family types for the 1996-97 and 2006-07 financial years and discusses changes to the tax and cash transfer systems that have impacted on the 2006-07 outcomes. Also examined is the distribution of Australian families who are above or below their net tax threshold with analysis by family type, number of children, and State; a comparison is made between 1996-97 and 2005-06.

1 The author is from Tax Analysis Division, the Australian Treasury. This article has benefited from comments and suggestions provided by Phil Gallagher and Simon Lambert. The views in this article are those of the author and not necessarily those of the Australian Treasury.

Introduction

Governments are often criticised for not giving large tax cuts to low-income earners. However, many low-income earners pay very little tax, if any at all, and would not be able to benefit from tax cuts. For this reason, an increase to family payments or benefits is often a more effective vehicle to target assistance to low-income earners than the tax system. In 2005-06 an estimated 38 per cent of Australian families will receive more money in benefits from the Australian Government than they will pay in income taxes.

The Australian system of cash benefits and family payments is tightly targeted and aims to provide assistance to those in need whilst keeping the cost affordable. Therefore most government payments are income and asset tested. The personal income tax system is progressive and includes many tax offsets. Also included in the tax system is the Medicare levy.

A net tax threshold (NTT) is the private income at which income tax liability first exceeds cash benefit entitlements. NTTs provide a useful measure of the interaction between cash transfers and income tax. During the period of this study there have been many changes in the government programmes that determine NTTs. These have included:

- increases in the value of family payments;
- reductions in marginal rates of income tax;
- increases in income tax thresholds;
- liberalisation of income tests for family payments, pensions, and allowances; and
- the introduction of, and increases in, the value of several tax offsets.

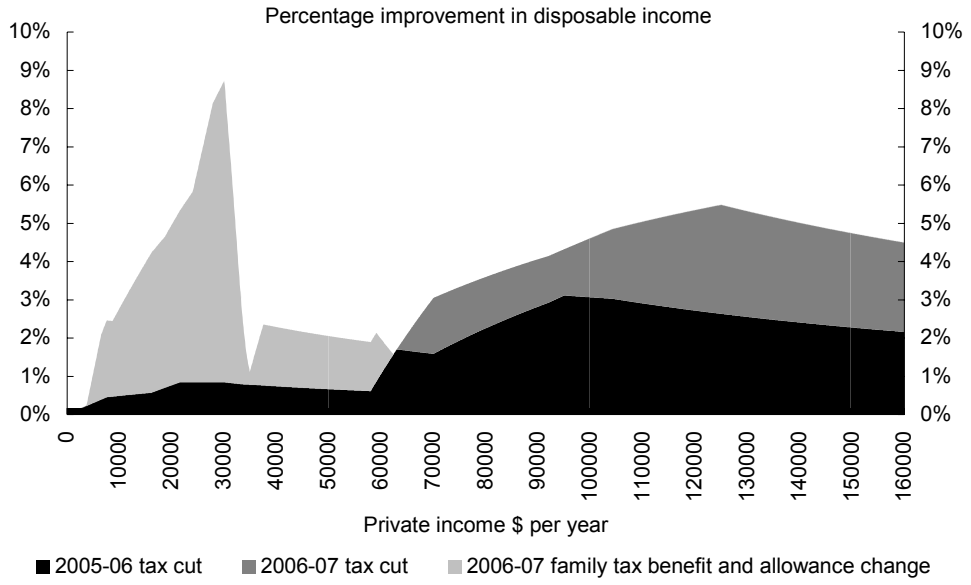
Some of the policy reforms that have implemented these changes include: The New Tax System (TNTS) in 2000, the More Help for Families package announced in the 2004-05 Budget, the Extra Assistance for Families package announced in the lead-up to the 2004 Election, and the Welfare to Work package announced in the 2005-06 Budget, together with cuts to personal income tax.

Since 1996-97, real earnings have grown and unemployment has declined. Recent analysis by the National Centre for Social and Economic Modelling shows that, between 1997-98 and 2004-05, the real disposable incomes of low-income families will have grown by an average of $87 per week (McNamara, Lloyd, Toohey and Harding 2004). Household income distribution statistics published by the Australian Bureau of Statistics (2005) show that the real equivalent disposable income of low-income

families improved by 9 per cent between 2002-03 and 2003-04, largely because of changes in family payments.

Changes in pensions and allowances can also improve living standards for low-income families. Chart 1 depicts the percentage gains in disposable income a single-income couple with two children aged 3 and 8 would make in 2006-07 as a result of the changes announced in the 2005-06 Budget. At the lower incomes it is the enhancement to Newstart Allowance, not tax cuts, which gives the family the biggest gains in disposable income and provides incentive to work.

Chart 1: Effects of 2005-06 Budget on the disposable income of a single-income couple



Background on net tax thresholds

Definition

A family's NTT is the amount of private income they can have before income tax paid exceeds cash benefits received from the Australian Government. In this study NTTs have been calculated on a **family** basis rather than for the individual.

The family has been chosen as the unit of analysis because the calculation of NTTs for partnered individuals is problematic. Typically government cash transfers received by couples have income tests that take into account the incomes of both partners. This means that for a partnered person the NTT will depend on the level of their partner's income. The situation becomes even more difficult when family payments are

involved, as a decision would need to be made as to who is the recipient of the payments for the purposes of calculating individual NTTs.

NTTs differ for different family types because of the different entitlements that are targeted at people in different circumstances. For example, the amount of Family Tax Benefit Part A a family is entitled to is determined by the number of dependants and their ages. The tax system also contains elements where different people are treated differently, for example the Senior Australians Tax Offset is available only to people of a certain age. Even two families who look the same in structure, for example same age and number of children, can have different NTTs as a result of different income splits between the income recipients. Therefore a decision has to be made about the split of income for partnered couples when calculating NTTs.

Methodology

The STINMOD Model

Due to the complexity of both the cash benefits system and the tax system it is easier and more reliable to utilise a micro simulation model to calculate NTTs. The model used in this study for both the hypothetical scenarios and the distributional study was a Treasury-modified version of STINMOD (designated STINMOD* in this paper).

STINMOD* is a static micro simulation model which was developed by the National Centre for Social and Economic Modelling (NATSEM). The model is a computer program which replicates the rules of government expenditure and revenue programmes. These rules can then be applied to single hypothetical families or to population samples which contain sufficient demographic data, including labour force status, age, housing and financial detail about individuals and families. The population samples used for this study are based on ABS Surveys of Income and Housing Costs. The survey datasets need to be brought forward in time to represent the current year or a year in the near future. So the surveys have been reweighted, incomes uprated, and variables adjusted and imputed as necessary to fit the requirements of the model and to represent the selected time period (see Bremner et al, 2002).

Only Commonwealth cash benefits and the personal income tax system are taken into account in this study. Because of data constraints, and modelling difficulties, State benefits and State taxes, including the GST, are not modelled. Programmes modelled include Family and Community Services (FaCS) pensions and allowances, family payments, Rent Assistance, Pharmaceutical Allowance, Department of Veterans' Affairs (DVA) payments, personal income tax, tax offsets including the Mature Age Worker Tax Offset, and the Medicare levy.

Because of the complexity of some government programmes and the limited information provided on survey files, not all elements of Australian Government programmes are modelled in STINMOD*. For example Remote Area Allowance, Abstudy, Double Orphan Pension, Bereavement Allowance, and Mobility Allowance are not modelled. Child Care Benefit and Higher Education Contribution Scheme policy rules are programmed into STINMOD* and can be used for hypothetical scenarios but, because of limited information on the survey data, are not included in the distributional analysis undertaken for this study. Although many government payments have assets tests, only income tests are modelled, once again because of insufficient detail in the survey data.

Hypothetical cameos

Cameos

A hypothetical cameo is not based on survey data — its characteristics are made up by the researcher to examine the theoretical impacts of policy settings.

Twenty different hypothetical families were examined, with their disposable income and NTT calculated for both 1996-97 and 2006-07. The cameos chosen included both young and old, singles and couples with and without children. Families with children have two, one aged 3 years and the other 8 years. Various income splits were selected for the couple scenarios, with private incomes being specified as a percentage of AWOTE (average weekly ordinary time earnings for full-time employees). Three different senior single cameos were modelled, one with zero private income, one with wage income, and one with investment income. A senior Australian with income from wages is entitled to the Mature Age Worker Tax Offset in the 2006-07 year.

Table 1: Hypothetical families modelled

		As percentage of AWOTE		
Description	Children	Income of head	Spouse's income	Income split
Single person		67%		100
Single person		100%		100
Single person		167%		100
Sole parent	2	0%		100
Sole parent	2	67%		100
Couple		133%	0%	100:0
Couple		167%	0%	100:0
Couple		100%	33%	75:25
Couple		100%	67%	60:40
Couple	2	100%	0%	100:0
Couple	2	133%	0%	100:0
Couple	2	167%	0%	100:0
Couple	2	100%	33%	75:25
Couple	2	100%	67%	60:40
Couple	2	167%	100%	62.5:37.5
Senior single		0%		100
Senior single		33% (wages)		100
Senior single		33% (investment)		100
Senior couple		33% (investment)	33% (investment)	50:50
Pensioner couple		0%	0%	50:50

Calculation

The details of the hypothetical families are run through STINMOD* in order to calculate their disposable incomes. Both a 1996-97 policy and a 2006-07 policy version of STINMOD* were used in the study, with the parameters being financial year averages. The parameters and AWOTE used for 2006-07 were forecast. The policy changes announced in the 2005-06 Budget were included in the 2006-07 version of STINMOD*.

The calculation of a family's NTT is an incremental process. Income was increased by a dollar at a time, in accordance with the family's income split in the case of couples, and then the family was run through STINMOD*. This continued until the family's government cash benefits were equal to their tax paid. For example a couple with a 75:25 income split would have an extra 75 cents added to the head's income and 25 cents added to the spouse's income for each run of STINMOD* until the NTT was reached.

After the disposable income and NTT calculations were made all dollar amounts were then expressed in 2005-06 dollars.

Results

The real disposable incomes of the families modelled have all risen since 1996-97. The increase in the real NTTs has been even more substantial for many of the families.

Table 2: Real disposable income for hypothetical families, 1996-97 and 2006-07

Family types and wage as percentages of AWOTE	Real disposable income ($2005-06)		
	1996-97	2006-07	% change
Single person (67%)	$24,286	$28,672	18.1%
Single person (100%)	$33,888	$40,989	21.0%
Single person (167%)	$50,218	$63,028	25.5%
Sole parent (0%)	$19,382	$24,726	27.6%
Sole parent (67%)	$34,088	$40,749	19.5%
Single-income couple (133%)	$44,050	$54,477	23.7%
Single-income couple (167%)	$51,848	$64,637	24.7%
Dual-income couple (100% and 33%)	$47,415	$57,110	20.4%
Dual-income couple (100% and 67%)	$58,174	$69,661	19.7%
Single-income couple with children (100%)	$38,070	$49,312	29.5%
Single-income couple with children (133%)	$46,603	$59,815	28.4%
Single-income couple with children (167%)	$54,401	$69,941	28.6%
Dual-income couple with children (100% and 33%)	$49,170	$61,286	24.6%
Dual-income couple with children (100% and 67%)	$59,929	$73,195	22.1%
Dual-income couple with children (167% and 100%)	$84,106	$104,017	23.7%
Senior single (0%)	$11,469	$12,930	12.7%
Senior single (33% wages)	$18,485	$23,588	27.6%
Senior single (33% investment return)	$18,485	$23,101	25.0%
Senior couple (33% and 33% investment returns)	$32,598	$41,666	27.8%
Pensioner couple (0% and 0%)	$19,014	$21,486	13.0%

Table 3: Real net tax thresholds for hypothetical families, 1996-97 and 2006-07

Family types and wage as percentages of AWOTE	Real effective net tax threshold ($2005-06)		
	1996-97	2006-07	% change
Single person (67%)	$14,926	$16,649	11.5%
Single person (100%)	$14,926	$16,649	11.5%
Single person (167%)	$14,926	$16,649	11.5%
Sole parent (0%)	$34,502	$44,951	30.3%
Sole parent (67%)	$34,502	$44,951	30.3%
Single-income couple (133%)	$16,083	$27,497	71.0%
Single-income couple (167%)	$16,083	$27,497	71.0%
Dual-income couple (100% and 33%)	$19,466	$30,460	56.5%
Dual-income couple (100% and 67%)	$22,646	$31,067	37.2%
Single-income couple with children (100%)	$33,931	$44,951	32.5%
Single-income couple with children (133%)	$33,931	$44,951	32.5%
Single-income couple with children (167%)	$33,931	$44,951	32.5%
Dual-income couple with children (100% and 33%)	$34,559	$47,891	38.6%
Dual-income couple with children (100% and 67%)	$34,657	$46,884	35.3%
Dual-income couple with children (167% and 100%)	$34,641	$47,003	35.7%
Senior single (0%)	$20,205	$25,575	26.6%
Senior single (33% wages)	$20,205	$26,310	30.2%
Senior single (33% investment return)	$20,205	$25,575	26.6%
Senior couple (33% and 33% investment returns)	$33,893	$43,956	29.7%
Pensioner couple (0% and 0%)	$33,893	$43,956	29.7%

The single-income couple families with children have enjoyed the greatest increases in disposable income with each having an increase of over 28 per cent. In 2006-07, the dual-income couple cameos modelled still have slightly higher disposable incomes than the single-income couples with the same total private income: $61,286 and $73,195 as opposed to $59,815 and $69,941 respectively.

As shown in Table 3, the sole parent and single-income couples with children cameos show a real NTT of $44,951 in 2006-07, an increase of 30.3 per cent for sole parents and 32.5 per cent for single-income families. Current tax and family assistance policy treats sole parents and single-income families alike, which is reflected in their 2006-07 NTTs.

Single-income couples with no children have had a 71 per cent increase in their real NTT since 1996-97, with dual-income couples also fairing well. Both single and couple seniors have also had substantial increases in both their disposable income and NTT.

The substantial reforms to the family payments system in recent years are reflected in the families with children cameos, which all show significant increases in both their disposable incomes and NTTs. Policy changes which have contributed to the increases achieved by seniors include the introduction of the Senior Australians Tax Offset (SATO), increased pensions under The New Tax System, and the Mature Aged Worker Tax Offset. Senior Australians who are eligible for SATO will now pay no tax on

annual incomes of up to $21,968 for singles and up to $36,494 for couples. These amounts could be higher again if they are eligible for the Mature Age Worker Tax Offset. Also contributing to the increases in disposable incomes and NTTs are the tax cuts over this period.

Distributional analysis

Population

In the above analysis NTTs were calculated for some representative hypothetical family types. Distributional analysis of NTTs is undertaken by applying the NTT concept to representative samples of Australian families for both 1996-97 and 2005-06. Modified unit record data from ABS Surveys of Income and Housing Costs are used by STINMOD* to represent the Australian population for these two financial years. Because of sampling and non-sampling errors in the survey data and assumptions underlying the modifications made to the original data, the population may differ somewhat to the actual.

Calculation

The sample data sets are run through STINMOD* and government benefits receivable and income tax payable are calculated for each of the families in the data. Each family's position in relation to their NTT is then determined by subtracting income tax and dividend imputation credits from cash benefits received. If a family receives more government cash benefits than they pay in tax then they are said to be in a positive net tax position, otherwise they will be in a negative net tax position. The negative net tax payer families also include those whose government cash benefits are equal to their income tax payable — typically both components of the NTT calculation are zero in the equality case. In 2005-06 there were an estimated 544,400 families (5 per cent of all families) who had a net tax gap equal to zero, compared with 454,400 families (also 5 per cent of all families) in 1996-97.

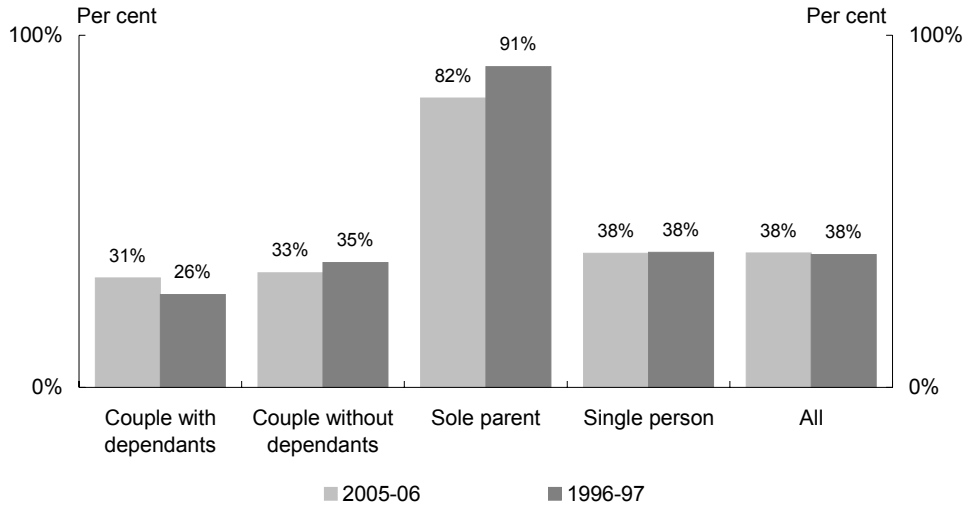
Four family types are analysed — couples without dependants, couples with dependants, sole parents and single people. Demographic changes between 1996-97 and 2005-06, such as changes in average family size, can distort the results somewhat.

Results

In 2005-06 an estimated 38 per cent of families in the population receive more cash benefits than they pay in tax. As shown in Chart 2 the distribution of these families is not equally dispersed between family types, particularly in the case of sole parents where 82 per cent receive more cash benefits than they pay in tax.

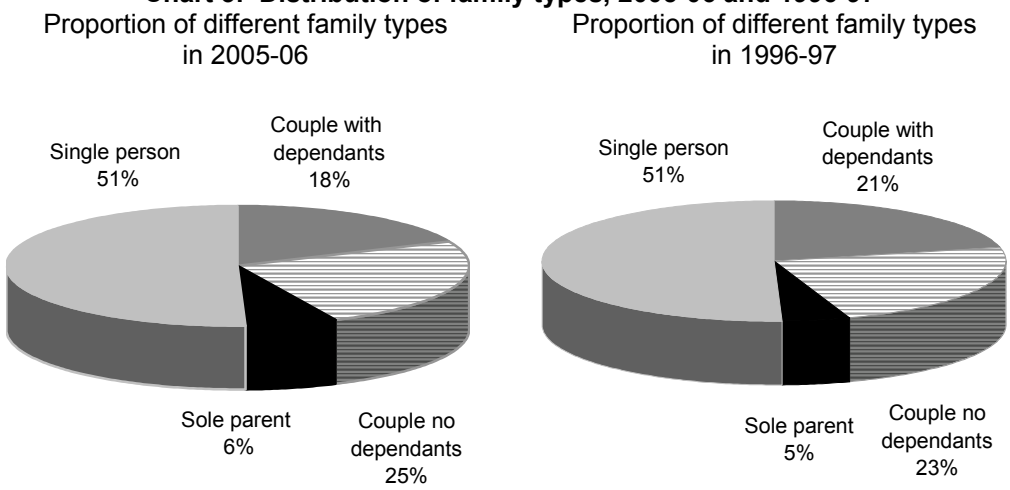
In 1996-97, there were also 38 per cent of families who received more in benefits than they paid in tax; however the 1996-97 distribution of families with a positive net tax gap differed somewhat to that in 2005-06. In 1996-97 a higher proportion of sole parents had positive net tax gaps, 91 per cent compared with 82 per cent in 2005-06. The increase in the proportion of couple families with dependants who are in a positive net tax position is largely the result of increases in family payments.

Chart 2: Proportion of families in a positive net tax position by family type



The proportion of different family types in the population differed only slightly between 1996-97 and 2005-06, with a marginal 3 per cent decrease in the proportion of couples with dependants and a slight increase in the proportion of sole parents and couples without dependants (Chart 3).

Chart 3: Distribution of family types, 2005-06 and 1996-97



The proportion of families in the population with a positive net tax gap does not tell us anything about the size of this gap. Although the population percentage of families with a positive net tax gap was the same in 1996-97 and 2005-06, there has been an estimated 11 per cent increase in the average real amount of the net tax gap. Table 4 below shows estimates of the average real positive net tax gap broken down by family type for both 1996-97 and 2005-06. The average amount has increased across all family types.

It is interesting to note that although the proportion of sole parents in the population who have a positive net tax gap has decreased between 1996-97 and 2005-06, the real average dollar amount of the gap has increased by 17 per cent. Increased employment by sole parents is the likely cause of the decrease in the proportion of those with positive net tax gaps, with family payment reforms causing an increase in the average net tax gap amount.

The increase in the average gap for single people is largely a result of policy initiatives targeted at senior Australians such as increases to pensions and SATO.

Table 4: Estimated average positive net tax gap for population groups

Family type	Average positive net tax gap amount ($2005-06 pw)		% change
	1996-97	2005-06	
Couple with dependants	$260	$277	6%
Couple	$338	$362	7%
Sole parent	$328	$385	17%
Single person	$204	$230	12%
All	$257	$286	11%

Tables 5 and 6 contain estimates for 2005-06 and 1996-97 of the net tax position of couples with children and sole parents broken down by whether they have two or fewer children aged under 16, or more than two. The results clearly show that families with more than two children are more likely to have a positive gap than those with two or fewer. The proportion of families with a positive gap with three or more children has increased from 39 per cent in 1996-97 to 51 per cent in 2005-06.

Table 5: Net tax position by number of children, 2005-06

Family type	Net tax position 2005-06					
	Two or fewer children aged under 16		All	Three or more children aged under 16		All
	Negative or zero	Positive		Negative or zero	Positive	
Couple with dependants	73%	27%	100%	49%	51%	100%
Sole parent	20%	80%	100%	4%	96%	100%
All	59%	41%	100%	41%	59%	100%

Table 6: Net tax position by number of children, 1996-97

Family type	Net tax position 1996-97					
	Two or fewer children aged under 16		All	Three or more children aged under 16		All
	Negative or zero	Positive		Negative or zero	Positive	
Couple with dependants	77%	23%	100%	61%	39%	100%
Sole parent	9%	91%	100%	5%	95%	100%
All	63%	37%	100%	54%	46%	100%

Also of interest is the distribution of families in positive net tax positions by State (Chart 4). Both Tasmania and South Australia have a slightly larger proportion of families with positive gaps compared to the other States and Territories. The ACT and the NT have the lowest proportion. There is no noticeable variation in proportions between 1996-97 and 2005-06 (Chart 5).

Chart 4: Proportion of families in a positive net tax position by State/Territory

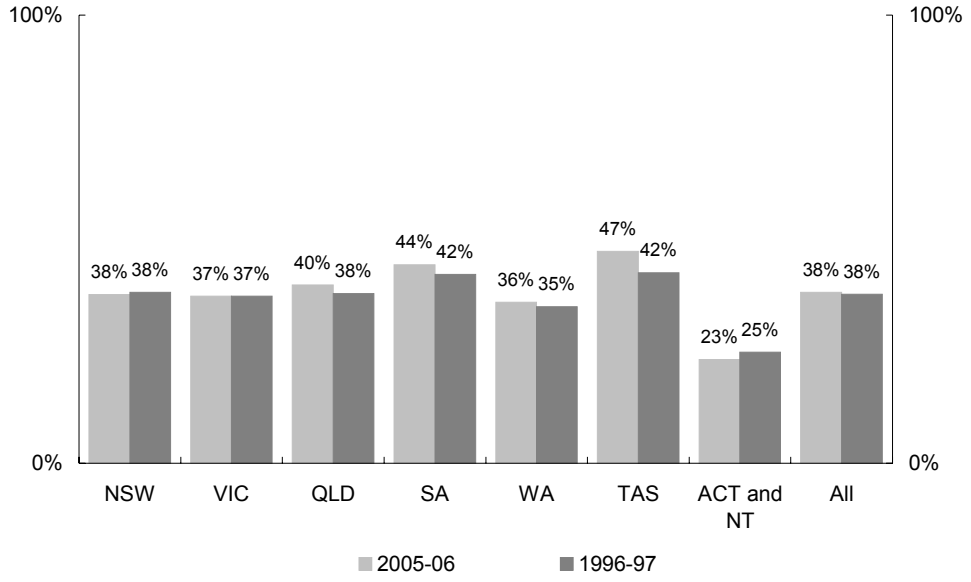
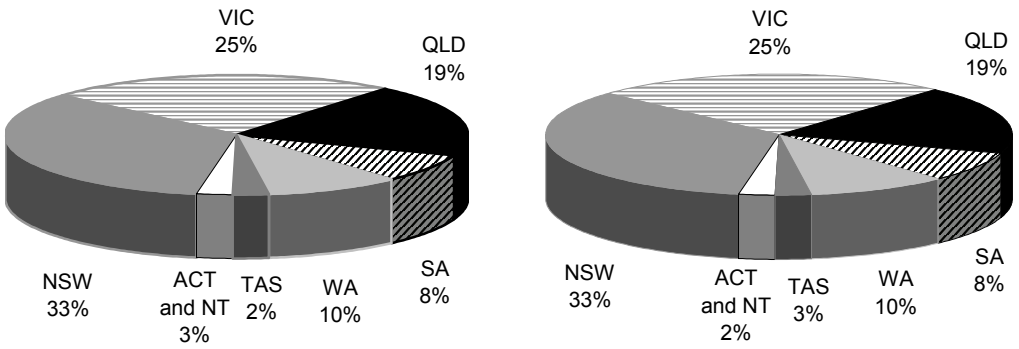


Chart 5: Proportion of families in different States and Territories



Conclusion

The real dollar amount of both NTTs and disposable incomes increased substantially between 1996-97 and 2005-06 for all the cameos modelled in this study. The increases were particularly noticeable for couples with children. This is largely a result of the recent policy emphasis on assisting Australian families with children. The distributional analysis further supported the large impact the family policies have had on families with children, particularly larger families.

References

Australian Bureau of Statistics 2005, 'Household income and income distribution, Australia, 2003-04' (Cat. No 6523.0), August.

ACOSS 2004, 'Analysis of NATSEM Research on low income families', *ACOSS Information Paper*, October.

Bremner K, Beer G, Lloyd R and Lambert S 2002, *Creating a basefile for STINMOD*, Technical Paper No 27, National Centre for Social and Economic Modelling, June.

McNamara J, Lloyd R, Toohey M and Harding A 2004, *Prosperity for all? How low income families have fared in the boom times,* National Centre for Social and Economic Modelling, October.

Tax system complexity and compliance costs — some theoretical considerations

Tracy Oliver and Scott Bartley[1]

This paper examines some of the factors that influence the level of tax system complexity and taxpayers' compliance costs. The policy trade-offs and legislative and administrative design choices that are made during the development and implementation of a new provision have a direct bearing on the complexity of the tax system and the compliance costs of taxpayers. Private interest in minimising tax liabilities can also be an important driver of tax system complexity. This paper shows how tax-minimising behaviour can lead to a level of tax system complexity and compliance costs in excess of that which is likely to be optimal from the perspective of society as a whole.

1 The authors are from Tax Analysis Division, the Australian Treasury. This article has benefited from comments and suggestions provided by Mike Callaghan, Paul Flanagan, Rick Krever and Nigel Ray. The views in this article are those of the authors and not necessarily those of the Australian Treasury. An earlier version of this paper was presented to the OECD Committee of Fiscal Affairs, Working Party 2 meeting in June 2005.

Introduction

The level of tax system complexity and the level of taxpayer compliance costs are important matters for taxpayers, government and policy makers for a number of reasons.

The purpose of this paper is to highlight some of the factors that influence tax system complexity including the economic and social environment faced by taxpayers, taxpayer behaviour, and the development, implementation and administration of tax policy. The paper begins by explaining why complexity and compliance costs are important and shows how the cumulative impact of many 'simple' tax measures can create an overly complex set of tax law. The paper then examines how tax policy design can influence the level of complexity, for example when policy makers trade off simplicity to achieve other tax goals such as equity and efficiency. Lastly, the paper shows that taxpayers may be willing to accept, and even demand, complexity if potential tax savings outweigh any increase in their compliance costs. The analysis indicates how such demands can move the tax system beyond a socially or privately optimal level of complexity.

Why complexity and compliance costs are important

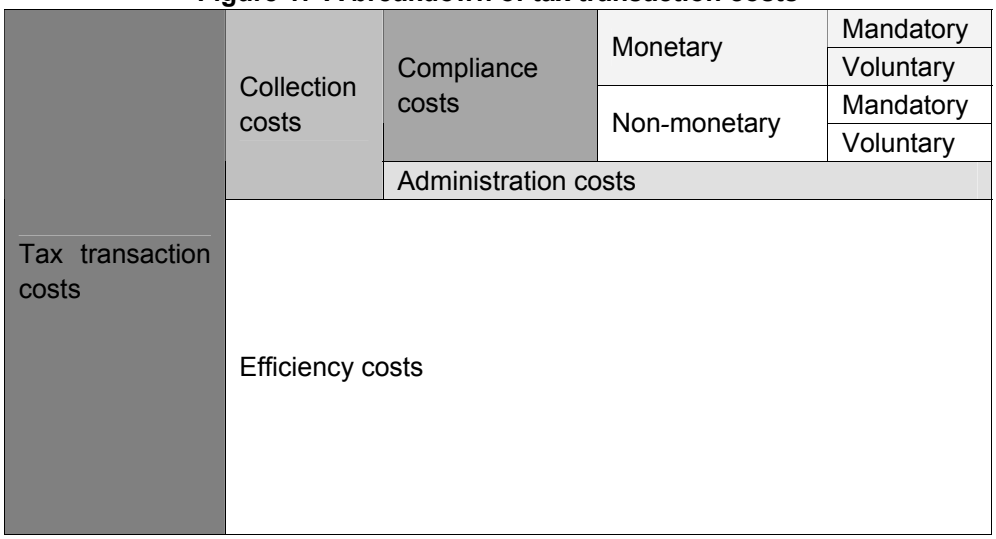
Figure 1 provides a schematic representation of the types of costs incurred in raising revenue. There are two main types of cost associated with raising revenue: collection costs and efficiency costs. By far the largest of these are the efficiency costs, being several multiples of collection costs.[2] Notwithstanding the importance of efficiency costs, which to a reasonable extent are an unavoidable consequence of raising revenue, the focus of this paper is on collection costs.

Collection costs comprise government administration costs and the compliance costs incurred by taxpayers in meeting their obligations under the tax assessment Acts. Compliance and administration costs have been estimated to be around 2 per cent of GDP.[3]

2 These efficiency costs arise because the tax system distorts the allocation of resources relative to the optimal position (see, for instance, Harberger AC (1966) 'Efficiency Effects of Taxes on Income from Capital,' in Krzyzaniak M ed., *Effects of Corporation Income Tax*, Detroit, Wayne State University Press.)

3 Two major studies of taxpayer compliance costs have been conducted in Australia, both focused at the 'macro' level, these being a 1997 study by the Australian Taxation Studies Program, for the Australian Taxation Office, and an earlier study led by Jeff Pope at the Australian Tax Research Foundation.

Figure 1: A breakdown of tax transaction costs



Compliance costs cover a wide spectrum of both monetary and non-monetary costs. They include, but are not limited to, the costs of: acquiring the necessary knowledge of relevant aspects of the tax system; compiling records; acquiring and maintaining tax accounting systems and completing tax return forms; evaluating the tax effectiveness of alternative transactions or alternative methods of complying with the requirements of the law; and collecting and remitting taxes levied on employees and turnover.

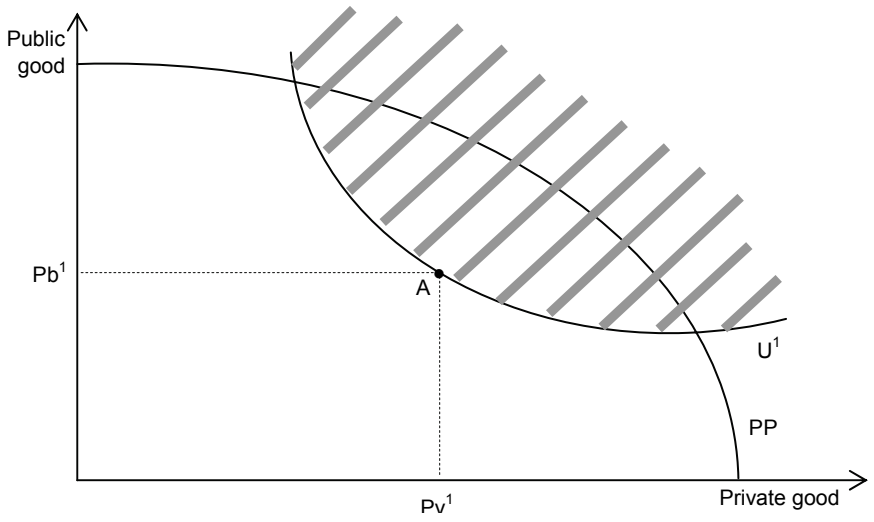
Compliance costs can be further categorised into mandatory costs and voluntary costs. Mandatory costs are those costs that taxpayers must incur to meet their statutory obligations. For example, the law requires that taxpayers report all forms of income identified within the statute and be able to substantiate any claimed deductions, rebates or offsets. Voluntary costs are those additional costs that the taxpayer may choose to incur to determine or minimise their tax liability. For example, taxpayers may choose to evaluate alternative methods of complying with the law to determine which produces the most favourable tax outcome. They may also seek advice to identify tax-effective ways to structure transactions. Voluntary costs may also be incurred in calculating and applying deductions, rebates and other concessions for which the taxpayer is eligible but not legally required to claim.

A certain level of collection costs will always be associated with raising the revenue to be spent by government on redistribution and the provision of goods and services. The higher these costs, the lower the socially desirable level of these goods and services, other things equal.

To illustrate how compliance costs affect economic output, consider an economy that produces two goods, a public good and a private good.[4] Figure 2 shows a possible production possibility curve (PP) for the two goods. A production possibility curve shows the boundary between the attainable and unattainable levels of production. It is the limit of what an economy can produce from its resources and technology. If a tax system is associated with excessive levels of compliance costs, the economy will not be performing on its production possibility curve.

Point A on Figure 2 shows such a sub-optimal level of production. At point A the highest attainable level of social utility is represented by the social utility curve U^1. At this point the level of goods produced by the private and public sectors will be Pv^1 and Pb^1 respectively. Reducing the level of compliance costs would allow society to move to a higher level of production and utility. Note that a decrease in the level of compliance costs does not necessarily result in a higher level of either the public good or the private good, but the production of at least one of the goods must increase.

Figure 2: Compliance costs and the production possibility curve



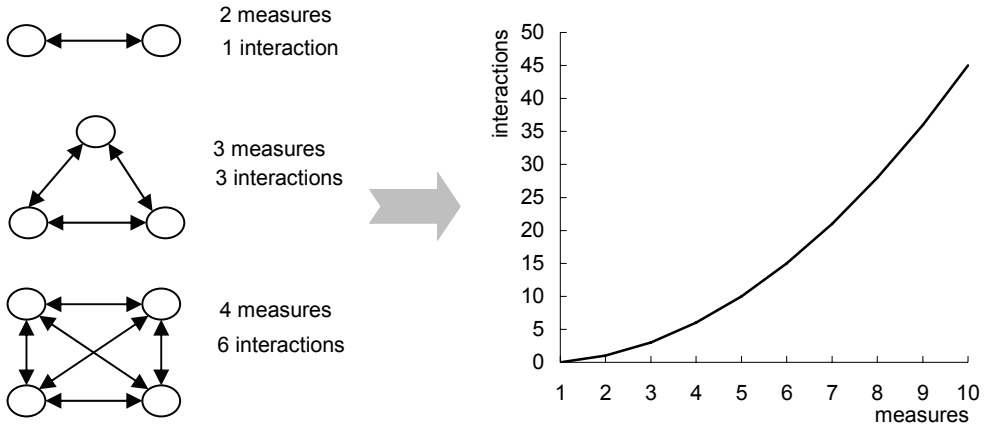
Cumulative impact of many changes

A new tax measure does not have to be complex itself to increase the level of tax system complexity. Often, government is asked to make a 'simple' change to the tax

4 A public good has two particular characteristics: non-rivalry (consumption by one person does not reduce the amount available for others) and non-excludability (once the good is provided it is impossible to stop people consuming it even if they have not paid). Common examples of public goods are national defence and lighthouses. (See Samuelson PA (1954), 'The Pure Theory of Public Expenditure,' *Review of Economics and Statistics*, vol. 36, November, pp. 387-389).

law, but the compounding effect of many separate relatively simple tax measures can result in complex interrelated provisions. As the number of provisions increases, understanding the relationships between them can become more difficult. Figure 3 shows how the addition of one extra measure can compound the number of possible interactions that may need to be considered.

Figure 3: The exponential relationship between measures and complexity



The cumulative complexity generated by many individual provisions may be further compounded by the rate of change in the law. Even relatively simple changes to the law may collectively impede the ability of taxpayers to understand the requirements of the law without needing to seek professional assistance.[5]

Drivers of complexity

Tax system complexity is the product of a range of influences, both external and internal to the development, implementation and administration of tax policy. The following sections provide a brief overview of some of the key factors influencing the level of tax system complexity. These factors are organised according to whether they originate from the policy process or as a result of the private interests of taxpayers.

Tax policy drivers of complexity

In developing and implementing tax policy, policy makers are faced with a range of trade-offs. Notwithstanding the importance of simplicity, most policy decision-making requires judgments on how simplicity is to be balanced with other policy objectives.

5 See the Business Council of Australia's *Taxation Action Plan – for Future Prosperity*, April 2005 for more details of business concerns.

These other objectives may include equity, efficiency, social issues, certainty, choice, transparency and revenue protection.

Tax axiom trade-offs

Policy makers must decide on the relative trade-off between the competing tax axioms of simplicity, equity and efficiency when raising a given level of revenue. For instance, both a poll tax and a perfect set of Ramsey taxes might have relatively low efficiency costs.[6] However, the former is likely to have a low level of complexity, while the latter would require extreme complexity as each commodity transaction requires a different tax rate. Points in between these two polar cases (that is, all real world tax systems) will have higher efficiency costs. In the same way, the relationship between equity and simplicity is not linear. A simple poll tax is usually considered to be inequitable but so might a complex Ramsey tax system.

To allow for a simple two-dimensional analysis, the following framework considers equity and efficiency as one element. It is reasonable to expect that a degree of complexity is necessary to raise revenue in a way that is both equitable and efficient. The framework proposes, however, that excessive complexity will begin to reduce equity and/or efficiency as more and more concessions, exemptions and anti-avoidance measures are introduced.

Whether excessive complexity results in equity or efficiency losses, or both, will depend on the extent of any associated behavioural change.[7] For example, suppose that an arbitrary concession is granted to a particular industry. Such a concession would reduce horizontal equity as that particular industry would pay less tax than other industries with similar characteristics. If the concession induced a large shift into that industry, then there would also be efficiency losses due to the distortion of economic activity.

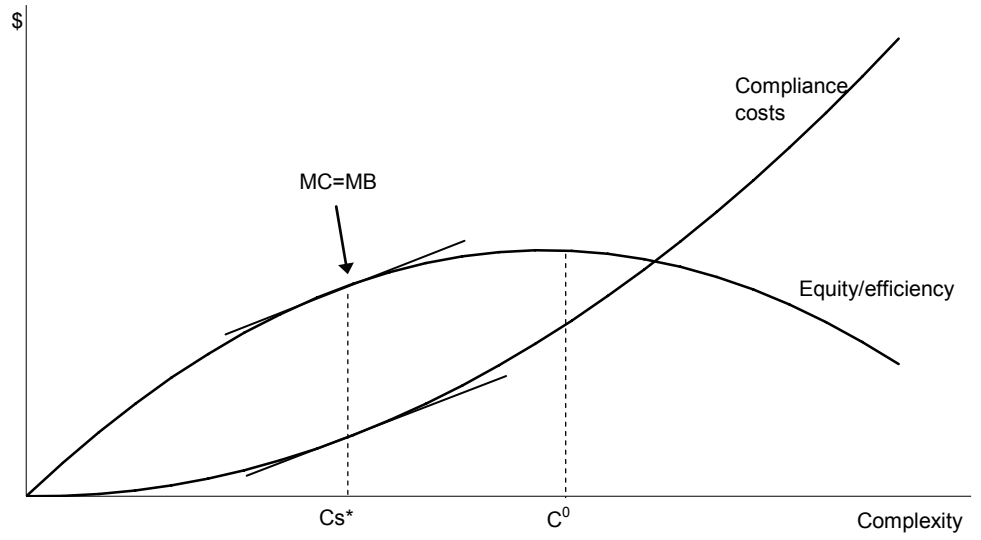
Figure 4 presents a simple graphical representation of the trade-off between equity, efficiency and compliance costs. If there were no costs associated with complexity then the optimal complexity level would simply be where equity/efficiency is maximised (represented by the point C^0). However, as there are costs associated with complexity, the optimal level will fall as these costs are taken into account. By introducing a compliance cost curve, the optimal point will be where the net benefit of equity/efficiency less compliance costs is greatest. As discussed previously, compliance costs increase exponentially with the level of complexity (see Figure 3). The

6 Ramsey taxes take account of the elasticity associated with particular commodities. The idea is that economic distortions, and hence utility losses, are minimised. Ramsey FP (1927), 'A contribution to the theory of taxation,' *Economic Journal*, 37, pp. 47-61.

7 See Kaplow L (1996), 'How tax complexity and enforcement affect the equity and efficiency of the income tax,' *National Tax Journal*, vol. 49, no. 1, March, pp. 135-50.

new optimum is at the point where the marginal benefit of an extra unit of complexity is equal to the marginal cost of complying with the increased complexity. The point Cs* indicates the socially optimal level of complexity. Going beyond this level of complexity would mean that the compliance cost would be larger than the associated integrity benefit; hence the total net benefit would be reduced.

Figure 4: Socially optimal level of complexity



While it may be theoretically possible to determine the socially optimal level of complexity, when it comes to policy design and implementation the difficulties are substantial. The conceptual model implies that equity, efficiency and compliance costs can be measured in dollar terms, but this is virtually impossible to do in the real world with any level of certainty or confidence. Careful subjective judgments are required. Nevertheless, this conceptual framework highlights the way in which costs associated with complexity should be factored into decision-making.

Measuring the tax base

One of the key elements of complexity is the choice of the tax base. The three most common methods involve using a measure of consumption, income or wealth. Each approach has its own set of measurement issues and each provides a different indication of 'ability to pay'. In reality, all OECD countries rely on a mixture of these three tax bases. Although this adds to complexity, it reflects the history of tax systems, judgments about the most appropriate balance between the tax axioms and the fact that too heavy reliance on a narrow base results in distortions and tax planning incentives.

Over time, the definition of taxable income in Australia has undergone significant change with, for example, the addition of capital gains to the tax base and the introduction of a fringe benefits tax. While measuring these types of income may not in itself be inherently complex, the number of exemptions and concessions results in complexity.

Choice

While it seems reasonable that providing choice is of benefit to taxpayers, there are significant costs associated with choice. Whenever choice is provided taxpayers have an incentive to investigate the tax consequences of all options. This may result in some taxpayers incurring the costs of performing multiple tax calculations for no benefit. Therefore, though some taxpayers will benefit, providing choice may be associated with a net cost to society.

Using tax law for social or economic policy objectives

Using the tax system to redistribute income or to deliver other social policy objectives (such as environmental objectives) has a direct impact on the complexity of the tax system. The pursuit of these objectives often requires that tax provisions be implemented in a targeted manner, increasing complexity because they often depend on characteristics and information that are not required for tax purposes. However, while it is clear that moving these social functions outside of the tax system would decrease the complexity of the tax system, it is less clear whether this would increase or decrease society's overall level of complexity.

Protecting the revenue base

A degree of complexity, in the form of anti-avoidance measures, is necessary and reasonable to minimise revenue losses through tax avoidance and evasion activity. The presence of enforcement procedures and penalties may also lead to an increase in the compliance costs that taxpayers are willing to incur in order to reduce the risk of penalty. The extent to which anti-avoidance measures are needed depends, in part, on community attitudes towards paying tax, which, in turn, are a function of the perceived 'fairness' of the tax system and the perceived merits of the goods and services that government provides.

Legislation and the tax interface

The use of legal concepts, technical tax and accounting terms and prescriptive rules can reduce the ability of taxpayers to understand their rights and obligations. As a consequence taxpayers may need to engage professional assistance or else may choose not to comply. In addition to being complex, legislation giving rise to ambiguity may create loopholes that can potentially be exploited. A lack of consistency, in particular with tax definitions, can also increase complexity.

A preference for overly-detailed, prescriptive law may also add to the level of complexity because that law needs to be very explicit and comprehensive to ensure that anomalies are not created and the provision is not abused.[8] Law written in this way must also be regularly updated to take account of situations that were not known or considered when the law was drafted.

The complexity that taxpayers face in complying with their tax obligations can be reduced by improving the interface between the tax law and the taxpayer. The extent to which taxpayers are willing to rely on the use of an interface will be determined by the level of underlying complexity in their particular circumstances and the degree to which they are willing to sacrifice transparency for simplicity.[9]

Administration versus compliance costs

Administration costs can sometimes be direct substitutes for compliance costs. For instance, a move towards greater self assessment may reduce administration costs while increasing taxpayer compliance costs. As the final incidence of administration costs also falls on taxpayers, any suggested proposals to reduce compliance costs must take account of any resultant increase in administration costs. There may be economies of scale from moving more of the revenue collection responsibility to the tax administration, which would spread the costs over all taxpayers. However, this could also reduce the cost to taxpayers of seeking and complying with more complex tax provisions and, as a result, could lead to a higher level of complexity and total collection costs than might otherwise be the case. This issue is discussed in further detail later in the paper.

Private drivers of complexity and compliance costs

In addition to the public policy drivers of complexity, market complexity, taxpayer objectives, and community attitudes also play a part in determining the level of tax system complexity and the resulting level of compliance costs.

Market complexity

To a considerable extent, complexity in the tax system is a reflection of the complexity in markets for factors of production, goods and services. A growing number of Australian taxpayers now own equity investments, are involved in complicated business structures, or invest or work overseas. Increasing globalisation and the advent of e-commerce have led to a rapid expansion in cross-border transactions and increased the need to deal with the double-taxation issues that arise when two (or

8 A detailed discussion of black-letter law versus coherent principles is provided in the Treasury *Economic Roundup*, Autumn 2005.

9 Transparency refers to the amount of information that is disclosed about an economic activity.

more) tax jurisdictions are simultaneously involved in an economic transaction. This complexity is compounded where there are significant differences between Australia's tax treatment of transactions and that of our trading partners. Financial innovation has also blurred the distinction between debt and equity and led to the need for more sophisticated tax rules to ensure that hybrid financial instruments are taxed according to their economic substance.

Maximisation objectives of taxpayers

Within a given tax structure, optimising taxpayers may willingly incur compliance costs until the point where an extra dollar spent returns a dollar of tax saving.[10] For example, a taxpayer might bear the costs of testing alternative tax calculation methodologies, searching for tax-effective ways to structure transactions, or engaging in other tax minimisation activities. In addition, taxpayers may seek to reduce their tax liability by seeking preferential tax treatment through targeted concessions. These behaviours and their implications for tax system complexity and compliance costs are explored in detail in the following sections.

Private demand for tax system complexity

Tax minimisation

The following chart shows how a taxpayer's optimal level of complexity would, at least theoretically, be calculated. In the analysis, the tax saving from undertaking increasingly complex tax calculations or more sophisticated tax arrangements produces a declining incremental reduction in tax liability. The cost curve is the same as the curve used for the social analysis (Figure 4), which exhibits rising costs for an additional dollar of tax saved. If the level of tax and compliance costs were the only considerations of the taxpayer, the optimal complexity level would be where the tax saving net of compliance costs is largest.

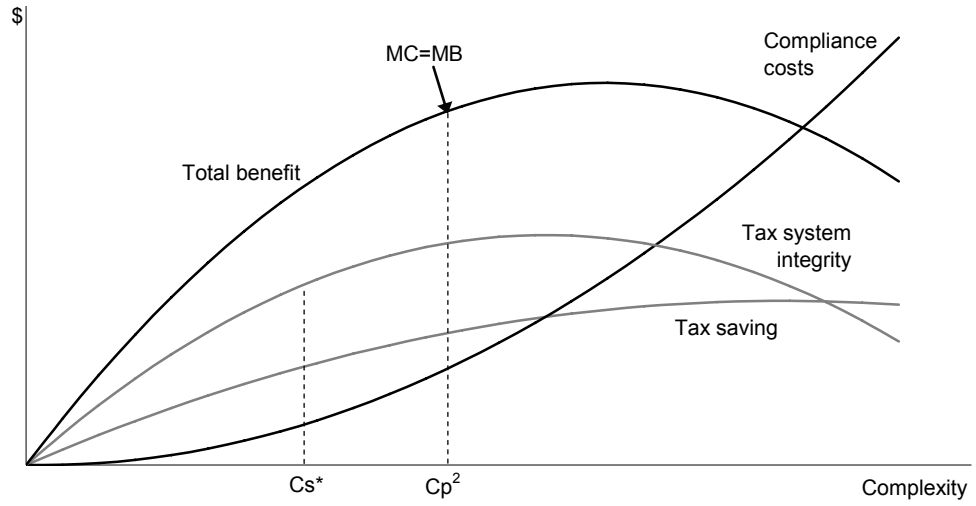
As well as tax minimisation, it is also reasonable to expect that taxpayers care about equity and efficiency, otherwise tax collections would be eroded and the quantity and/or quality of public goods and services would decline. The equity/efficiency function from the social model can be added to the taxpayer model to produce a new total benefit curve. Figure 5 shows this new curve and its impact on the optimal level of complexity. If the taxpayer behaves in an individualistic way, assuming that their

10 The level of compliance costs faced by a taxpayer will correspond to particular behaviours. For example, a taxpayer may have high compliance costs because they are attempting to comply fully with a complex tax system, possibly even over-complying if they are risk-averse and concerned about the uncertainty flowing from the tax system complexity, or they may have high compliance costs because they are using complex arrangements to avoid tax.

behaviour is of such inconsequence it has no significant implications for society more generally, then the private benefit curve will be an additive function of the social benefit and the tax that they save. The additional consideration of the tax saved implies that that privately optimal level of complexity will always be higher than the socially optimal level.

If administration and efficiency costs were added to the model the divergence between the two points (Cs* and Cp^2) would be even larger. This is because administration and efficiency costs would reduce the socially optimal level of complexity but not the privately optimal level. This assumes that most taxpayers would not consider these costs when optimising their tax outcomes.

Figure 5: Tax integrity and tax saving incentives



The extent to which taxpayers are able to target an optimal level of complexity will depend on the transparency of the compliance costs associated with a particular level of complexity and the degree to which taxpayers internalise costs. For example, if tax agents charge a flat fee taxpayers may find it worthwhile to take on more tax complexity than would otherwise be optimal. Some taxpayers may take a risk-based approach to tax minimisation, based on perceived audit risk and the size and timing of any penalties.

The extent to which tax minimisation behaviour occurs — and whether tax avoidance escalates to tax evasion — will depend, in part, upon each taxpayer's acceptance of the need to pay tax, their perceptions of the integrity of the tax system and the value they place on equity and the broader objectives of revenue collection.[11] If many individuals

11 Tax avoidance involves taking full advantage of the law to minimise tax liability whereas tax evasion usually implies an understatement of income or an overstatement of deductions.

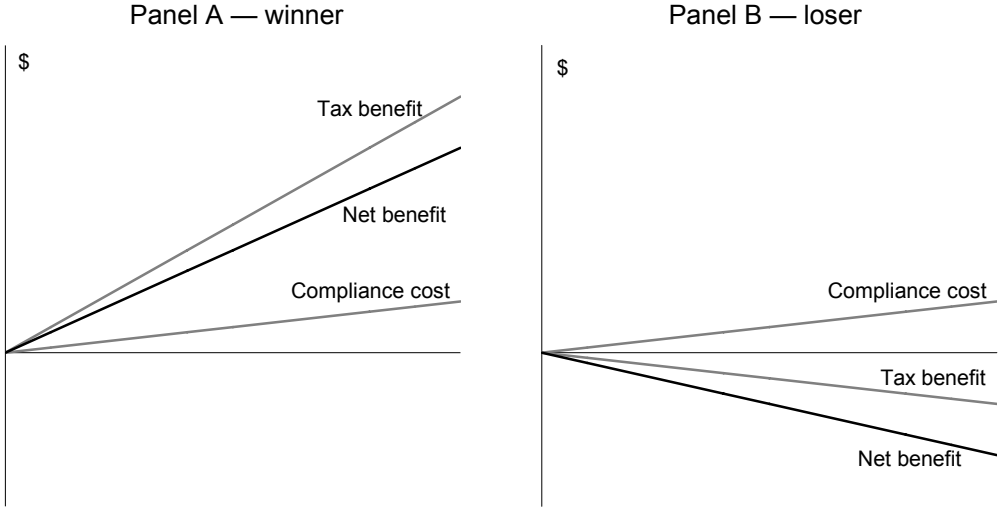
engage in tax avoidance, it will affect others' willingness to comply and could undermine tax system integrity. This pressure is likely to lead to increased compliance monitoring and enforcement as well as a wider use of anti-avoidance legislation. Enforcement and anti-avoidance activity may provide a net benefit to society but will, of itself, increase complexity and compliance costs, in part due to increased demand for information to underpin the administration's compliance activities.

Rent-seeking behaviour

The phenomenon of rent-seeking takes place when an entity seeks to extract uncompensated value from others through manipulation of the economic or regulatory environment. Rent-seeking behaviour in the tax system is often successful because taxpayers seeking a targeted concession are more effective in lobbying than those that stand to lose under the concession. This is because the beneficiaries of concessions are often more informed and better represented in the lobbying process than the broader community which bears the revenue cost, the compliance cost and any loss of equity and/or efficiency. In addition, the individual benefit to recipients of a targeted concession is typically more easily measurable, more tangible and of a much greater value than the less tangible and dispersed cost imposed on each member of the broader population.

These incentives are illustrated in Figure 6. Panel A represents the beneficiary of a concession where the reduction in tax liability exceeds the incremental compliance costs. Panel B represents a taxpayer that is ineligible for the concession, of which there are assumed to be many. Under a revenue neutrality constraint, the taxpayer in Panel B will bear the revenue cost of the concession provided to the taxpayer represented in Panel A. Although they are not eligible for the concession, their cost of compliance may increase slightly as an indirect consequence of a more complex tax law.

Figure 6: Winners versus losers



The theory of competitive markets can be used to understand how rent-seeking activity will continue until all economic profits are exhausted. Lobbying for tax concessions has many properties of a competitive market: there are many lobby groups; there are no restrictions on entry; and lobby groups already in the industry have no (or little) advantage over new entrants. As discussed in the preceding section, taxpayers will attempt to maximise profit by equating marginal revenue with marginal cost. The theory of competitive markets predicts, however, that an industry making a profit will attract new entrants.

Assuming that there is a limited pot of concessions available to be won, it can be shown that lobbying for tax concessions will continue until it reaches a point where the net gain to any individual tends to zero. This reflects the theory that a competitive market always results in a zero-sum game. This is because there are no 'supernormal' profits that exist in monopolistic or oligopolistic markets. The privately optimal outcome that maximises profits could be achieved if all taxpayers agreed to reduce their demand for concessions and share the profits evenly. However, due to taxpayer information, organisation and distribution problems, the benefits are likely to be unequally shared and those taxpayers that have received little or no benefit will find it profitable to lobby for their 'fair share'.

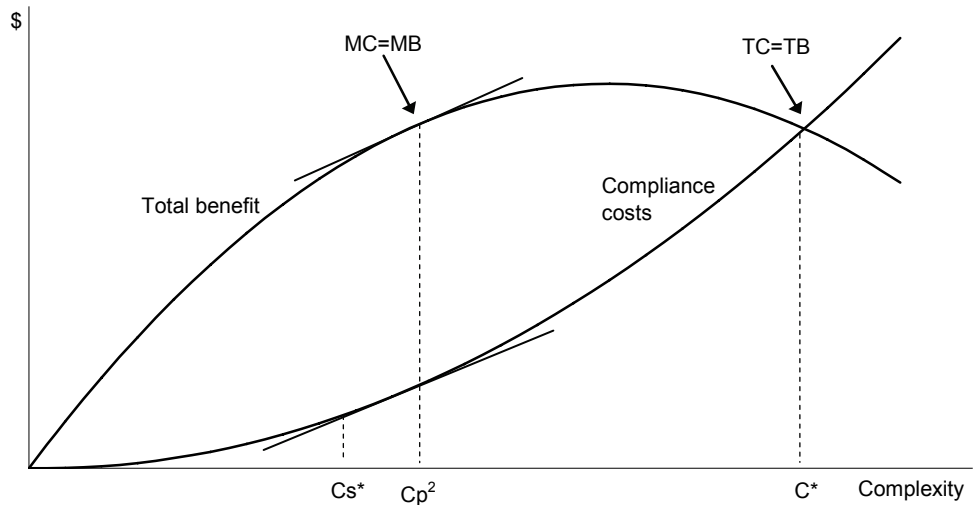
At the competitive equilibrium, the collective demands of these taxpayers imply a level of complexity that exceeds both the privately and socially optimal levels. A real-world example of this conflict between individual interests and the common good is the *tragedy of the commons* (see Box 1).

Box 1: The Tragedy of the Commons[12]

In 1832 William Forster Lloyd, a political economist at Oxford University, looking at the recurring devastation of common (not privately owned) pastures in England, asked: 'Why are the cattle on a common so puny and stunted? Why is the common itself so bare-worn, and cropped so differently from the adjoining inclosures?' Lloyd concluded that the destruction of the common was because each human user of the common was guided by self-interest. Because the herdsman owned his animals, the gain from adding another animal would come solely to him. However, the loss incurred by overloading the pasture would be 'commonised'. Because the privatised gain would exceed his share of the commonised loss, a self-seeking herdsman would add another animal to his herd, then another. Following the same reasoning, so would all the other herdsmen. Ultimately, the common property would be ruined.

Figure 7 below shows the competitive equilibrium level of complexity where total cost equals total benefit. While Cp^2 is the point at which total private benefit is maximised, point C* shows the level of complexity where all possible profits have been extracted. As discussed, lobbying for concessions will continue up until this point, and possibly beyond if taxpayers underestimate the costs or overestimate the potential tax saving of a concession.

Figure 7: The competitive equilibrium

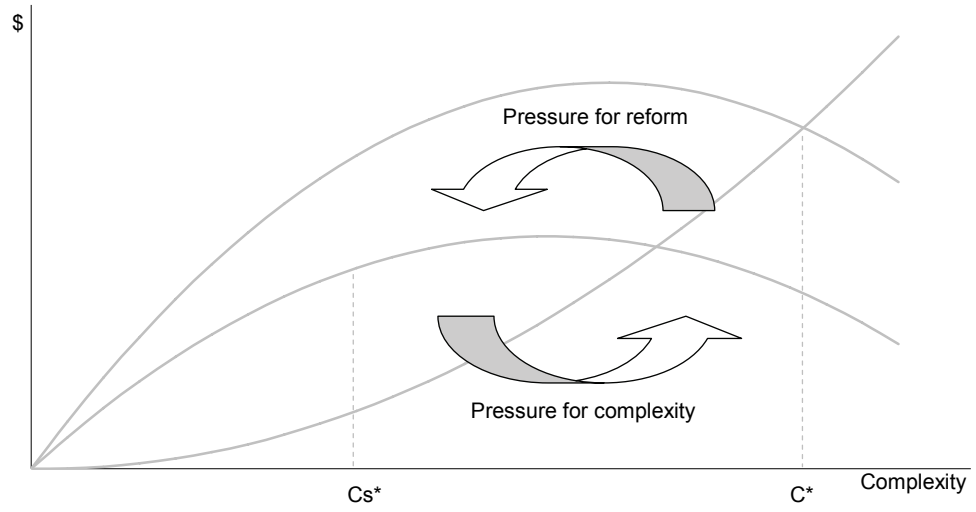


12 Taken from Hardin, Garrett, 'The Tragedy of the Commons'. *The Concise Encyclopedia of Economics*. Indianapolis: Liberty Fund, Inc., ed. David R. Henderson, 2002. [Online] available from http://www.econlib.org/library/Enc/TragedyoftheCommons.html; accessed 4 May 2005; Internet.

The complexity cycle

The competitive equilibrium described above (point C*) is not likely to be sustainable. As the cost and integrity implications of additional complexity become apparent to the broader taxpaying community and government, there are likely to be increasing calls for tax reform in order to move towards a more optimal complexity level. Whether complexity is reduced to the socially or privately optimal level will depend on the exact nature of the reform (due to asymmetric information and general measurement difficulties, it would not be possible to determine the exact level of complexity that optimises social net benefit). Post-reform, opportunities for tax savings will exist and the race for concessions will start again.

Figure 8: The complexity cycle



This complexity cycle is consistent with the existence of ongoing pressure by taxpayers to increase the concessionality of the tax system, interspersed by periodic pressure for more fundamental tax reform.

Conclusion

There are both public and private drivers of tax system complexity and compliance costs, but they are by no means independent. Taxpayer behaviour and community attitudes will influence both policy design and the administration of a tax system.

A certain level of complexity, and hence compliance costs, is required to raise revenue, and to do so in an equitable and efficient manner. Even with the simplest tax system, measuring the tax base, whether it is income-, consumption- or wealth-based will be

associated with a rising level of complexity as markets become more and more sophisticated.

While the design and implementation of tax policy is an important factor that influences tax system complexity, the private incentives to minimise tax are also a significant driver of complexity. Taxpayer-driven complexity can come from taxpayers minimising tax within the current structure as well as rent-seeking behaviour seeking new concessions or exemptions.

While increased efforts could be made to assess all the costs and benefits associated with any tax proposal, it is not necessarily complex measures that lead to complex tax law. Even if it were possible to conduct a full cost-benefit analysis of each separate policy proposal, the results of such analysis may indicate that each measure produces a net benefit. Nevertheless, the cumulative impact of these measures may result in a very different story. The aggregate level of complexity may become a disincentive for emerging businesses, deter sole traders from taking on staff, and prevent taxpayers from complying with the tax law (both intentionally and unintentionally).

Key themes from the Treasury Business Liaison Programme — July and August 2005

Treasury officers met with around 80 companies and organisations in Sydney, Melbourne, Perth, Wollongong and Albury-Wodonga through the Business Liaison Programme in July and August 2005.[1]

Conditions in the retail sector are mixed, with some retailers reporting slowing sales while others are finding improved conditions. Car sales are strong in both domestic and export markets. Mining companies told how they are expanding production and those manufacturers supplying the mining sector describe business conditions as very good. The rural sector welcomed the recent rains.

Businesses expect to continue increasing employment although they say that skill shortages are becoming more widespread. However, this is only leading to a marginal acceleration in overall wages. While oil and steel prices have risen considerably, firms suggest there is only a minimal increase in the rate at which they can raise prices. Wage increases are being variously met by productivity improvements, cuts in other costs and modest reductions in profitability.

Treasury greatly appreciates the commitment of time and effort made by the Australian businesses and industry associations that participate in the Business Liaison Programme.[2]

---

1 A detailed explanation of the Treasury Business Liaison Programme is provided in the Treasury *Economic Roundup*, Spring 2001.

2 This summary of business conditions reported in liaison meetings reflects the views and opinions of participants. It is provided for the information of readers. While Treasury's evaluation of the economic outlook is informed by findings from business liaison, a much wider range of information and data are utilised to ensure a rigorous assessment of the Australian economy.

Retail trade

A varied picture emerges from discussions with retailers. Some report that sales have picked up somewhat in recent months. The 'baby bonus' added to the sales of products such as toys. Motor vehicle sales are at record highs with industry contacts expecting sales of around a million cars this year.

Others report that the mild winter in much of the country, following a generally mild summer, has led to weak sales for some household appliances and seasonal clothing. Sales of furniture and appliances are also being dampened by the slower pace of home completions. Some retailers blame higher petrol prices for diverting spending away from other purchases.

Financial institutions report a slightly more cautious attitude towards borrowing by households, consistent with the slowdown in household credit. Intermediaries also pointed to a reduced usage of mortgage equity withdrawals. This caution is not surprising given that estate agents and others note a change in sentiment towards house prices, which are no longer assumed to be inexorably rising.

Production and investment

Manufacturing

The most confident manufacturers interviewed are those supplying the mining industry. Some of these are undertaking investment to expand their productive capacity. Suppliers to the construction industry in Western Australia report very strong conditions.

As well as record domestic sales, automotive vehicle manufacturers are continuing to expand exports to the Middle East. As a result, they report high levels of capacity utilisation. Most have plans for investment to increase capacity as new models are introduced next year.

Some manufacturers report a rundown in their inventories earlier in the year which is leading them to increase production. In some cases, this might require more investment. Some other firms are investing to rationalise production in fewer sites to reap economies of scale.

Some manufacturers are finding it hard to compete with imports. One way they are reacting to this challenge is by moving some of their own production facilities overseas. Some manufacturers report increasing the proportion of components they source from overseas.

Housing

There are divergent trends in housing markets across Australia. House prices are reported as having fallen in Sydney overall. Prices for houses in harbourside suburbs are holding up while prices are still falling for inner city apartments. House prices seem to have stabilised in most other capitals, with the exception of Perth where they are still rising.

Housing construction has weakened to varying degrees across the country, although it may now be stabilising. Industry sources believe that underlying demand is being supported by strong immigration, increased prevalence of one-person households and an increased rate of demolition.

Other construction

The construction of offices and refurbishment of shopping centres, schools and hospitals, are supporting other building activity. There is increasing construction of infrastructure projects such as roads. Construction activity for mining companies remains an area of strength.

Mining

Stimulated by the very high prices for iron ore and some types of coal, and the prospect of continued strong growth in demand from countries such as China, Australian mining companies continue to aspire to increase production. Some mining companies report record levels of output, but in some cases supply constraints are limiting their ability to expand production as much as they want. One example of a supply constraint is a shortage of tyres for very large vehicles. Some improvements have been made in capacity at transport nodes, although some mining contacts still report problems. As well as increasing production from current mines, some mining companies report increased exploration.

Agriculture

While welcome rains have fallen across much of Australia's farmland, rural contacts warn that follow-up rains are still required. Contacts report that some areas (such as the NSW-Queensland border, western NSW, and central Queensland) missed out on rains.

Beef exports to Japan are particularly strong at present and the second case of BSE in the United States may delay resumption of their exports to some key Asian markets. The current strength of Australian beef exports has further slowed rebuilding of herds, which are still below pre-drought levels.

Tourism and education

Tourism is reported as picking up with improved business for airlines, hotels, gaming resorts and car rentals. As well as hosting foreign students on Australian campuses, universities are earning more revenue from running courses overseas.

Employment

The majority of the companies interviewed expect at least to maintain employment around current levels. However, it was noted that in some cases automation to improve efficiency would reduce employment.

As unemployment falls, there are growing signs of labour shortages. The occupations most frequently mentioned as being in short supply remain accountants; some kinds of engineers; professionals in the mining industry; some construction tradespeople; and truck drivers. However, some contacts cited a wider range of skills and there are also some reports of semi-skilled or experienced unskilled labour being hard to find. Concerns are being expressed about the ageing of the workforce in certain occupations, and the potential for this to lead to skill shortages in coming years.

As noted last quarter, the increased investment in the mining sector has increased the demand for labour. Furthermore, the markedly higher prices recently negotiated for iron ore and coal exports have increased the capacity of mining companies to pay higher wages. Accordingly, contacts suggest that the mining sector is attracting workers such as truck drivers, cooks and labourers away from the farm sector and engineers and mechanics away from other sectors.

Some firms, especially those with international operations, report bringing in overseas workers, even some with limited English language skills, to meet labour demands. Many firms report hiring less experienced or lower skilled workers than usual.

Labour costs

Unsurprisingly, firms are noticing upward pressure on labour costs for occupations where labour is in short supply. For some specialised niches, it was suggested that salaries are rising at 10 to 20 per cent a year. However, the moves towards more flexible labour markets over the past two decades mean that, unlike during previous periods of labour shortage, wages increases obtained for workers with skills in short supply are not flowing through the whole economy. Overall wages growth is rising, but only modestly.

As well as paying higher wages, some firms in remote areas were spending on improved accommodation and facilities to attract workers. A number of firms report

significant compliance costs in meeting occupational health and safety requirements, with firms operating across state jurisdictions reporting the heaviest burdens.

Costs, prices and profits

The ongoing rise in global oil prices has raised costs for many firms. Steel prices have also increased substantially over the past year, despite falling back in recent months. Some firms have price contracts that allow for these price rises to be passed through to purchasers, but most firms report that competitive forces in the markets in which they sell mean that such cost increases have to be absorbed.

Some firms are offsetting higher labour and raw material costs by reducing costs elsewhere. More firms are cutting costs by tendering for purchases of inputs. Insurance charges are reported as moderating, following significant increases in previous years. However, many retailers report much higher rents in large shopping malls.

In many cases productivity increases from more efficient productive processes are sufficient to cover the increases in labour and other costs. Some companies are explicitly tying remuneration increases to achieving these productivity increases. But as noted above, some firms are hiring lower skilled labour, or tradespeople who had worked in different industries. There are also reports that firms are now more likely to 'hoard' labour during a temporary lull in sales for fear that when demand picks up they will not be able to rehire sufficient workers. Both these factors could be leading to a (short-term) reduction in productivity in some areas.

Some firms report reduced margins, although in general profits are still increasing.

Regional economic conditions

As has been the case for some time, activity is particularly strong in Queensland and Western Australia. This was driven by strong population growth and the strength of the resources sector. New South Wales is weaker, which is generally attributed to the earlier and larger fall in house prices there.

This round included a visit to Albury-Wodonga. This area has a vibrant economy, attracting activity from the surrounding region, partly because of its good transport links and educational and aged care facilities. Local businesses perceive unemployment as relatively low, and report some difficulty in attracting skilled and semi-skilled staff. The businesses located there regarded Albury-Wodonga as a good location. As essentially a single city straddling a state border, Albury-Wodonga businesses report being particularly affected by state rivalries and inconsistent regulations.

Sources of economic data

The following table provides sources for key economic data. Australian Bureau of Statistics (ABS) data can be obtained over the internet at **http://www.abs.gov.au**. The Reserve Bank of Australia information is available at **http://www.rba.gov.au**. Similarly, OECD information is available at **http://www.oecd.org**. Information on individual economies is also available via the IMF at **http://www.imf.org**.

International economy	
Output, current account balance and interest rates	OECD Main Economic Indicators
Consumer price inflation	ABS cat. no. 6401.0
National accounts	
Components of GDP, contributions to change in GDP	ABS cat. no. 5206.0
Incomes, costs and prices	
Real household income	ABS cat. nos. 5204.0 and 5206.0
Wages, labour costs and company income	ABS cat. nos. 5204.0, 5206.0 and 6302.0
Prices	ABS cat. nos. 6401.0 and 5206.0
Labour market	ABS cat. no. 6202.0
External sector	
Australia's current account, external liabilities and income flows	ABS cat. nos. 5368.0, 5302.0 and 5206.0

Past editions of Economic Roundup

Details of articles published in the past two editions of the Economic Roundup are listed below:

Autumn 2005

Economic forecasting: history and procedures

Forecasting the macroeconomy

Comparing Australian and United States productivity

Possible links between household debt, demand for imported goods and Australia's current account deficit

Structural fiscal indicators: an overview

The coherent principles approach to tax law design

Key themes from the Treasury Business Liaison Program — February and April 2005

Summer 2004-05

Australia's medium-term challenges

Measuring recent trends in Australia's economic remoteness

Why have Australia's imports of goods increased so much?

The changing pattern of East Asia's growth

Foreign investment issues in the Australia-United States Free Trade Agreement

Australian net private wealth

Key themes from the Treasury Business Liaison Program — November 2004

Copies of these articles are available from the Treasury. Written requests should be sent to Manager, Domestic Economy Division, The Treasury, Langton Crescent, Parkes, ACT, 2600. Telephone requests should be directed to Ms Susan O'Shea on (02) 6263 2756. Copies may be downloaded from the Treasury web site http://www.treasury.gov.au.

The index of articles and other major Treasury publications is published also on the Treasury website which provides a comprehensive list of press releases, speeches, publications, annual reports, legislation, discussion papers, submissions and articles released by the Department. Information on the Treasury website can be downloaded in PDF and RTF formats, or read online.