Treasury costings of taxation policy

Colin Brown[1]

The Treasury is responsible for costings of new policy proposals involving taxation revenue and for costings of tax expenditures. This paper outlines the general approach to costing new policy proposals and tax expenditures and examines a range of issues that arise in the costing process, the types of analysis that may be undertaken and the significance of the benchmarks used in interpreting published estimates.

1 The author is from the Tax Analysis Division, the Australian Treasury. This article has benefited from comments and suggestions provided by Thomas Abhayaratna, Michael Callaghan, Phil Gallagher, Anthony King, Kathryn McCrea, Jason McDonald and Nigel Ray. The views in this article are those of the author and not necessarily those of the Australian Treasury.

Introduction

The Treasury is accountable for estimates of *taxation revenue*, including estimates of the impact on taxation revenue of new policy proposals. The 'costing' of new policy proposals plays an important role in contributing to the Government's evaluation of different policy options, informing the policy development process, updating the budget revenue estimates and informing the Parliament and the public.

This paper examines Treasury's approach to estimating the impact or 'cost' to revenue of tax measures, the impact of behavioural responses on the estimates and the effect of using different costing benchmarks. The effects are examined by comparing budget costings, which are prepared against the forward estimates, with tax expenditure estimates, which are prepared against a hypothetical non-concessional benchmark.

Budget revenue — costings against the forward estimates

Budget revenue costings measure the difference in expected revenue collections under a new policy proposal and the expected revenue collections already included in the 'forward estimates' of revenue. The forward estimates are the revenue that the government expects to receive in the budget year and the projected revenue for each of the next three fiscal years. Table 1 shows the aggregate forward estimates of revenue from the 2007-08 Budget. These estimates are the benchmark for assessing the financial impact of new policy proposals on the Budget. The 'cost' of a measure may be either a loss of revenue compared with the forward estimates or a gain to revenue.

Table 1: Total Australian Government general government revenue

	Actual	Estimates		Projections		
	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Total taxation revenue ($b)	**206.8**	**220.5**	**231.1**	**244.1**	**256.6**	**267.3**
Real growth on previous year (%)	1.5	1.8	2.3	4.4	4.0	1.9
Per cent of GDP	21.4	21.3	21.1	21.3	21.5	21.3
Non-taxation revenue ($b)	**15.1**	**15.1**	**15.7**	**16.7**	**18.0**	**20.1**
Real growth on previous year (%)	15.5	-4.5	1.6	5.0	6.7	9.2
Per cent of GDP	1.6	1.5	1.4	1.5	1.5	1.6
Total revenue ($b)	**221.9**	**235.5**	**246.8**	**260.7**	**274.6**	**287.3**
Real growth on previous year (%)	2.4	1.4	2.2	4.5	4.2	2.4
Per cent of GDP	23.0	22.8	22.5	22.8	23.1	22.9

Table 1 shows that at the time of the 2007-08 Budget, 2005-06 was the last year for which actual revenue data was available. This estimate of 'actual' revenue forms the base for the revenue estimates and projections. The revenue estimates for 2006-07 (the incomplete year during which the 2006-07 Budget was presented) and 2007-08 (the budget reference year) are 'estimates' based on an assessment of recent activity levels and forecasts of activity up to the end of 2007-08, while the following three years are

'projections' based on growth in a range of economic parameters.[2] The estimates and projections take account of the estimated impact of new policy proposals.

A key point to note about the forward estimates is that they are based upon *actual* revenue collection data, which incorporates the existing behaviour of taxpayers, including levels of compliance with the tax laws and response effects.

A general approach to costings against the forward estimates

When new policy proposals are costed against the forward estimates, the existing forward estimates are the benchmark and the estimated cost of the new policy is the change in tax revenue which the new policy will produce. Appendix A derives a model for costing new policy proposals against the forward estimates. This model can be used to explore the factors that need to be considered in new policy costings that affect a particular tax base. The model is expressed in the following formula:

$$\Delta Rev_i = [t_{ni} - t_{bi} + (c + a + c.a).t_{ni} - a.o.t_{oth}] \times B_{b0} \times (1+g_{bi}) \quad (12)$$

where:

- t_{bi} is the tax rate applying to the tax base in period i before the policy change;
- t_{ni} is the tax rate applying to the tax base in period i after the policy change;
- B_{b0} is the tax base for activities affected by the policy change in the base period for the costings, generally the last period for which there is actual data available;
- g_{bi} is the growth in the tax base between the base period and period i;
- c is the change in the tax base, measured as the change in the proportion of base period transactions (B_{b0}) that are taxable as a result of the policy change;
- a is the response of taxpayers to the policy change as a proportion of base period transactions (B_{b0});
- o is a factor that represents the offset to the behavioural response a to the policy change as a result of a change in activity in other tax bases (o = 1 represents a full offset and o = 0 is no offset); and
- t_{oth} is the average tax rate applying to those other transactions.

---

2 A guide to the sensitivity of expenses and revenue to changes in economic parameters is provided in Appendix C of Statement 2, Fiscal Outlook in Budget Paper No. 1, *Budget Strategy and Outlook 2007-08.*

This costing model presents new tax policy proposals in terms of the change in tax rate ($t_{ni} - t_{bi}$) or in terms of the proportionate change in the tax base that arises from the new policy (c) or a combination of both. The model allows for the consideration of issues such as the behavioural response to a policy change (a), for the operation of a resource constraint in the economy (o) and for the tax rate applicable to alternative activities affected by the resource constraint (t_{oth}).

The values of variables such as the costing base (B_{b0}) and the base tax rate (t_{bi}) are usually obtained from statistical data (for example from the *Taxation Statistics* published annually by the Australian Taxation Office). The new policy tax rate (t_{ni}) and the impact of a proposal on the tax base (c) are specified as part of the new policy being costed. The growth rate between the base year and the year being costed (g) is usually based on the growth parameters used to project the forward estimates. The behavioural response to the policy (a) and the offset (o) are usually assumptions based on a variety of information sources or on judgment as to the likely magnitude of taxpayer response based on past experience.

Response effects

Response effects are an important part of a new policy costing because they may have significant effects on costing outcomes. Reliable information about the magnitude of response effects is often unavailable. Consequently, taxpayer responses are the element of a costing that requires the greatest exercise of judgment.

The Treasury's approach to including response effects in policy costings is to take account of behavioural effects where it is practicable to do so. In particular, emphasis is placed on the reliability of any estimate. Where there is no reliable basis for quantifying response effects, the costing exercise may include analysis to determine the sensitivity of the estimates to the potential range of behavioural responses.

A variety of information sources can be used to estimate the magnitude of behavioural responses to a new policy, including:

- where a policy aims to achieve a particular behavioural response, that response;
- academic and other studies of behavioural responses (for instance, studies into the price elasticity of demand for particular goods, or labour market responses to changes in real wages or effective marginal tax rates);
- input from consultations or submissions;
- evidence from previous experience of similar changes or derived from analysis of taxation or other data;

- the results of econometric modelling and studies; and
- sensitivity analysis.

Where budget revenue costings take account of behavioural effects, they generally only include the direct behavioural effects of a policy change (indirect or 'second round' effects are discussed below). Direct impacts include:

- changes in the demand for the particular goods, services, investments or assets affected by a policy change;
- changes in the prices of the particular transactions affected by a policy change;
- changes in the supply of goods or services as a result of a policy change (for instance, increased production of goods by businesses in response to cost reductions); and
- any offsets that involve switching resources between the particular activity affected by the policy change and other activities, as would result from the application of a resource or budget constraint.

The last effect is important because costing analysis needs to take account of where the resources, both financial and physical, underpinning a change in a particular activity or investment come from. This is particularly important in an economy facing resource constraints where an increase in activity in one sector can only be accommodated by diverting scarce resources (such as skilled labour) from other activities, reducing the tax collected from them. Failure to take account of resource constraints is likely to result in an overestimate of impact of behavioural responses on the costing analysis.

All costing analysis makes assumptions about response effects, either explicitly or implicitly. Public commentary often implicitly assumes that a proposal will have no behavioural impact (that is $a = 0$; $o = 0$) in which case the proposal's cost is wholly a function of the change in tax rate and/or the tax base. Such an implicit behavioural assumption needs to be tested carefully. For example, when estimating the impact of a change in an excise duty, a 'no behavioural response' assumption implies that the demand for the excisable goods concerned is perfectly inelastic.

What is the likely magnitude of response effects?

The direction and magnitude of response effects are important considerations for costing analysis.

Generally, a change in the tax base or tax rate would produce an opposite change in the level of the taxed activity being undertaken, so that an increase in the tax rate or in

the tax base for an activity would produce a reduction in the level of activity (that is, in the general costing model, if $t_{ni} - t_{bi} > 0$ then $a < 0$; or if $c > 0$ then $a < 0$).

Response effects, expressed as a proportion of the tax base, are likely to be much smaller than the proportion by which tax collections change (that is, $a < c$; or $a < (t_{ni} - t_{bi})/t_{bi}$ in the general costing formula). Put another way, a 10 per cent reduction in tax is likely to produce much less than a 10 per cent increase in activity. This means that while response effects may partially offset a tax change, they are unlikely to produce a full offset such that a tax change pays for itself. Some reasons for this follow:

- Taxpayer behaviour is more likely to be related to the change in the *full* tax inclusive value of a transaction rather than just to the tax component. So it is the effect of tax on the *tax inclusive price* of the transaction or the *post tax return* from activity (depending upon whether the effects are on demand or on supply) that produces the behavioural effect, rather than the change in tax itself.

  - For instance, if the marginal tax rate paid by a taxpayer who faces a marginal tax rate of 30 per cent is cut by 10 per cent (that is to 27 per cent), the taxpayer will receive an increase in marginal disposable income of 4.3 per cent.[3] This means that when the taxpayer decides on whether to change the amount of labour to supply, the taxpayer is responding to the 4.3 per cent increase in post tax marginal income rather than to the 10 per cent reduction in tax payable on that marginal income. For any given elasticity for a transaction, the magnitude of the response effect from a given proportionate change in tax will be smaller, the smaller the tax is as a percentage of the price concerned. Therefore, in the example above, a taxpayer would have to have a wage elasticity of +2.3 for the magnitude of the response effect to equal the magnitude of the tax change.

  - In this example, income effects may, to some extent, counteract the added incentive to work arising from a lower tax rate. These effects arise from the increase in disposable income for a given amount of work and wage rate, which means less work is needed to achieve a particular target level of income.

3 Calculated as follows: $[(1 - t_{ni})/(1 - t_{bi})] - 1 = [(1 - 0.27)/(1 - 0.3)] - 1 = -0.043$.

- While tax changes may produce changes in taxpayer behaviour, those changes are often at the *margin of behaviour* (that is, a tax cut may mean that for *some* taxpayers, the post-tax price of a transaction falls sufficiently to induce them to undertake an additional transaction) but the tax change applies equally to all taxpayers and transactions, including taxpayers whose behaviour remains unchanged or transactions that would have occurred without the tax change. It is the cost across all taxpayers and transactions that is included in new policy costings.

- Usually, the tax on a transaction cannot be reduced to less than zero.[4] This means that, if we assume no offsetting impacts on activity elsewhere (i.e. o=0), the cost of providing a tax exemption (or reduction in rate to zero) is equal to the revenue previously collected, regardless of the magnitude of any behavioural response.

  – This can be illustrated in the general costing model. If the new tax rate $t_{ni} = 0$ and offsetting activity effects o=0 then the change in revenue will be:

$$\Delta \text{Rev}_i = [t_{ni} - t_{bi} + (c + a + c.a).t_{ni} - a.o.t_{oth}] \times B_{b0} \times (1 + g_{bi})$$

$$= - t_{bi} \times B_{b0} \times (1 + g_{bi})$$

Resource constraints and offsets

The response to providing a tax concession for an activity may be affected by the effect of wider resource constraints in the economy. These constraints may be financial or due to constraints on the availability of physical resources, such as labour or capital. In an economy with near full employment, constraints on physical resources are likely to be more apparent. However, even in a less than fully employed economy, a tax change is still likely to see a diversion of resources between activities. For instance, unemployment may be due to labour market regulations, so any changes to tax rates may involve changes in the allocation of labour already employed.

Resource constraints introduce an additional element into costings that offsets the behavioural impact of a change. For instance, if we relax the assumption that there is no offsetting impact on activity in the tax exemption example above (that is o>0), an

4 *Tax offsets* (or rebates) are the exception to this rule if the offset can be used to reduce *other* tax payable by the taxpayer or is refundable. A tax offset is an amount that is payable as a credit against a taxpayer's tax liability, usually calculated by reference to the value of a transaction. A refundable tax offset is one where any amount by which the offset exceeds the taxpayer's tax liabilities is payable to the taxpayer in cash. Refundable tax offsets are classified as expenses for budget purposes.

additional revenue impact arises from the reduction in tax paid on other activities. The magnitude of this additional impact will be determined by the size of the response effect (a), the extent to which that response offsets the other activity (o) and the tax rate applying to the displaced activity (t_{oth}):

$$\Delta \text{Rev}_i = [-t_{bi} - \boldsymbol{a.o.t_{oth}}] \times B_{b0} \times (1 + g_{bi})$$

This means that when considering the response effects to a new policy proposal, the costing analysis needs to take account of where the resources for that response (physical or financial) come from. The effect of providing a tax concession for one activity will be to increase its post tax return relative to other activities. As a result, the concessionally taxed activity will have a relative advantage over competing activities which will tend to divert resources away from them.

Resource allocation effects may be built into costing models in the form of a budget constraint assumption and are necessary to avoid 'magic pudding' effects in costings. The resource allocation effects may differ, depending upon the nature of the substitution effects (or 'offsets') concerned and macroeconomic conditions. For instance:

- The extent of offsets may be limited. For example, at full employment, the labour force response to a cut in marginal tax rates comes from individuals reducing their consumption of leisure. If leisure is untaxed ($t_{oth} = 0$) then the *value* of the offset will be zero (even if $o = 1$) and will not affect the costing estimate, but the *extent* of the offset will be limited by the numbers of hours of leisure available.

- The impact of offsets on a costing will depend upon whether a change increases or decreases differences in effective tax rates. As an economy approaches full employment, the main effect of a tax concession will be to divert resources from one marginal investment to another as a result of the change in the relative after-tax returns from each activity (that is, the offset factor $o \rightarrow 1$). If $o = 1$ then the revenue impact of a tax change will depend upon whether the new effective tax rate is above or below the rate applying to alternative activities (that is, $t_{ni}+c$ versus t_{oth}). For example, reducing the effective tax rate on a heavily taxed activity may expand that activity at the expense of lower taxed activities, with the result that the net impact of the response and offset effects reduces the cost of the tax change (that is, where $a > 0$; $t_{ni} < t_{bi}$ or $c < 0$ and $t_{ni} > t_{oth}$). On the other hand, the net effect of providing a tax concession to an activity that is already concessionally taxed will add to the cost of the tax change.

- The impact of offsets on financial flows may differ from offsets arising from physical resource constraints. Financial offsets may be smaller where the response is financed from a change in the rate of saving or from wealth rather

than by diverting finance from other activities. The overall offset (*o*) will depend upon the extent to which taxpayers can dissave (or wish to increase savings), whether the response simply reallocates savings from one investment activity to another (in which case $o = 1$) and whether other binding constraints apply, for example through the operation of resource constraints in a near full employment economy.

- Similarly, where a tax change affects highly mobile foreign investment, the response effect (*a*) can be large and the financial offset to other (domestic) activity (*o*) small. In this case the response to a tax change may result in financial resources moving into or out of Australia with the offsets manifesting themselves in other countries.

Second-round effects

Policy costings reported in the budget are 'static' policy costings which means that they only take account of the direct impact of a policy change. Direct impacts include the immediate behavioural response to a policy change net of any offsetting changes in other activities that arise as a result of the target group for the change switching resources from those other activities. In this context, the target group of a change may be interpreted broadly, for instance by considering the decisions of the entities that invest in businesses or industries rather than looking at the impact of the concession at the business or industry level.

Second-round effects refer to the impacts on tax revenues that arise from the responses of non-target groups and from the further economic feedbacks from a policy change, for instance due to changes in the level of demand, supply, prices or wages flowing on from the introduction of a new policy.

Generally, budget costings of new policy proposals do not include second-round economic feedback effects because of the uncertainty of the magnitude and timing of those impacts and because second-round impacts are likely to be small relative to the direct financial impact of a measure, particularly over the forward estimates period. This position is reflected more generally in the guidelines for costing all new policy proposals for the budget (revenue, expense or capital).

Second-round economic feedback effects are likely to take much longer to arise than the immediate costs of a new policy proposal. While some second-round effects, such as those which arise from changes in the level of economic activity, demand or prices, may arise relatively quickly, other effects such as those arising from changes in investment or saving may take much longer. A recent US study has indicated that a cut in capital taxes could have second-round impacts sufficient to finance up to half the

cost of the original tax cuts[5], but other analysis of the models used to derive these results indicates that only two thirds of these second-round effects could be expected to be realised after twenty years.[6]

Second-round effects have been included as separate elements of the costings of a few major tax reform packages: the 2000 New Tax System; the 1999 Review of Business Taxation; and the 2005 Welfare to Work package. These packages included estimates of second-round effects because the magnitude of the reforms meant that the second-round effects were likely to be measurable over the forward estimates timeframe. More importantly, the broadly based nature of the packages meant that they were expected to produce unambiguous second-round benefits for the whole economy rather than shifting resources from one activity to another.

As discussed in Appendix A, the exclusion of second-round economic feedback effects from new policy costings is implied in the general costing model by assuming that the growth in the tax base is not affected by the new policy (that is, the assumption that $g_{ni} = g_{bi}$).

Where estimates of the impact of second-round effects on taxation revenue are estimated they are usually presented as a separate element of the costing of the new policy proposal. This is because second-round effects are estimated separately, for instance by feeding the results of the base costing into a macroeconomic model.

In cases where the second-round effects of new policy proposals cannot be quantified reliably, the analysis of those proposals often includes qualitative assessments of second-round effects. This reflects the purpose of most new policy proposals — which is to provide some form of economic benefit. An important point to note is that the analysis of second-round effects needs to go beyond the financial impact of a proposal on taxation revenue and look at all aspects of the impact of proposals. The second-round impacts of a proposal on taxation revenue usually arise from the impact on total output and economic growth, which can be expected to be larger than the impacts on tax revenue (by a factor of $1/t_{ni}$).

Second-round economic impacts can be positive, as would be expected in the case of a change that enhances economic efficiency, or negative, as would be expected in the case of a change that detracted from economic efficiency. A proposal can have an overall benefit for the economy but still impose a financial cost on the Budget — this

5 N Gregory Mankiw and Matthew Weinzierl, Dynamic Scoring: A Back-of-the-Envelope guide, Harvard University, December 2005.

6 *Economic Report of the President*, United States Government Printing Office, February 2004, page 123.

will happen wherever the second-round gain in tax revenue is less than the first round budget cost.

Tax expenditure costings

The Treasury produces an annual Tax Expenditures Statement (TES) which provides details of tax concessions provided by the Australian Government.[7] The TES estimates measure how much assistance is provided to taxpayers by the tax concessions listed — rather than the revenue gain that would accrue to the Australian Government from abolishing them. The benefit to taxpayers of each concession is measured relative to a non-concessional benchmark. Potentially, tax expenditure estimates can be calculated in a number of ways.[8]

Consistent with most tax expenditure statements published in OECD countries, Australia uses the 'revenue forgone' approach to calculate tax expenditures. This approach measures how much the revenue is reduced (relative to a benchmark) because a particular tax expenditure exists. It is the most reliable method of estimating the level of assistance each tax expenditure provides to taxpayers.

Under the revenue forgone approach, tax expenditure estimates identify the financial benefits derived by individuals or businesses that receive concessions. It does not follow that, if a tax concession is abolished, tax revenue would increase by this amount because the approach does not take account of behavioural responses of the recipients of tax expenditures (that is, $a = 0$, $o = 0$).

The 'no behavioural change' assumption means that tax expenditure estimates may differ substantially from budget revenue costings, which are measured relative to the government's forward estimates of revenue and take into account both current and prospective taxpayer behaviour.

For example, the tax expenditures for the capital gains tax (CGT) discounts applying to individuals are measured relative to a benchmark of full taxation of capital gains.

- The budget estimates for implementing the CGT discount from 1 October 1999 counted the revenue arising from increased realisations of capital gains as an offset to the cost of introducing the discount.

---

7 The 2006 TES lists around 270 tax expenditures. The aggregate value of the measurable tax expenditures is nearly $42 billion or 4.4 per cent of GDP for 2005-06.

8 See Chapter 3 of the *2006 Tax Expenditures Statement* for a discussion of the different approaches to measuring tax expenditures.

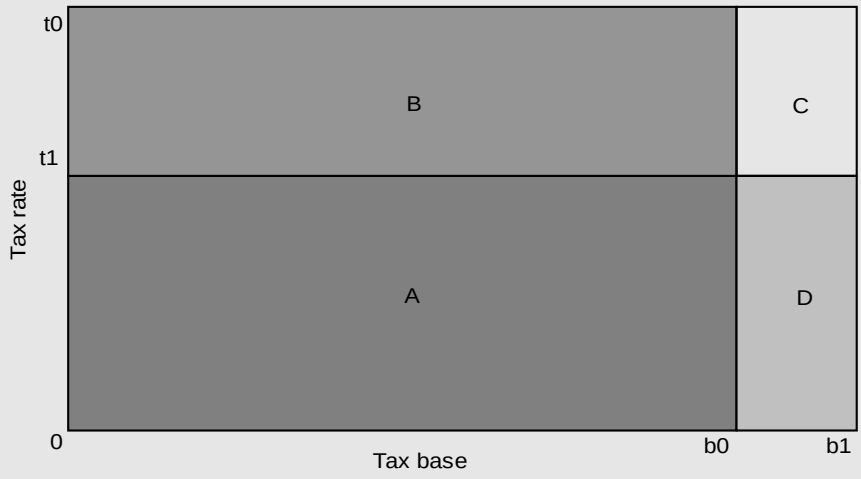
- On the other hand, the estimates of the tax expenditure arising from the CGT discount are proportional to the total level of capital gains realisations — increased realisations of capital gains increase the magnitude of the tax expenditure estimate.

Box 1: The difference between a budget costing and a tax expenditure

The diagram below illustrates the difference between a tax expenditures estimate and a revenue estimate for the budget. The axes of the chart are the tax base and the tax rate and the areas shown in the chart represent tax revenue. If in period 0 an activity is subject to a non-concessional effective tax rate[9] *t0* and at that tax rate the tax base is *b0* then revenue from this tax is equal to the area A + B. If a tax concession is provided for this activity that reduces the effective tax rate to *t1* and as a result activity increases to a new level of *b1*, the total revenue collected will now be equal to area A + D.

In this example the budget impact of the measure would be the difference in revenue collected (A + D) – (A + B) = (D - B).

On the other hand, for measuring tax expenditures, the benchmark effective tax rate is *t0*, so before the tax change there is no tax expenditure. When the effective tax rate is reduced to *t1*, a tax expenditure is created equal to the difference between the benchmark tax rate and the new tax rate (that is, *t0* – *t1*) times the new tax base (that is, *b1*). This is equal to area B + C in the diagram.



9 This refers to the effective tax rate rather than the statutory rate. We calculate the effective tax rate as the actual tax payable divided by the full tax base. We can change the effective tax rate by changing tax rates, the tax base or combinations of both.

Box 1 illustrates the difference between the tax expenditure estimate for a particular tax provision and the estimates of its budgetary cost. The box illustrates the following points:

- The value of the tax expenditure associated with a concession and its budgetary cost will only be equal where there is no behavioural response to the measure (that is, $b1 - b0 = 0$);

- A positive tax expenditure (that is, one which provides a benefit to the taxpayer) will arise from a tax concession even if the response effect is such that the concession results in a gain to tax revenue (that is, $B + C > B - D$).

- More generally, where the response to providing a new tax concession is an increase in activity, the tax expenditure estimate will be greater than the revenue estimate. Similarly, once the concession is in place, the revenue gain from removing the concession will be smaller than the associated tax expenditure.

- Tax expenditures are calculated on a case-by-case basis which means that overlaps between tax expenditures may not be taken into account. For instance, a concession that reduces the tax rate applying to a particular taxpayer will also reduce the value of tax base concessions provided to that taxpayer.

Behavioural responses, substitution of tax concessions and potential overlaps between tax concessions all mean that estimates of tax expenditures under the revenue forgone approach, while being a reasonable measure of the benefit particular concessions provide to taxpayers, will overstate the magnitude of the revenue impact of tax concessions, both for individual concessions and in aggregate. The aggregates published in the TES are only a guide to broad trends in tax expenditures over time and are not an accurate estimate of the impact of tax expenditures on total taxation revenue.

Understanding what is included in the tax expenditure benchmarks is very important because being able to identify a revenue impact for a tax provision does not necessarily mean that it gives rise to a tax expenditure. For instance, personal income tax cuts have a revenue impact but are not tax expenditures because the personal income tax rate scales are part of the tax expenditure benchmarks. Similarly, tax deductions for work related expenses are not tax expenditures because they are not personal consumption

and are therefore excluded from the calculation of income used in the TES income tax benchmark.[10]

On the other hand, some tax measures may have no revenue impact but may still give rise to a tax expenditure. For instance, rollover relief for some transactions may result in a tax expenditure because it defers taxation. It is possible for the rollover relief to have no impact on the revenue estimates because: (a) no revenue in respect of these transactions was included in the forward estimates (for instance because the transaction concerned was not expected to occur in the forward estimates period); and (b) the transaction being provided rollover relief would not proceed in the absence of that relief.

Concluding remarks

Treasury's costings of the financial impact of new taxation policy proposals are only one input into taxation policy analysis. Any assessment of a new policy proposal needs to take account of the wider policy environment, including most importantly the effectiveness of a proposal in terms of the policy objectives it is meant to achieve and the impact of policy proposals on the wellbeing of Australians. While costings of new taxation policy proposals do not generally include second-round effects, these are important considerations in assessing their impact, particularly in the longer term.

While costings of new policy proposals aim to include behavioural responses and offsets where it is practical to do so, this is made difficult by the lack of reliable data on these effects. This means that it is frequently not possible to estimate behavioural responses precisely and that judgements often have to be made about the magnitude of these effects, including whether to assume that a proposal has 'no behavioural effect'. Where a behavioural response is included in the costing of a new policy proposal, the analysis also must take account of whether that response has any impact on other activities.

10 Under the Schanz-Haig-Simons definition of income used in the TES, an entity's income is defined as the increase in the entity's economic wealth (stock of assets) between two points of time, plus the entity's consumption in that period. Consumption includes all expenditures, *except* those incurred in earning or producing income. Further information on definitions of income can be found in *Tax Policy Handbook,* edited by Parthasarathi Shome, page 117, International Monetary Fund, Washington DC, 1995.

Understanding the purpose of tax policy costings is important. This is illustrated by the difference between costings against the forward estimates for budget purposes and costings for the Tax Expenditures Statement. Budget costings measure the impact of proposals on the government's budget, taking account of existing behaviour and the existing revenue base, which in many cases includes tax concessions. By contrast, the Tax Expenditures Statement measures the benefit of concessions to the taxpayer, relative to a non-concessional benchmark with no behavioural change. This means that tax expenditures estimates are not comparable to budget revenue estimates and are not a good indicator of the revenue effect of removing tax concessions.

APPENDIX A

A general model for estimating the revenue impacts of tax policy propsals

Revenue from a particular tax base or taxpayer[11] can be represented as the product of the tax rate and the value of the tax base from which we collect tax. The tax base could be income, turnover, sales, a stock such as wealth and so on. We can therefore estimate tax revenue in any period i as:

$$R_{bi} = t_{bi} \times B_{bi} \quad (1)$$

where:

- R_{bi} is revenue from the tax concerned in period i;
- t_{bi} is the applicable average tax rate in period i;
- B_{bi} is the tax base in period i; and
- b is a flag that indicates we are looking at the base (forward estimates) tax scenario.

We can represent the forward estimates of revenue for a particular tax as:

$$R_{b0} = t_{b0} \times B_{b0} \quad \text{Tax in base year}$$

$$R_{b1} = t_{b1} \times B_{b0} \times (1 + g_{b1}) \quad \text{Tax in first estimate year}$$

$$R_{bi} = t_{bi} \times B_{b0} \times (1 + g_{bi}) \quad \text{Tax in year } i \quad (2)$$

11 The level at which this modelling approach can be applied will depend upon the complexity of the tax base concerned. The more complex the base the greater the level of disaggregation required. For instance, for individuals (where we have a tiered tax scale, rebates and credits), the approach could be applied at the individual taxpayer level through a microsimulation approach and the results aggregated. For companies where there is a single tax rate, a more aggregated approach is possible.

where g is the cumulative compound growth rate for the tax base (B) measured between the base period (0) and period i — that is:

$$g_{bi} = B_{bi} / B_{b0} - 1 \quad (3)$$

We could implement a new tax policy by changing the tax rate (t), the tax base (B) or both. We can calculate the taxation revenue under this new policy proposal (denoted by the subscript n against each variable in equation (2)) as:

$$R_{ni} = t_{ni} \times B_{n0} \times (1 + g_{ni}) \quad (4)$$

and the cost of the new policy proposal in period i (ΔRev_i) would be:

$$\Delta Rev_i = R_{ni} - R_{bi}$$

$$= [t_{ni} \times B_{n0} \times (1 + g_{ni})] - [t_{bi} \times B_{b0} \times (1 + g_{bi})] \quad (5)$$

Second-round economic feedback effects

Generally costings of new taxation policy proposals only focus on the direct first round behavioural impacts (where practical to do so) and direct budgetary consequences of a new policy. This is because the second-round economic feedback effects of policy changes are very difficult to estimate, uncertain and likely to be small relative to the direct effects of the policy over the forecasting period.

The implications of our assuming no second-round economic feedback effects is that the growth parameter in our costing formula (g) is not affected by the new policy proposal with the result that we assume that $g_{ni} = g_{bi}$.

This means that the equation (5) can be rewritten as follows:

$$\Delta Rev_i = [(t_{ni} \times B_{n0}) - (t_{bi} \times)] \times (1 + g_{bi}) \quad (6)$$

Changes to the tax rate versus tax base

We can now look at estimating the effects of changes in the tax base versus the tax rate. In the equations above we express the tax base in terms of its level in a base year 0. This is because we usually prepare costings using a period where we have data for the tax base then grow the resulting estimates out to subsequent years using a growth parameter (g in the equations above). For most costings, provided the tax base in the base period is not zero (that is, $B_{b0} > 0$), we can also express the impact of a policy change in terms of a tax base change parameter (h), the value of which represents the impact of the proposed policy change on the size of the tax base (for instance, by way

of a tax deduction) or the impact on the base of the direct behavioural responses to the policy change.

If:

$h = B_{n0} / B_{b0} - 1$ *where* $B_{b0} > 0$

Then:

$B_{n0} = (1 + h) \times B_{b0}$ (7)

Substituting equation (7) for B_{n0} in equation (6) gives the following result:

$$\Delta Rev_i = \{[t_{ni} \times (1 + h) \times B_{b0}] - [t_{bi} \times B_{b0}]\} \times (1 + g_{bi})$$

$$= (t_{ni} - t_{bi} + h.t_{ni}) \times B_{b0} \times (1 + g_{bi}) \quad (8)$$

Direct behavioural responses

We can break down the impact of a tax change on the size of the tax base (h) above into separate components representing the impact of the policy change on the proportion of the tax base that is subject to tax (c) and an element representing the response of taxpayers to the change (a). Generally, we would expect that an increase in tax, whether due to an increase in the tax rate (that is, $t_{ni} > t_{bi}$) or an increase in the tax base (that is, $c > 0$) would result in a negative response effect (that is, $a < 0$).

If:

$h = B_{n0} / B_{b0} - 1$

and:

$B_{n0} = (1 + c) \times (1 + a) \times B_{b0}$

then:

$$h = [(1 + c) \times (1 + a)] - 1$$

$$= c + a + ca \quad (9)$$

Substituting for h in equation (8) allows us to take account of behavioural effects in our costing:

$$\Delta Rev_i = (t_{ni} - t_{bi} + h.t_{ni}) \times B_{b0} \times (1 + g_{bi}) \quad (8)$$

$$= [t_{ni} - t_{bi} + (c + a + ca).t_{ni}] \times B_{b0} \times (1 + g_{bi}) \quad (10)$$

The response effect a in equation (10) represents the taxpayer response to the policy change on transactions subject to the policy change. This response effect does not take account of the impact of the change on other transactions. This impact is important where the resources underlying transactions are constrained, for instance where an increase in activity in response to a tax concession diverts resources from non-concessionally taxed activities. This effect can be taken into account into by adding another term to the equation (10)

$$Offset = a \times o \times t_{oth} \times B_{b0} \quad (11)$$

where:

- o is an offset factor, representing the extent to which an increase in the activity affected by a tax change is offset by a change in other activities. Generally $0 \leq o \leq 1$ where 0 is no change and 1 is a full dollar for dollar offset in activity.

- t_{oth} is the average tax rate applying to the other activities affected by the tax change.

Deducting this offset factor (11) from equation (10) gives:

$$\Delta Rev_i = [t_{ni} - t_{bi} + (c + a + c.a).t_{ni} - a.o.t_{oth}] \times B_{b0} \times (1 + g_{bi}) \quad (12)$$

Equation (12) provides a general equation that can be used to estimate the revenue impact of a taxation change.

As noted in deriving equation 7, this equation requires the existing tax base to be greater than zero. Where the existing tax base for a transaction is equal to zero (for instance, in the case of an import that is excluded from the domestic market due to a prohibitive tariff) there would be no loss of tariff revenue on that item from reducing the tariff but there would be a loss of revenue from tariffs on competing imports and taxes on domestic production. In this case the cost would be wholly due to the offset factor in equation 11, which would need to be respecified in terms of the tax base for the other transactions so that:

$$\Delta Rev_i = t_{oth} \times \Delta B_{oth} \quad (13)$$

References

Alshuler, R, Bull, N, Dowd, T and Moomau, P 2005, *The Role of Dynamic Scoring in the Federal Budget Process: Closing the Gap Between Theory and Practice*, American Economic Association, Annual Meeting Papers 2005.

Auerbach, AJ 2005, *Dynamic Scoring: An Introduction to the Issues, American Economic Association*, Annual Meeting Papers 2005.

Budget Paper No. 2, *Budget Measures 2006-07*, Commonwealth of Australia, Canberra, May 2006.

Budget Paper No. 1, *Budget Strategy and Outlook 2006-07,* Commonwealth of Australia, Canberra, May 2006.

Economic Report of the President (Chapter 5), February 2004, United States Government Printing Office, Washington DC.

Mankiw, NG and Weinzierl, M 2005, *Dynamic Scoring: A Back-of-the-Envelope Guide*, Harvard University.

Polackova Brixi, H, Valenduc, CM A and Li Swift Z (editors) 2004, *Tax Expenditures – Shedding Light on Government Spending through the Tax System – Lessons from Developed and Transition Countries*, The World Bank, Washington DC.

The Treasury, *Annual Report 2004-05*, Commonwealth of Australia, Canberra September 2005.

The Treasury, *2006 Tax Expenditures Statement,* Commonwealth of Australia, Canberra, 2006.