Incentive and Distributional Effects of a Tax Mix Change: Some Simple Analytics

John Freebairn*
The University of Melbourne

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Melbourne Institute of Applied Economic and Social Research
The University of Melbourne
Parkville, Victoria 3052 Australia
Telephone **(03) 9344 5288**
Fax **(03) 9344 5630**
Email **melb.inst@iaesr.unimelb.edu.au**
WWW Address **http://www.ecom.unimelb.edu.au/iaesrwww/home.html**

Abstract

Simple models are used to assess changes in effective average and marginal tax rates on income from work and capital and on income consumed and spent caused by a shift from taxation of income to taxation of consumption. The new income tax rate schedule becomes more progressive than currently. For low income earners with negligible savings, the same aggregate tax burden is paid, but with less lost in income tax and more in consumption tax. For middle and high income earners, on average the aggregate tax burden changes little, but those with larger savings win and those with low savings lose. Also, the lower tax burden on saving and capital income is matched by a higher tax burden on labour income.

Current tax reform proposals often, but not always, include options to shift the tax burden away from income and onto consumption. In Australia this tax mix change option has been expressed as using a component of revenue generated by a broad based consumption tax to fund reductions in income tax rates; the other revenue would be used to rationalise some of the existing indirect taxes. For example, in 1985 Option C of the Draft White Paper (1985) proposed using some of the revenue from a retail sales tax, after replacement of the wholesale sales tax, to reduce income taxation[1]. The Fightback! tax reform proposals of 1991 and 1993 set out to use some of the revenue from a goods and services tax, after replacement of the wholesale sales tax, payroll tax and most of petrol excise, to help fund lower income taxation (Hewson and Fischer, 1991)[2]. Proposals to replace the present hybrid or mixed income tax system with a progressive personal expenditure tax effectively would remove taxation of saving and shift the tax base from income to consumption (see for example FitzGerald, 1996, and debate in the run-up to the US presidential elections in 1996)[3]. This paper uses a number of simple models to assess the effects of an aggregate revenue neutral proposal to change the tax mix on personal incentives to work and to save, and to assess the effects of the tax mix change on the distribution of the tax burden for people with different income and savings levels.

Most of the key results can be illustrated with a model with proportional income tax rates and a single consumption tax rate. Later in the paper the case of Australia's current progressive rate income tax schedule is considered. In all cases we consider tax mix changes which yield the same aggregate revenue assuming no behavioural responses on decisions to work, spend and save, and we look at options which do not change the vertical distribution of the tax burden when considered over broad categories of households classified by level of taxable income. Effects of the tax mix change on

incentives and efficiency are measured in terms of changes in effective marginal tax rates on decisions to work, consume and save. Effects of the tax mix change on redistribution and equity are measured in terms of changes in average effective tax rates, or in total tax paid. Effective tax rates include income and consumption taxes.

The main results of the paper are as follows:

- To observe aggregate revenue neutrality and current vertical equity restraints, a tax mix change will fund reductions in personal marginal income tax rates and increase the bottom tax free threshold. The statutory income tax rate schedule would need to be more progressive than now. For example, a tax mix change involving a 5% net increase in consumer prices would fund reducing the bottom 20% rate to 15.8% and the top 47% rate to no less than 44.2%.

- For most people, including those with negligible savings, a tax mix change simply redistributes total tax paid from lower tax on income to higher tax on expenditure.

- An aggregate revenue neutral tax mix change reduces the tax burden on saving and investment income, and increases it on current consumption and on labour income.

- for any particular taxable income category of households, a tax mix change reduces the tax burden for these with relatively high savings and increases the burden for those who save less than the average.

1. Proportional Tax, No Saving

Begin with a proportional or flat income tax rate[4], t_y, which also is the marginal and average income tax rate, applied to income, Y. Then, tax paid, T(y), is

$$T(y) = t_y Y \qquad (1)$$

Now, suppose a consumption tax is used to fund some reduction in the income tax, but to collect the same aggregate revenue. Let t_c be the consumption tax rate levied on disposable income, assuming all disposable income is spent and none saved. The income tax rate is reduced by x, with $0 \quad x \quad 1$ so that $x\, t_y = t_y^1$, where t_y^1 is the new, lower, income tax rate. Then, with a tax mix change, aggregate tax revenue, T(m), is given by

$$T(m) = x\, t_y Y + t_c Y (1 - x\, t_y) \qquad (2)$$

Aggregate revenue neutrality requires T(y) = T(m). Using (1) and (2), the aggregate revenue neutral consumption tax rate is given by

$$t_c = (1 - x)\, t_y / (1 - x\, t_y) \qquad (3)$$

Substituting (3) for t_c in (2), and dividing through Y, the effective average and marginal tax rate, t_e, where $t_e = T(m)/Y$,

$$t_e = x\, t_y + (1 - x\, t_y)\, t_c \qquad (4)$$
$$= t_y$$

That is, the tax mix change does not alter the effective tax rate. What one gains by less taxation of income is offset by higher consumption taxation of the income when it is spent. Only a money illusion argument that we see income taxes but ignore consumption taxes would change this result. With tax reform involving a tax mix change being a long term structural change, such as a form of money illusion seems a nonsense.

2. Proportional Tax, Saving

This time, we allow households to save some of their disposable income, and for simplicity we assume a constant average and marginal propensity to save at rate s, with $0 < s < 1$. Initially we consider a one year aggregate revenue neutrality situation and later move onto a two year story to capture the use of savings for greater future consumption.

(a) One year revenue neutrality

With just an income tax, t_y, tax collected is given by (1) above, savings is $s\ Y\ (1 - t_y)$ and consumption, C, is given by $(1 - s)\ Y\ (1 - t_y)$. Using a consumption tax to reduce income tax by x as before gives a tax mix revenue T(m)

$$T(m) = x\ t_y\ Y + t_c\ (1 - s)\ (1 - x\ t_y)\ Y \qquad (5)$$

If the revenue requirement is to balance in the current year, then T(y) of (1) has to equal T(m) of (5). Solving for t_c gives the required first year aggregate revenue neutral consumption tax rate

$$t_c = (1 - x)\ t_y/[(1 - s)\ (1 - x\ t_y)] \qquad (6)$$

Note that relative to t_c in (3), the tax rate in (6) is greater the larger the saving rate s, or saving pushes up the required consumption tax rate to fund a given reduction in income taxation.

The effective tax rate defined in terms of income, Y, is given by

$$t_e = x\ t_y + (1 - s)\ (1 - x\ t_y)\ t_c \qquad (7)$$
$$= t_y$$

where the last step uses (6) to substitute for t_c. That is, the tax mix change has no effect on the effective average and marginal tax rate in terms of income.

So far we have assumed all households have the common savings rate s. Suppose instead individuals have different savings rates, s^i, which may be above, equal to, or below the average rate s. Then, the effective tax rate for individuals i, denoted t_e^i, is given by

$$t_e^i = x\, t_y + [(1 - s^i)/(1 - s)]\,(1 - x)\, t_y \qquad (8)$$

and

$$t_e^i \gtrless t_y \text{ as } s^i \gtrless s \qquad (9)$$

That, is, above average savers gain, below average savers lose, and those at the average are unaffected with the tax mix change. This result simply reflects that a tax mix change reduces the tax burden on that part of income saved and increases the burden on that part of income consumed.

The foregoing result hints at the proposition that a tax mix change favours saving relative to consuming. This proposition is more explicitly seen in a two period model.

(b) Two year revenue neutrality

This time we explicitly recognise that saving is used to finance future period consumption. A two period model in which saving in period 1, S, is used to increase consumption in the second period is the simplest model. The model also illustrates the proposition that a tax mix change shifts the burden from taxation of saving and investment, or of capital income, to the taxation of labour.

Suppose we have two periods, 1 and 2, where equal wage incomes are earned in each period, $Y_1 = Y_2 = Y$. There are constant income and consumption tax rates t_y and t_c in periods 1 and 2, where the income tax falls on labour income Y and on capital income rS, where S is savings and r is the rate of return, and the consumption tax falls on consumption in each period, C_1 and C_2. Saving is a given proportion. s, of first period disposable income, ie. $S = s (1 - t_y) Y$, and is fully consumed in period 2. For aggregate revenue neutrality we hold the present value of taxes collected over the two periods equal, using discount rate r.

Starting with an income tax only world, in period 1 income tax $T_1 (y) = t_y Y$ is collected, and $S = s Y (1 - t_y)$ is saved. In period 2, income tax is paid on labour income $t_y Y$ and on earnings on savings $t_y r S = t_y rs Y(1 - t_y)$. In present value terms, income tax collected is given by

$$\begin{aligned} T(y) &= t_y Y + [t_y Y + t_y r s (1 - t_y) Y]/(1 + r) \\ &= t_y Y [1 + 1/(1 + r) + s r (1 - t_y)/(1 + r)] \end{aligned} \tag{10}$$

Now, replace the income tax completely with a consumption tax (in essence assume $x = 0$ in previous sections). Consumption tax collected in period 1 is $t_c C_1 = t_c (1 - s) Y$ and in period 2 it is $t_c C_2 = t_c Y + t_c s Y(1 + r)$. In present value terms, consumption tax revenue collected is

$$\begin{aligned} T(c) &= t_c (1 - s) Y + [t_c Y + t_c s Y (1 + r)]/(1 + r) \\ &= t_c Y [1 + 1/(1 + r)] \end{aligned} \tag{11}$$

To compute the required consumption tax rate t_c, set (10) and (11) equal for the same present value of revenue collected yielding

$$t_c = t_y [1 + sr (1 - t_y)/(2 + r)] \tag{12}$$

From (12), the consumption tax rate exceeds the income tax rate, essentially reflecting the avoidance of double taxation of saving with a consumption tax. The difference is greater the larger the saving rate s, the higher the income tax rate t_y, and the higher the savings return rate r. The taxation of labour income consumed in each period rises from t_y to t_c, whereas the effective tax rate on income saved in period 1 and consumed in period 2 falls. In this way a tax mix change by increasing taxation of labour income increases distortions to labour versus leisure choice decisions and by reducing taxation of saving it concurrently reduces distortions to saving and investment decisions.

(c) Two year revenue neutrality and pre-existing savings

The preceding model assumed households began with zero savings or capital stock. In fact, a tax mix change would take place where we already have accumulated savings or wealth. This realistic position gives rise to significant transitional adjustment issues which have both equity and incentive implications. The simple two period model of the previous section, augmented with a starting period stock of wealth earning assets K_0, is used to illustrate the key issues.

Consider first the income tax. In period 1 it applies to labour income Y and the capital income r K_0. Savings is given by $S = s [Y (1 - t_y) + (1 + r (1 - t_y))K_0]$. In period 2 income tax is levied on labour income Y and the income earned on savings rS. In present value terms, total income tax paid is

$$T(y) = t_y [Y (2 + r)/(1 + r) + rK_0 + sr [Y (1 - t_y) + (1 + r (1 - t_y)) K_0]/ (1 + r)] \quad (13)$$

Note that the income tax falls only on the earnings of the initial wealth K_0, and not the principal itself.

Now consider the consumption tax. In period 1 it is levied on that part of wealth not saved, $C_1 = (1 - s) [Y + (1 + r) K_0]$. In the second period the tax is levied on second

period labour income Y and on the savings and earnings spent, $C_2 = s\,Y\,(1 + r) + s\,K_0\,(1 + r)^2$. Total tax in present value terms is given by

$$\begin{aligned} T(c) &= t_c\,[(1 - s)\,Y_1 + s\,Y_1\,(1 + r)/(1 + r) + Y_2/(1 + r) + (1 - s)\,K_0\,(1 + r) \\ &\quad + s\,K_0\,(1 + r)^2/(1 + r)] \\ &= t_c\,[Y\,(2 + r)/(1 + r) + K_0\,(1 + r)] \end{aligned} \tag{14}$$

Note that the consumption tax falls on the initial stock of wealth when it is spent as well as the earnings on wealth.

To find the aggregate revenue neutral consumption tax rate, equate (13) and (14)

$$\begin{aligned} t_c\,[Y\,(2 + r)/(1 + r) + K_0\,(1 + r)] &= t_y\,[Y(2 + r)/(1 + r) \\ &\quad + r\,K_0 + sr\,[Y\,(1 - ty) + (1 + r\,(1 - t_y))\,K_0]/(1 + r) \end{aligned} \tag{15}$$

which gives (12) when $K_0 = 0$. Comparing (12) and (15), it is now possible for the consumption tax rate t_c to be less than the income tax rate t_y, essentially because the consumption tax falls on the pre-period wealth and the earnings, whereas the income tax falls only on the earnings. Further, since K_0 depends on previous saving and investment decisions which cannot be altered, this represents a lump sum tax with no distortions.

However, the one-off effective capital loss associated with a tax mix change usually calls for appropriate balancing compensation. If full compensation is paid for equity reasons, as was proposed under Fightback!, then the extra revenue required involves raising the consumption tax rate and the story of section (b) above applies.

3. Progressive Income Tax Rate Schedule

The flavour of effects of a tax mix change on incentives and on distribution shown above for a proportional tax flow through when a multi-step progressive income tax

schedule, as now applies to Australia, is in place. We consider initially the case with no savings, then add savings, and conclude with an illustration.

(a) No savings

Tax rates for each step of the present personal income tax rate schedule are adjusted downwards and the tax free threshold is increased with a net increase in the consumption tax burden so as to retain the same aggregate tax collection and to ensure maintenance of current vertical equity[5].

Let t_{yi} be the current marginal income tax rate at step i in the schedule (say 20% between $5400 and $20700 in the present scheme), and t^1_{yi} is the new marginal tax rate. The additional broad based consumption tax rate, which falls on all disposable income spent, and here we assume zero savings, is given by t_c. This consumption tax rate also is the net increase in consumer prices and is over and above that part of a new expenditure tax required to replace existing indirect taxes.

Combining (1) and (2) for revenue neutrality, but this time holding t_{yi} and t_c as given, the new marginal income tax rate for each step i is given by

$$t^1_{yi} = (t_{yi} - t_c)/(1 - t_c) \qquad (16)$$

The marginal income tax rate reduction, $t_{yi} - t^1_{yi}$, is larger the greater the increase in consumption taxation t_c and the smaller is the current marginal income tax rate.

Changes in the marginal tax rate of (16) are sufficient to compensate households for the higher consumption tax burden when $t_c < t_y$. This condition does not hold for income up to the present tax free threshold. To some extent, compensation can be provided by increasing the tax free threshold from its present level Y_o to a higher level Y_n so as to equate additional consumption tax revenue collected on up to the new tax free threshold,

$t_c\ Y_o$, to revenue foregone with the higher threshold, $(t_{yi} - t_c)\ (Y_n - Y_o)$. Then, the new tax free threshold is given by

$$Y_n = Y_o\ t_{yi}/(t_{yi} - t_c) \qquad (17)$$

Then, adjustment of the marginal income tax rates via (16) and of the tax free threshold via (17) ensures aggregate revenue neutrality and vertical equity for all taxpayers with taxable income above Y_n.

Those with taxable income below the new tax free threshold cannot be fully compensated via changes to income tax rates. But additional tax revenue is collected. Additional compensation mechanisms, including increased social security payments and special targeted income tax credits, will be required (see Harding, 1998, for a discussion).

Interpretation of (16) and (17) provides interesting insights about feasible changes in income tax rates which can be funded by a tax mix change which is constrained to be revenue neutral and to maintain current vertical equity. A tax mix change involves using a flat rate tax on consumption outlays, which here equal disposable income, to fund reductions in a progressive income tax rate schedule imposed on taxable income. The new income tax rate schedule is much more progressive. From (17), the tax free threshold increases providing relatively greater income tax reductions for those on lower incomes. From (16), reductions in marginal income tax rates are smaller, both absolutely and relatively, at higher income levels. The underlying logic is that while income taxes apply to all income, the consumption tax at most falls on disposable income, and a progressive income tax means disposable income as a share of income declines with income. The example below illustrates the key implication that a tax mix change, while funding lower income taxation, requires for vertical equity that the remaining income tax rate schedule become a more progressive one.

A second implication of (16) for a tax mix change debate is that unless the net increase in taxation of consumption is very large, reductions in the higher marginal income tax rates will be small. Again, the examples below illustrate this point.

(b) Add savings

In reality, some households save, and generally the savings rate is higher at higher income levels, but it also varies with demographic circumstances.

Suppose the marginal savings rate on average for households at income tax step i can be represented by s_i. Then, aggregate revenue neutrality for year one, and maintenance of average vertical equity in year one, can be maintained by a modification of (16); and if necessary (17). Equating (1) and (5) for the marginal income tax rate t^{11}_{yi} as a function of the present rate t_{yi}, the net increase in expenditure tax rate t_c, and the savings rate s_i gives

$$t^{11}_{yi} = (t_{yi} - (1 - s_i)\, t_c)/(1 - (1 - s_i)\, t_c) \qquad (18)$$

The effects of allowing for saving are three. The feasible reduction in the marginal income tax rate is reduced because the consumption tax base is eroded by saving. And, since saving tends to rise with income this effect is greater at higher and higher levels of income. Second, and following the first effect, the remaining income tax rate schedule with a tax mix change will be more progressive the more important is saving.

Third, while not shown formally, but using the framework of (8) and (9), households who are large savers relative to the average in their income step gain, and those who dissave or are relatively small savers pay more overall tax after a tax mix change.

(c) An example

By way of illustration, this section describes changes in the personal income tax rate schedule which could be funded by a tax mix change that has a net one-off consumer price increase of 5% or of 10% under the constraints of aggregate tax revenue neutrality and maintenance of current vertical equity. The 5% net consumer price increase might be associated with a GST on a broad New Zealand type tax base and with a half of the revenue used to replace the present wholesale sales tax (WST); or a 16% GST on the same broad base but with stamp duties, financial taxes, payroll tax and a WST replaced. A commensurately larger GST tax rate would be required for a larger tax mix change involving a net 10% increase in consumer prices.

Consider first the case of no savings. That is, formulae (17) and (18) are used to adjust the marginal tax rates and the bottom tax threshold. The current personal income tax rate schedule and a tax mix change income tax rate schedule for options with a net 5% and 10% increase in consumer prices are as follows

Current Schedule		5% Tax Mix Change		10% Tax Mix Change	
Taxable income $/year	Marginal tax rate %	Taxable income $/year	Marginal tax rate %	Taxable income $/year	Marginal tax rate %
0 - 5400	0	0 - 7200	0	0 - 10800	0
5401 - 20700	20	7201 - 20700	15.8	10801 - 20700	11.1
20701 - 38000	34	20701 - 38000	30.5	20701 - 38000	26.7
38001 - 50000	43	38001 - 50000	40.0	38001 - 50000	36.7
50001 -	47	50001 -	44.2	50001 -	41.1

The extra revenue collected by a broad based consumption tax, as part of a tax mix change, funds lower income taxation in terms of lower marginal tax rates and a higher tax free threshold. For example, with the 5% tax mix change option, the tax-free threshold is raised from its present $5400 to $7200, and the next marginal tax rate is reduced from 20% to 15.8%, and the top rate is reduced from 47% to 44.2%. It can be seen that the

remaining income tax rate schedule becomes more and more progressive the more extensive the tax mix change. Further, even for a very large tax mix change involving a 10% increase in consumer prices, the top tax rate is at 41.1%.

Next, allow for the more realistic case of saving, and further allow the marginal saving rate to rise with taxable income. For illustration, suppose the two low income bands have zero saving, those in the $20700 to $38000 band have a marginal saving rate of 3%, the next category have a 5% marginal saving rate, and that the very well-off have a marginal saving rate of 10%. The next set of calculations take the case of a 5% tax mix change with no savings (middle column of previous data) and the above schedule of marginal savings. The aggregate revenue neutral and one year vertical equity maintenance schedule becomes

Taxable Income $/year	Marginal Income Tax Rate for a 5% Tax Mix Change with:	
	No saving %	Saving %
0 - 7200	0	0
7201 - 20700	15.8	15.8
20701 -38000	30.5	30.6
38001 - 50000	40.0	40.2
50001 -	44.2	44.5

Including an allowance for saving increases the required marginal income tax rates faced by middle and especially high income taxpayers in order to collect the same revenue after the tax mix change. In the process, the new income tax rate schedule is more progressive than when savings are ignored.

4. Extensions and Refinements

The models used in this paper have proceeded under a number of simplifying assumptions whose relaxation warrants further analysis.

First, the paper has assumed a very special set of behavioural responses. On the one hand it has followed much convention that all expenditure taxes are fully passed forward to consumers as higher prices and that income taxes are fully absorbed by individuals and have no effects on pre-tax wages, interest rates, etc. At the same time, in calculating revenue neutrality it has been assumed that there are no changes in employment, saving, investment and production decisions. To the extent a tax mix change facilitates a more productive and efficient economy, and that is a principal rationale for tax reform, an expanding economy, and larger tax bases, finance some reduction in required tax rates which have been ignored in this paper.

Second, for simplicity it has been assumed that the GST increases consumer prices proportionately for all individuals independent of their income and demographic circumstances. In reality, it is likely that an implementable GST will exempt some services, including financial services, for practical reasons, and that some products will be exempted or zero rated for political reasons, for example education, health and housing. Then, the assumption that the consumption tax raises average prices by the same proportion for all households will need to be reconsidered.

Third, the paper has given no consideration to changes in taxation of corporations and superannuation, nor to the taxation of overseas investment income. Given that tax rates for these items are relatively low when compared with most personal income marginal tax rates, the omission seems unexceptional. However, others might see the situation differently and the analysis would need to be modified if a tax mix change were to include changes in some of these other income tax rates.

End Notes

1. Specifically, a 12.5% retail sales tax rate was proposed, with about a half of the revenue to replace the wholesale sales tax, and the rest to fund major personal income tax reductions.

2. Specifically, a 15% goods and services tax rate was proposed. Most of the revenue was to replace the wholesale sales tax, payroll tax and 80% of Commonwealth petrol excise, with some to fund lower personal income tax rates.

3. A brief review of the issues, with references to more detailed studies, can be found in a series of papers in the May 1997 issue of the *American Economic Review*.

4. Both the income and consumption tax rates, t_y and t_c, are expressed as tax inclusive rates. Formulae linking tax inclusive rates, t(i), and tax exclusive rates, t(e), are t(i) = t(e)/(1 + t(e)).

5. Slightly different formulae have been proposed by Wright and Henry (1985) for changing the marginal tax rates and they also increase the threshold for all steps of the tax schedule.

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