Effective marginal tax rates on savings[1]

This working document outlines some preliminary research undertaken as part of the *Tax and Transfer Incidence in Australia* project completed in October 2015. This document is made available in the interests of furthering research conversations. **The views expressed in this document are exploratory and cannot be attributed to the Productivity Commission.**

Effective marginal tax rates (EMTRs) are commonplace in debates about the incentive structures of tax and transfer systems, but their usage tends to be quite narrow. Usually, EMTRs are calculated on labour income and are used to provide an indication of the direct effects of a tax and transfer system on the incentives of individuals to undertake paid work. Relatively little attention has been paid to using EMTRs as an indicator of the effects of a tax and transfer system on individual incentives to undertake other activities.

One activity of particular economic importance is saving. At an individual level, providing the right incentives to save is important so that people have sufficient funds to provide for retirement, plan for risks to their income and health, and purchase housing and other durable goods. At an economy wide level, providing the right incentives to save is important to provide funds to invest in capital and, therefore, drive economic growth.

Extending the concept of EMTRs to savings is a first step in better understanding how the tax and transfer system affects incentives to save. While an EMTR is not a direct measure of the incentive to save, it can be used to measure the effect of the tax and transfer system on the return to savings. EMTRs can also be used to examine the consistency of tax treatments for different savings instruments and therefore provide an indication of the extent to which inconsistent tax treatments distort choices between savings instruments.

This working document provides an introduction to the concept of EMTRs on the return to savings. It explains how EMTRs on the return to savings can be calculated, explores the effects of varying key assumptions in EMTR calculations, and provides some illustrative estimates of EMTRs for different savings instruments in Australia.

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Calculating EMTRs on the return to savings

The EMTR on the return to savings measures the extent to which the tax and transfer system affects the rate of return on an additional increment of income saved. For a marginal increase in savings, it can be calculated as the percentage difference between the annualised real pre-tax rate of return (p) and the annualised real post-tax rate of return (r) (Wakefield 2009).[2]

$$EMTR = \frac{p - r}{p} \tag{1}$$

Calculating the pre-tax rate of return

The annualised real pre-tax rate of return on savings (p) is the rate of return that would be earned if no taxes were levied on the return to savings. This can be calculated using the general formula for the future value of an investment with continuous compounding. In this case, the real future value is the real pre-tax value of withdrawal (w') and the present value is the initial contribution from taxed labour income (c).

$$w' = c \times (1 + p)^n \tag{2}$$

This formula can be rearranged in terms of p to obtain the annualised real pre-tax rate of return on savings.

$$p = \left(\frac{w'}{c}\right)^{\frac{1}{n}} - 1 \tag{3}$$

The real pre-tax value of withdrawal (w') is a function of the incremental contribution to savings (c), the nominal annual rate of return on savings (i) and the annual inflation rate (π).

$$w' = c \times \left(\frac{1 + i}{1 + \pi}\right)^n \tag{4}$$

Substituting (4) into (3) results in a simplified equation (5) for the annualised real pre-tax rate of return on savings (p), which can then be inserted into the EMTR equation (1).

2 This approach is consistent with recent publications that calculate EMTRs on savings both in Australia (for example, Treasury 2009, 2015) and the United Kingdom (Mirrlees et al. 2011). However, EMTRs could be calculated in other ways. One approach would be to define an EMTR on savings as the future value of taxes as a proportion of the pre-tax or post-tax future value of consumption.

$$p = \left(\frac{c \times \left(\frac{1+i}{1+\pi} \right)^n}{c} \right)^{\frac{1}{n}} - 1$$

$$= \frac{1+i}{1+\pi} - 1 \tag{5}$$

Calculating the post-tax rate of return

The annualised real post-tax rate of return on savings (r) has the same form as the pre-tax rate of return but includes the real value of savings at withdrawal after tax (w) rather than before tax (w').

$$r = \left(\frac{w}{c} \right)^{\frac{1}{n}} - 1 \tag{6}$$

Accounting for taxes on savings

The real post-tax value of savings at withdrawal (w) is calculated taking into account taxes levied:

- on or before contribution
- on returns[3] as accrued
- on withdrawal (when returns are realised).

Taxes levied on savings indirectly, such as stamp duty, are not included in calculations (box 1).

As shown in equation (7), the initial contribution from taxed labour income (c) is adjusted by a factor which reflects the relative sizes of the tax rate on consumed labour income (t_c) and the tax rate on saved labour income (t_s). If a person receives tax relief when they make a savings contribution, then t_c is greater than t_s. If a person pays additional tax when they make a savings contribution, then t_c is less than t_s. In other words, the real post-tax withdrawal value (w) is only affected by taxes on or before contribution to the extent that labour income contributed to savings is taxed at a different rate to labour income that is immediately consumed.

$$w = \frac{c \times \left(\frac{1-t_s}{1-t_c} \right) \times \left(1 + \left(i \times (1-t_r) \right) \right)^n \times (1-t_w)}{(1+\pi)^n} \tag{7}$$

3 Returns can include interest income and capital gains.

Box 1 **Which taxes should EMTRs on savings include?**

In Australia, individuals face a number of taxes on capital, including:

- personal income tax on interest, rent, dividends and income from trusts; capital gains tax on shares and housing (including discounts and exemptions); and superannuation taxes
- stamp duties, land tax and local council rates.

The taxes listed in the first set are considered to be 'savings taxes', while those in the second set are 'investment taxes'. Savings taxes directly affect the return to savings, and therefore should be included in the calculation of EMTRs on savings. By contrast, investment taxes are not likely to directly affect the return to savings. Instead, they are likely to be reflected in lower asset prices because savers will be prepared to pay less for them. For example, stamp duties, land tax and local council rates can all be thought of as primarily affecting property prices, rather than the return on wealth saved in housing.

This classification of capital taxes is consistent with recent studies that calculated effective tax rates on the return to savings in the UK. Savings taxes (such as income tax, social security contributions, capital gains tax and inheritance tax) were included in the calculations, while investment taxes (such as corporation tax, council tax, business rates and stamp duties on property and shares) were excluded (Adam, Browne and Heady 2010; Wakefield 2009).

Following these arguments, the calculation of EMTRs in this note only includes savings taxes and omits investment taxes.

Each period, the nominal rate of return (i) is taxed at the tax rate on returns (t_r), and the compounded value is multiplied by the nominal value of the contribution after contribution taxes. At withdrawal, after n periods, the total nominal value of savings is then taxed at the tax rate on withdrawals (t_w). This is then adjusted for the rate of inflation (π) to obtain the real post-tax value of withdrawal (w).

The advantage of accounting for contribution taxes as described in equation (7) is that an EMTR of zero implies that the tax and transfer system is 'neutral' with regard to the timing of consumption. That is to say, the tax and transfer system neither encourages nor discourages saving at the margin for a given individual and savings instrument.[4] In practice, there are arguments for deviating from the neutral taxation of savings (box 2), but neutrality between consumption today and consumption tomorrow is generally considered to be a constructive benchmark against which to judge the design of savings taxation (Mirrlees et al. 2011).

4 A negative EMTR implies a tax and transfer system that encourages saving at the margin, while a positive EMTR implies a tax and transfer system that discourages saving at the margin.

Box 2 Neutral taxation and the ideal tax base

There are three ways to think about neutrality in the taxation of savings. A tax system could be neutral between:

1. consuming today and saving today
2. consuming today and consuming tomorrow
3. different savings instruments.

Perspectives on neutrality are tied up in the debate about whether the ideal tax base is 'comprehensive income' or 'comprehensive consumption'. Advocates of comprehensive income argue that all sources of personal income — earned income, transfer payments, interest income and capital gains — should be subject to taxation (Hyman 2008). According to this view, a tax system should be neutral between consumption and savings (1) and between different savings instruments (3).

Advocates of comprehensive consumption argue that all forms of consumption should be subject to taxation. In other words, the ideal tax base includes earned income and transfer payments, but excludes interest income and capital gains. In the absence of above-normal profits, this can be achieved via a direct consumption tax or an income tax that excludes all savings income (a 'pre-paid' consumption tax).[a] According to this view, a tax system should be neutral between consumption today and consumption tomorrow (2) and different savings instruments (3).

While there remain advocates for both tax bases, over the second half of the twentieth century, more and more academic economists came to favour consumption as the ideal tax base (possibly coupled with a tax on wealth transfers) (McLure and Zodrow 1994). For example, former Treasury Secretary Ken Henry (2009, p. 3) noted that 'comprehensive income taxation has, for some time, been considered by many economists as 'old thinking''. This shift reflected growing recognition of both the need to avoid distorting inter-temporal consumption choices and the (relative) ease with which a comprehensive consumption tax could be implemented (Bradford 2000).

More recently, nuanced views have gained currency. For example, Banks and Diamond (2011, p. 2) argued that the:

> … widely recognized result of the optimal tax literature – that capital income should not be taxed … – arises from considerations of individual behaviour and the nature of economic environments that are too restrictive when viewed in the context of both theoretical findings in richer models and the available empirical econometric evidence. Hence such a result should be considered not robust enough for applied policy purposes and there should be some role for including capital income as a component of the tax base.

There are also equity arguments for taxing savings. For example, Piketty (2014) has documented how the rate of return on private capital has exceeded the economic growth rate for much of history. In the absence of capital taxation, Piketty (2014, p. 515) has argued that wealth will continue to grow faster than labour income in the future, become increasingly concentrated in the hands of a few, and lead to an 'endless inegalitarian spiral'.

The upshot is that while a consumption tax base can provide a useful benchmark, achieving complete neutrality between consumption today and consumption tomorrow in all circumstances is not necessarily an appropriate goal for taxation policy.

[a] There is debate as to whether this theoretical equivalence holds in the real world (Blumkin, Ruffle and Ganun 2012).

Factors that affect EMTRs on the return to savings

Aside from the actual rate of tax paid, a number of factors affect the EMTR on the return to savings. These include the tax treatment of savings, the investment time horizon, the inflation rate and means-testing on transfer payments (which affects the effective rate of tax paid).

Tax treatments on savings instruments

Table 1 provides some hypothetical examples of how EMTRs on the return to savings vary by tax treatment when $100 of post-tax labour income is contributed to savings.

Comparing column 1 to column 2 shows that taxing only contributions to savings (commonly described as taxed-exempt-exempt or TEE) has the same effect as taxing only withdrawals from savings (commonly described as exempt-exempt-taxed or EET). Under the EET treatment illustrated, upfront tax relief on saved labour income means that the actual amount contributed to savings is $125 compared to $100 under the TEE treatment. As such, the gross returns under EET ($6.25) are higher than the gross returns under TEE ($5.00). However, the absolute value of tax paid under EET ($26.25) is commensurately larger than under TEE ($25.00). Consequently, the EMTR is the same. Further, because the rate of tax paid under these treatments is the same as the rate of tax on consumed labour income, the EMTR for both is zero.

When returns are taxed in addition to contributions or withdrawals (such as TTE, the usual tax treatment for a savings account) a positive EMTR results. For example, in column 3, contributions are taxed at 20 per cent and gross returns are taxed at 20 per cent as they accrue. Consequently, the EMTR on the return to savings is also 20 per cent.

That said, the EMTR on the return to savings does not depend solely on whether the returns to savings are taxed as they accrue. The *rate* of tax on contributions and withdrawals also matters. In the absence of a tax on returns as they accrue, an EMTR other than zero can still occur if contributions or withdrawals are subject to a tax rate different from the tax rate on consumed labour income. For example, in column 4, consumed labour income is taxed at 20 per cent, but savings are taxed (on withdrawal) at 19 per cent (a 5 per cent discount). The result is a negative EMTR: -26.25 per cent. Similarly, in column 5, consumed labour income is taxed at 20 per cent, but savings are taxed (on withdrawal) at 21 per cent (a 5 per cent premium). In this case the result is a positive EMTR: 26.25 per cent.

Table 1 **EMTRs under different tax treatments**

Comparison of treatments with a 20% income tax over 1 year[a]

Column number	*1*	*2*	*3*	*4*	*5*
Tax treatment	*TEE*	*EET*	*TTE*	*EET (5% tax discount)*	*EET (5% tax premium)*
Tax rate on consumed labour income (%) (t_c)	20	20	20	20	20
Tax rate on saved labour income (%) (t_s)	20	0	20	0	0
Tax rate on returns (%) (t_r)	0	0	20	0	0
Tax rate on withdrawal (%) (t_w)	0	20	0	19	21
Nominal rate of return (%) (i)	5	5	5	5	5
Incremental contribution from taxed labour income (c)	100	100	100	100	100
Contribution after tax relief $(c \times (\frac{1-t_s}{1-t_c}))$	100	125	100	125	125
Gross returns $(c \times (\frac{1-t_s}{1-t_c}) \times i)$	5.00	6.25	5.00	6.25	6.25
Returns net of tax $(c \times (\frac{1-t_s}{1-t_c}) \times (i \times (1-t_r)))$	5.00	6.25	4.00	6.25	6.25
Gross funds available for withdrawal at end of period $(c \times (\frac{1-t_s}{1-t_c}) \times (1 + (i \times (1-t_r))))$	105.00	131.25	104.00	131.25	131.25
Withdrawal net of tax $(w = c \times (\frac{1-t_s}{1-t_c}) \times (1 + (i \times (1-t_r))) \times (1-t_w))$	105.00	105.00	104.00	106.31	103.69
Rate of return before tax (%) (p)	5.00	5.00	5.00	5.00	5.00
Rate of return after tax (%) $(r = \frac{w}{c} - 1)$	5.00	5.00	4.00	6.31	3.69
Percentage point change in rate of return (%) $(p - r)$	0.00	0.00	1.00	-1.31	1.31
Real effective marginal tax rate (%) $\boldsymbol{EMTR = \frac{p-r}{p}}$	**0.00**	**0.00**	**20.00**	**-26.25**	**26.25**

a Formulas are simplified by assuming a one year investment period and zero inflation.

Sources: Banks and Tanner (1999); Wakefield (2009).

The investment time horizon

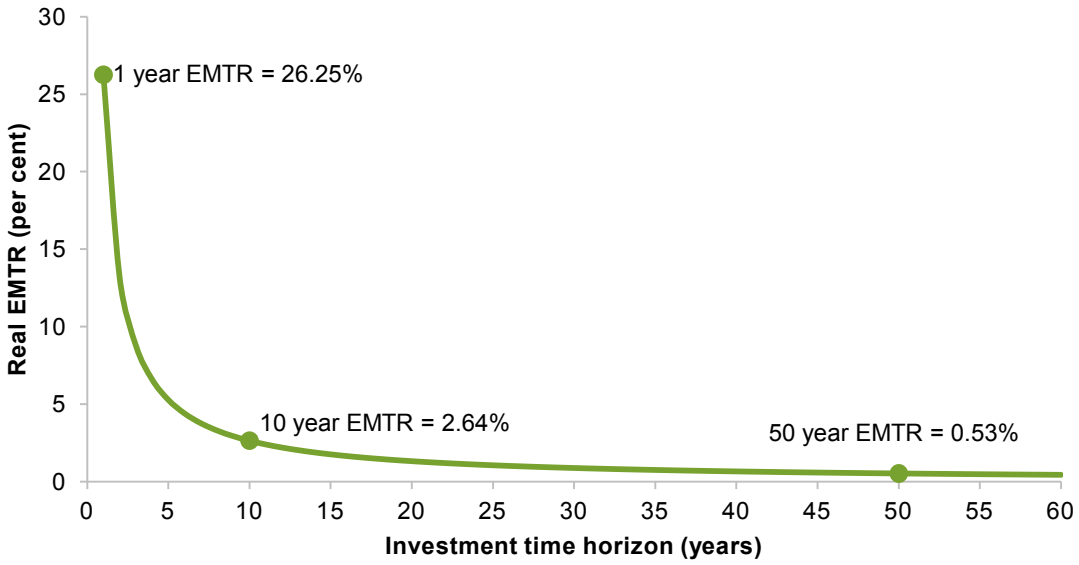
The effect of the investment time horizon on the EMTR depends on whether savings taxes are levied on contributions, returns or withdrawals.

Tax on contributions or withdrawals

When savings are only taxed at withdrawal (or at contribution), and are taxed at the same rate as labour income, then the EMTR is constant at zero regardless of the investment time horizon. If, however, savings withdrawals (or contributions) are taxed at a different rate to labour income, the EMTR depends on the investment time horizon (Wakefield 2009). As the time horizon lengthens and returns compound, the contribution becomes a smaller proportion of the total funds available at withdrawal, so the tax counts for less in the EMTR. For example, in table 1, a 5 per cent tax premium (relative to the tax on labour income) on withdrawn savings equated to an EMTR of 26 per cent with a 1 year time horizon. With a 10 year time horizon the EMTR declines to 3 per cent, and with a 50 year time horizon to less than 1 per cent (figure 1).

Figure 1 **Savings EMTRs with different time horizons**

Savings taxed on withdrawal at a 5% premium to other income[a]



[a] Savings taxed on withdrawal only at 21 per cent. Income not saved taxed at 20 per cent. Assumes a real return of 5 per cent per year and zero inflation.

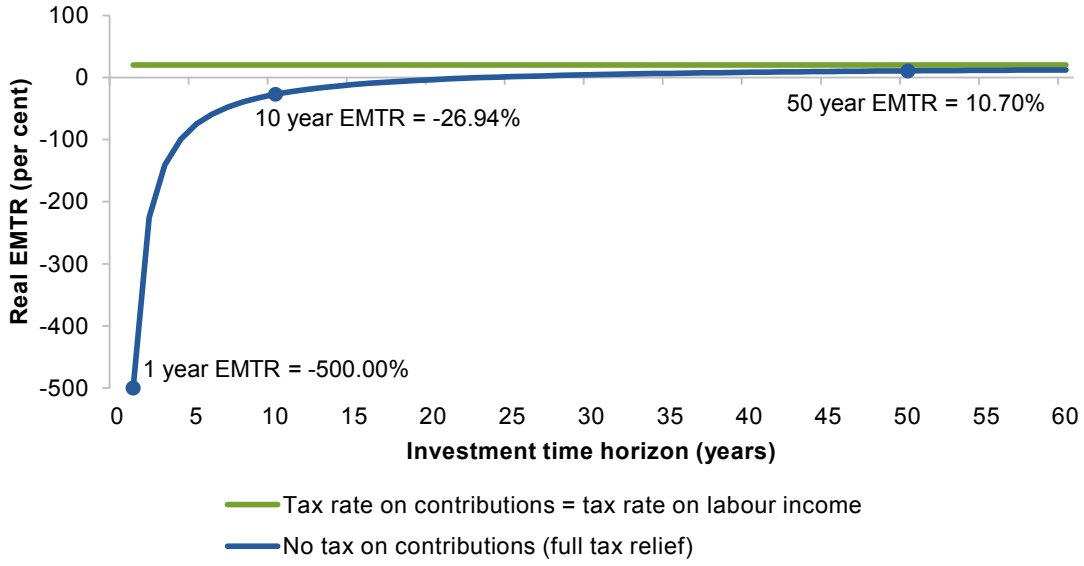
Source: Commission estimates.

Tax on returns

When returns on savings are taxed, and there is a tax rate on contributions (or on withdrawals) that is equal to the tax rate on labour income, then the EMTR is constant regardless of the investment time horizon. This implies that a person would be indifferent between (a) withdrawing their savings after n years and (b) over a total of n years, withdrawing their savings at the end of each year and immediately reinvesting the amount withdrawn. For example, in table 1, when labour income and returns on savings were both taxed at 20 per cent, the EMTR over a 1 year time horizon was 20 per cent. This EMTR remains at 20 per cent irrespective of the time horizon (figure 2).

Figure 2 **Savings EMTRs with different time horizons**

Savings taxed on contribution and returns as accrued[a]



[a] Savings returns and labour income taxed at 20 per cent. Assumes a real return of 5 per cent per year and zero inflation.

Source: Commission estimates.

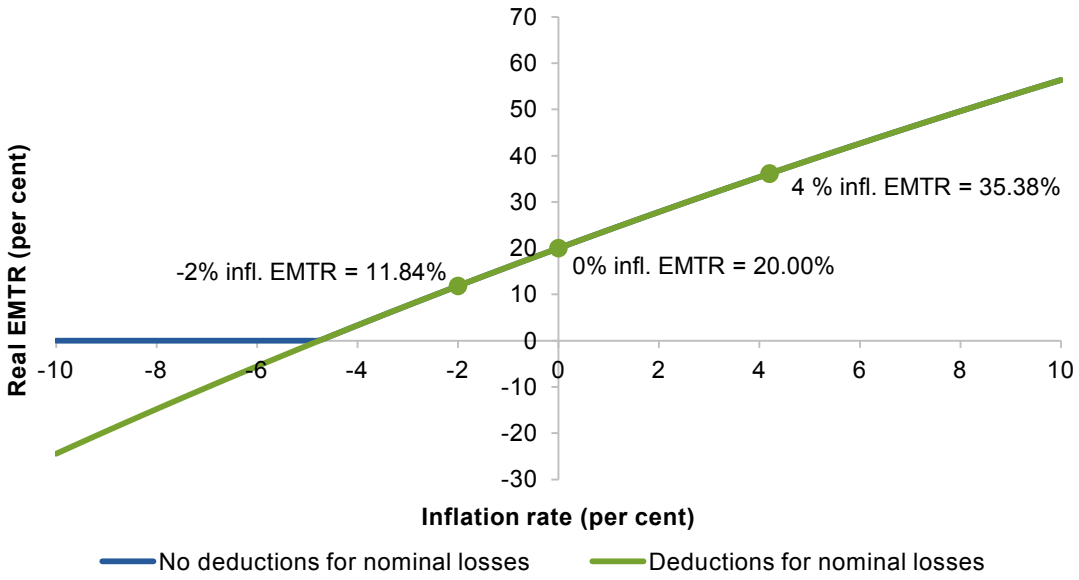
The EMTR of an investment with a tax on savings returns does differ depending on the investment time horizon when the tax rate on savings contributions (or withdrawals) is different to the tax rate on labour income. Furthermore, it converges to the EMTR of an investment that has a tax rate on contributions equal to the tax rate on labour income. As discussed above, this is because as the time horizon increases, the tax on the initial contribution becomes a smaller proportion of the total value of withdrawal and so it has a smaller impact on the EMTR. As an example, suppose that a person pays no tax on contributions or withdrawals (so that they receive a full tax relief on their initial contribution) and the tax on savings returns is 20 per cent. The EMTR for a 1 year time horizon would be -500 per cent. However, the effect of the tax relief reduces as the time horizon lengthens, and the EMTR converges to 20 per cent (figure 2).

Inflation

When savings are taxed on nominal returns as they accrue (rather than when they are realised), the EMTR calculated will vary depending on the rate of inflation (Wakefield 2009). As the rate of inflation increases, the amount of tax paid as a proportion of the real return increases, so the EMTR rises. For example, in table 1, the EMTR on savings with taxed contributions and taxed returns with a 5 per cent rate of return and no inflation was 20 per cent. With 4 per cent inflation, the EMTR on the real return rises to 35 per cent (figure 3).

Figure 3 **Savings EMTRs with different inflation rates**

Savings taxed on contribution and returns as accrued[a]



[a] Assumes a 1 year time horizon, real return of 5 per cent per year and a tax rate of 20 per cent on both the contribution and the returns.

Source: Commission estimates.

During periods of deflation, the effect on the EMTR depends on the tax treatment of losses. If losses can be deducted from other income, the EMTR can become negative when nominal returns are subject to taxation and inflation is strongly negative.[5] For example, using the example above with 6 per cent deflation, the EMTR is minus 6 per cent (figure 3).

In the Australian context, the effect of inflation on the EMTR is relevant for most savings instruments, because most savings instruments are taxed on nominal returns as they accrue.

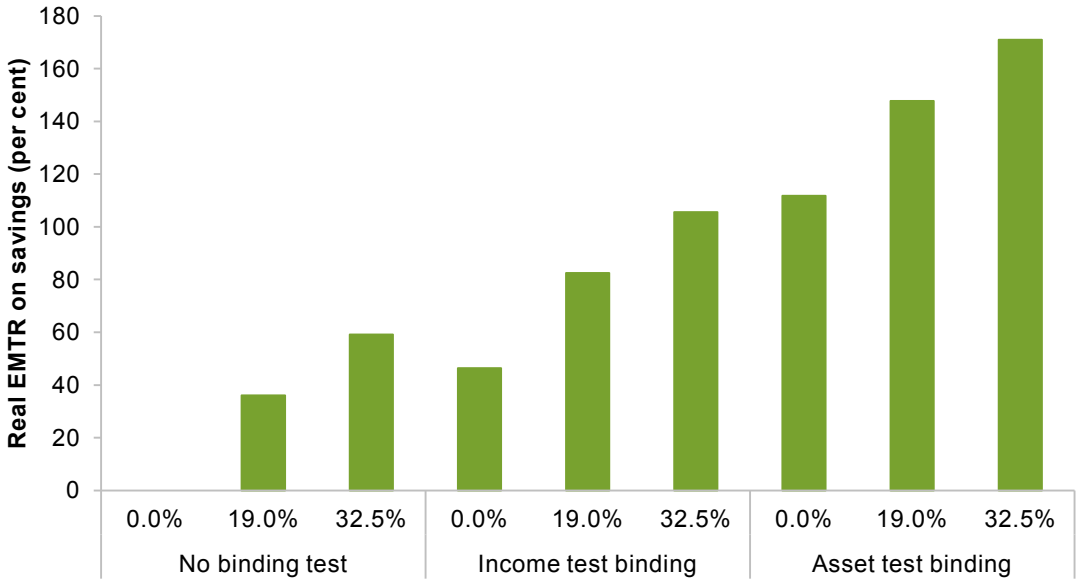
5 The treatment of losses can also affect EMTRs in the absence of inflation if the real rate of return is negative.

Means-testing transfer payments

On the transfer side, EMTRs on savings are affected by both income tests and assets tests. Figure 4 shows how the income test and assets test would affect the EMTR on savings faced by a person receiving the Age Pension with income invested in an interest-bearing savings account. Even if the person faces a 0 per cent statutory marginal income tax rate, if the assets test is binding, the person faces an EMTR on savings of 112 per cent. This is because the assets test reduces the Age Pension by about 4 cents per annum for every extra dollar of assets over the limit. Assuming a 6 per cent nominal return and a 2.5 per cent inflation rate, the return on savings minus the reduction in the Age Pension is not enough to offset the impact of inflation.

Figure 4 **Savings EMTRs with Age Pension income and assets tests[a]**

Facing statutory marginal income tax rates of 0%, 19% and 32.5%



[a] Based on a $100 marginal investment in an interest-bearing savings account. Assumes a 25 year investment period, 6 per cent nominal return on savings and 2.5 per cent inflation. Age Pension income and assets tests are based on a single person family. Under the income test, assets are assumed to earn a deemed nominal return of 3.25 per cent. The assets test is assumed to be based on the value of financial investments at the start of the year. The Age Pension is assumed to not be subject to tax and no tax offsets are considered.

Source: Commission estimates.

The taxation of savings in Australia

Savings taxation in Australia is complex. Different savings instruments are subject to very different tax treatments (table 2). Some tax treatments tend to favour savings over consumption (such as superannuation), while others tend to favour consumption over

savings (such as bank accounts and debt instruments). Owner-occupied housing is the only savings instrument with a tax treatment consistent with a comprehensive consumption tax. Many savings instruments have taxed contributions, partially taxed returns and partially taxed withdrawals (often with concessional tax rates).

Table 2 **Tax treatments and tax rates by savings instrument**
2014-15

		Bank accounts and debt instruments	*Rental properties*	*Owner-occupied properties*	*Domestic shares*	*Foreign shares*	*Super-annuation*
Tax treatment[a]		TTE	Ttt	TEE	Ttt	Ttt	ttE
Tax rate on contribution		Marginal income tax rate	Marginal income tax rate	Marginal income tax rate	Marginal income tax rate	Marginal income tax rate	15 per cent or higher[b]
Tax rate on returns	Capital gains as accrued	**na**	None	None	None	None	0 per cent or 10 per cent or 15 per cent[c]
	Interest/ dividends/ rental income[d]	Marginal income tax rate	Marginal income tax rate[e]	None	Marginal income tax rate (less imputation credit)[e]	Marginal income tax rate[e]	0 per cent or 15 per cent[f]
Tax rate on withdrawal	Realised capital gain component	**na**	50 per cent discount on marginal income tax rate	None	50 per cent discount on marginal income tax rate	50 per cent discount on marginal income tax rate	None[g]
	Initial contribution component	None	None	None	None	None	None[g]

[a] A lower case 't' refers to a non-zero concessional tax treatment. [b] Higher rates apply to high-income earners or if the concessional contribution cap is exceeded. For non-concessional contributions paid out of after-tax income, the marginal income tax rate applies. [c] No tax is paid on returns during the income stream phase. During the accumulation phase, the tax rate is 10 per cent if an asset has been held for more than 12 months and 15 per cent if not. [d] Taxes on interest, dividends and rental income could be considered to be taxes on withdrawal rather than on return if not reinvested. [e] If an asset is negatively geared (that is, expenses including interest costs exceed rental income/dividends) then losses can be offset against other income. [f] No tax is paid on returns during the income stream phase. [g] Taxes may apply if a person retires before they turn 60. **na** Not applicable.

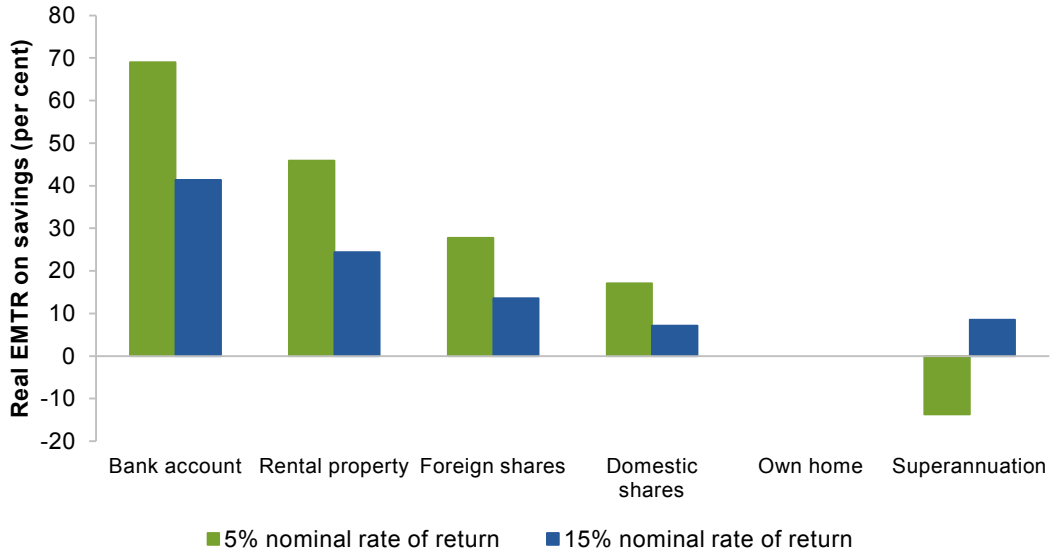
Sources: ATO (2015); Treasury (2015).

Figure 5 shows illustrative EMTRs on savings for common savings instruments in Australia for an individual with a taxable income of between $37 001 and $80 000 (and therefore facing a marginal income tax rate of 32.5 per cent). The different tax treatments of savings instruments translate to large differences in the EMTR an individual would face making a $100 investment in each. When rates of return and investment periods are held

constant across savings instruments, EMTRs tend be highest on savings held in bank accounts and lowest on savings held in superannuation.

Figure 5 **Illustrative EMTRs for different savings instruments[a]**

2014-15, for an individual facing a 32.5% marginal income tax rate



[a] Based on a $100 marginal investment and a 25 year investment period. Assumes 2.5 per cent inflation. The return on rental property, domestic shares and foreign shares assumes a 50 per cent split between capital gains and dividends/rental income. The return on foreign shares also assumes that a foreign company tax of 15 per cent has been paid on dividends, which can be claimed as a tax offset in Australia. All after-tax returns are assumed to be reinvested each year.

Source: Commission estimates.

This ranking ignores differences in average nominal rates of return, average investment periods across savings instruments and the potential for negative gearing. As discussed above, depending on how a savings instrument is taxed, the nominal rate of return and the investment period may influence the EMTR. And with negative gearing, EMTRs on savings instruments such as rental properties can decline substantially and become negative. As a consequence, the average EMTRs that Australian investors face in the real world could differ substantially from those calculated above.

Where to next?

EMTRs on savings could be used in a wide variety of contexts to improve public understanding of the effects of the tax and transfer system on the return to savings and provide an indication of incentives to save. Across the Australian population, people face different income tax rates, receive different amounts in transfers and have different

investment time horizons. One area for future research could be to calculate EMTRs on savings across the population and highlight circumstances that lead to very high EMTRs.

EMTRs could also be used to examine the effects of specific tax and transfer policies (such as superannuation taxes, capital gains taxes and the means testing of transfer payments) on the return to savings at different points in a person's life cycle.

The framework for EMTRs on savings described here could also be expanded to examine more complex questions such as how investments in human capital are treated by the tax and transfer system and how the treatment of human capital differs from that of financial capital.

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