

# Submission to the Review of Australian Higher Education

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17 October, 2007

“The net effect of the personal tax-transfer system on the return to the individual from improving their skills and hence the incentive to invest in skill formation is very difficult to determine.” (*Architecture of Australia’s Tax and Transfer System*, p246)

In this submission I present several findings of research into the impact of the tax-transfer system on skill formation based on a new measure for the effective tax rate on education and an aggregative general equilibrium model with endogenous skill formation. The research contributes directly to the following two objectives outlined in the terms of reference for the *Australia’s Future Tax System* Review Panel:

- ensuring appropriate incentives for skill formation
- ensuring appropriate incentives for “investment and the promotion of efficient resource allocation to enhance productivity and international competitiveness”

In what follows I report on my findings and on-going research in measuring the impact of the tax-transfer system on incentives for skill formation (Section 1), along with the impact on enrolments (Section 2) and growth (Section 3). Concluding remarks and an overview of ongoing research follows (Section 4). In an appendix I derive the elasticity of real wages to a capital-tax assuming endogenous human capital and complementarity between capital and skilled labour.

## **1 Impact of the tax-transfer system on incentives**

In Anderson (2007a,b) a new measure of the effective tax rate on skill formation that is grounded in the theory of human capital is derived and used to compare the financial incentives for undertaking tertiary education in Australia with other OECD countries. The main findings are as follows:

1. There appears to be substantial evidence that, compared with other OECD countries, the effective tax rate on investment in tertiary education is high for the marginal student. I show that the effective tax rate faced by Australian tertiary students is among the highest in the OECD, particularly for students who do not plan to do a post-graduate degree (Anderson 2008a,b).
2. The wage-elasticity of labour supply is an important factor influencing the effective tax rate. A rise in the marginal rate of tax facing graduates will not only reduce the after-tax return for graduates, but its effect will be compounded by a reduction in hours worked. A high wage-elasticity usually reflects a high opportunity cost to working, the most common example being working mothers. Therefore women are likely to face a higher financial disincentive than men when it comes to investing in tertiary education (Anderson 2008a).
3. I find the effective tax burden facing Australian students who plan to do a 4 year undergraduate degree, but no post-graduate studies, is among the highest in the OECD. A student with a zero wage-elasticity will face an effective tax rate of 24 per cent, the highest of the OECD. This rises to 37 per cent when the wage-elasticity is 0.25 and 47 per cent when the wage-elasticity is 0.50. Australia's effective tax rate is high compared to other OECD countries over a range of wage-elasticities, remaining well within the top five countries in terms of effective tax burden (Anderson 2008b).
4. These results do not incorporate the impact of a value-added tax. While in a number of countries, including Australia, educational services are not directly taxed, a value-added tax, such as Australia's GST, will have an adverse impact on skill formation.

This is because the GST raises the effective tax rate on the real wage of graduates. The effect is compounded by a positive wage-elasticity<sup>1</sup>.

## **2 Impact of the tax-transfer system on enrolments**

In Anderson (2008c), an applied aggregative general equilibrium model with endogenous skill formation is used to predict the initial impact of tax reform proposals involving full indexation of the income tax thresholds, the introduction of Earnings Tax Income Credit and the withdrawal of tax deductions on key variables. These variables include enrolments, average and marginal effective tax rates, as well as the lifetime earnings of those with and without education. The key findings are

1. There is substantial evidence that bracket creep reduces the financial incentives for investing in tertiary education.
2. The choice between alternative tax proposals in terms of their positive impact on student enrolments will depend on the starting wage for graduates and the risk premium that students place on investing in education.
3. The *initial* impact of the introduction of full indexation, coupled with a withdrawal of income tax deductions, is predicted to raise the rate at which school-leavers are entering tertiary education from its current rate of 64 per cent to 81 per cent.
4. While the predicted immediate impact of full indexation can be expected to be tempered over the medium to long-run by subsequent adjustments in relative wages and the capital stock, the change is substantial enough to suggest that full indexation may have an important role to play in expanding the capacity of the economy to innovate and grow.

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<sup>1</sup> In further research I intend to measure the impact of the GST and incorporate government-subsidised loans for education, such as the HECS.

### 3 Impact of the tax-transfer system on growth

The integration of skill formation into a general equilibrium setting provides an opportunity for a more accurate assessment of proposals for a change in the tax mix. For example, Freebairn (2007) argues that because capital is relatively more mobile internationally than labour, the tax base should be shifted from capital to labour (or consumption) with the primary aim of reducing dead-weight losses and improving the efficiency of the system.

Although wage-earners would be adversely affected in the short-run, Freebairn maintains that in principle there is scope for compensation from a “growth dividend”. The positive long-run effects of higher capital accumulation and, as a consequence, higher real wages would offset to some extent the negative short-run distributional impact on real after-tax labour earnings. Quantifying the long-run impact is therefore a critical issue.

To this end, Freebairn (2007) uses a simple one-sector open-economy production model to estimate that a fall in the before-tax return by 10 per cent (due to a lower tax on capital) would raise real output and real wages by 4.3 per cent. In arriving at this value Freebairn assumes an aggregate production function in capital and a *homogeneous* workforce. This obviously does not take into consideration the role of skilled labour and the potential impact on education due to complementarity between skilled labour and capital.

Once account is taken of the impact of capital accumulation through the derived demand for skilled labour and education, one would expect the “growth dividend” to be larger. My own preliminary estimate is that the long-run impact on skilled and unskilled wages would be 7.5 per cent<sup>2</sup>. While both estimates are based on very simple models and strict assumptions, the comparison does serve to illustrate the critical role of human capital formation in any quantitative assessment of the impact of tax reform.

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<sup>2</sup> See Appendix for details. This assumes capital and skilled labour are complements in production, the share of labour (skilled and unskilled) is 70 per cent and human capital and physical capital share equally in the share of output not going to unskilled labour.

## **Conclusions and on-gong research**

The research summarised in this submission highlights the fact that two reform agendas currently being pursued by the Federal government, in the areas of education and taxation, are not mutually exclusive. In some instances, they may well be complementary. However, there is a need for a comprehensive examination of the implications of tax reform proposals for skill formation and an efficient allocation of resources. Without such an examination the benefits of reforms, such as lowering of the tax on capital, may be *under*-estimated, while the benefits of other reforms, such as raising the rate of the GST, may well be *over*-estimated.

In terms of on-gong research, there is a need to extend the application of the new measure for the effective tax rate on skill formation to cover returns from different educational institutions within Australia, as well as more research into how Australia compares internationally. The measure itself needs to be extended to allow for the concessional treatment of educational loans and risk.

In terms of measuring the economic impact of reform to the tax-transfer system, the integration of skill formation into a fully dynamic framework is an area of on-going research and one which can be expected to have a critical role in assessing the implications of tax reform proposals.

## *References*

- Anderson, G.M. (2008a) "Effective Tax Rates on Skill Formation: A New Approach", Working Paper One (available from the author).
- Anderson, G.M. (2008b) "Effective Tax Rates on Skill Formation A Comparison of 25 OECD Countries", Working Paper Two (available from the author).
- Anderson, G.M. (2008c) "Human Capital and Tax Reform: The Impact of 'Bracket Creep'", Working Paper Three (available from the author).
- Freebairn, John (2007) "Changing the Tax Mix", Australian Economic Review, 40(2), pp194-9.



## Appendix

The estimate for the long-run impact of a reduction in capital tax of 10 per cent is derived from a modified version of the two-sector, endogenous human capital model of Anderson (2007c). Let  $C$ , denote output of the consumption sector and  $S$  and  $U$  denote the number of skilled and unskilled workers used in the production of the consumer goods and services. The production function for the consumption sector is  $C = (K^b S^{1-b})^a U^{1-a}$ . The corresponding unit cost function, assuming zero profits, takes the form  $p = 1 = A v^a w_U^{1-a}$ , where  $p$  is the price of consumer goods (equated to one),  $w_U$  is the before-tax unskilled wage and  $v$  is the unit cost function for the nest capital-skilled labour production function. The latter takes the form

$$(A-1) \quad v = B w_K^b w_S^{1-b},$$

where  $w_K$  is the before-tax cost of capital and  $w_S$  is the before-tax skilled wage.

Let  $r$  be the world rate of interest and  $t_K$  the tax on capital income. I assume an open economy with perfect capital mobility, so that the before-tax return on capital (assuming zero depreciation), is

$$(A-2) \quad w_K = \frac{r}{1-t_K}$$

Furthermore, from the marginal student condition derived in Anderson (2007c), it can be shown that skilled wage can be expressed as a function of the unskilled wage as follows:

$$(A-3) \quad w_S = g(r, T) w_U,$$

where  $g(r, T)$  is a function of the real after-tax return on capital,  $r$ , and taxes and transfers ( $T$  = taxes on skilled and unskilled labour income and tuition subsidies).

After substituting (A-3) and (A-2) into (A-1) to solve for  $w_U$ , and taking logs,

$$(A-4) \quad \ln w_U = \ln C - \left( \frac{ab}{1-a} \right) \ln \frac{1}{1-t_K}$$

$$\text{where } C = \left[ A(Brg(r)^{(1-b)})^a \right]^{-1}$$

Therefore, the elasticity of the skilled wage with respect to the tax-factor,  $(1-t_K)^{-1}$ , is equal to  $ab/(1-a)$ . For the estimates mentioned in the paper I follow Freebairn (2007), setting the share of physical capital to be 30 percent,  $ab = 0.3$ . Freebairn's estimate is derived by assuming  $b=1$  (skilled labour is not a factor of production), so that the elasticity is  $0.3/(1-0.3)=0.43$ . I assume  $b=0.5$ , implying  $a=0.6$  and the elasticity is therefore  $0.3/(1-0.6)=0.75$ . Skilled and unskilled wages will grow at the same rate so this gives us the elasticity of real wages generally.