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CAPITAL INCOME AND CAPITAL GAINS TAXATION IN AGRICULTURE AND FORESTRY*

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Introduction

The tax treatment of capital income and capital gains is regarded by economists as one of the most important issues in the design of an efficient and equitable system of income tax. At the same time, capital gains taxation (CGT) has long been a matter of political controversy and the CGT that was introduced in Australia in September 1985 is no exception.

The core of the problem is how should income be measured for purposes of an income tax. One concept of income, dating back at least as far as Irving Fisher, would define income in terms of a net cash flow. That is to say, all outlays, including investments in long-lived productive assets would be immediately expensed (100 percent write-off) in the year the expenditure was incurred. A net cash flow income tax base would, of course, greatly simplify tax accounting, but it is clearly not the concept of income intended to be the basis for an income tax. It is shown in Appendix A to be a tax on pure profits which excludes the "normal" return to capital and thus is more akin to a consumption tax than an income tax.

Once a decision has been made to include savings in the income tax base a comprehensive income tax of the Haig-Simons (1921;1938) genre logically recommends itself as the 'ideal' tax base. The comprehensive base is defined as income a taxpayer receives and spends on consumption plus income that is saved (invested) plus (minus) the gain (loss) of wealth resulting from a change in the value of assets owned by the taxpayer. Australian farms are overwhelmingly unincorporated organisations and the focus of this paper is therefore taxation of capital income and capital gains under the personal progressive income tax.

The concept of a comprehensive income tax base (CITB) has become firmly entrenched in modern tax policy literature. Moreover, as Head (1987) points out, the message has been received and articulated in major official studies of tax policy in overseas countries beginning with the classic Carter Royal Commission Report (1966) in Canada and followed by a number of major investigations including reports by the United States Treasury (1977), the Meade Committee in the United Kingdom (1978) and the Irish Commission on Taxation (1982). A fully comprehensive capital gains tax would presumably include gains and losses on human capital as well as on physical and financial assets. However, for the

purposes of this paper, I assume that the base of a capital gains tax excludes changes in human capital values.

Sources of Capital Gains

The present value of an asset is the value of the future income stream, including imputed income and anticipated capital gains, expected to be generated by the asset discounted at the appropriate market rate of interest. Changes in expected income streams (including the timing of income streams) and discount rates will both induce changes in asset values. A distinction is commonly made between sources of anticipated (systematic) capital gains and unanticipated (unsystematic) capital gains. A classic example of a systematic capital gain is the land located in the central business district (CBA) of an expanding city. As the 'catchment' area of the city grows, the rents that can be earned from centrally located businesses also grow (Swan, 1984). Similarly, as the city fringe continues to move outwards systematic capital gains will accrue on adjacent farmland as the time draws closer to when it will become part of the city.

Broadly speaking, systematic capital gains will accrue on long-lived assets having an inelastic supply and an increasing demand for their services. The asset base includes certain classes of land and natural resources, and rare man-made assets such as art objects, antiques, rare stamps and coins (B.A.E., 1985). In agriculture, an additional important source of systematic capital gains is maturing biological assets such as livestock, forestry, vineyards, aging wine stocks, and fruit and nut orchards. There is, of course, another group of manufactured durable farm assets - plant, equipment and buildings - on which systematic capital losses accrue. (See Appendix A for a detailed analysis). Outside agriculture, the major sources of systematic capital gains appear to be certain classes of real estate, rare man-made assets, increases in company share values attributable to retained company profits, and possibly some investments in the mineral sector.

Unsystematic capital gains and losses are essentially changes in asset values that are unanticipated. These windfall gains and losses result from such things as unforeseen changes in technology and unexpected changes in domestic and overseas government policies. The reason for distinguishing between systematic and unsystematic capital gains and losses is twofold. First, windfall capital gains seem likely to be roughly balanced by windfall losses so that the net CGT from this

source would be small. Second, if capital gains are completely unanticipated there is not a compelling efficiency argument for imposing a CGT. However, on equity grounds alone it is quite clear that a CGT should include both systematic and unsystematic capital gains and losses.

Let us now briefly review the implications for efficiency of an income tax that does not capture capital gains. As a point of departure, it should be noted that in a well functioning market the expected after-tax rate of return-including real capital gains - will be approximately equal for all investments of comparable risk. In the absence of a CGT, excessive resources will flow into those investments having a significant tax-free capital gains component. In long-run equilibrium, the additional resources flowing into the tax-sheltered investments will depress the expected before-tax rate of return on these investments so as to establish equality of after-tax rates of return on all investments (Chisholm, 1976). To take a simple example, consider two types of investments; investment A provides an income stream which is fully taxable while the returns from investment B are solely in the form of tax-free capital gains. If the expected before-tax rate of return on investment A is 10 per cent, and there were a uniform income tax rate of 50 per cent, the expected before-tax rate of equilibrium return on investment B would be 5 per cent. It follows that under a progressive income tax, the before-tax rates of return on investments where most of the expected return is in the form of tax-free capital gains will be too low for investors except for those in the highest marginal tax brackets. In this respect, it is relevant to note overseas estimates which show that in the United States and Canada typically the top one per cent of income earners receive 50 per cent of total net capital gains (Head, 1987).

From the viewpoint of society, arbitrary tax-induced divergences in expected before-tax rates of return on alternative investments is evidence of inefficient resource allocation. The consequent distortion of resource allocation can take many forms. For example, in the case of the growing city the absence of a CGT will cause land values to become inflated in the CBD which in turn will lead to over-investment in tall buildings. At this point, it is pertinent to ask what impact will the introduction of a CGT have on asset values and on the expected rate of systematic capital gains? Assume, for simplicity, that aggregate capital gains are small relative to taxable income generated by investments. Consequently, the after-tax yield on assets generating 'pure' taxable income determines, and is equal to, the rate of expected capital gains on assets generating 'pure' capital gains. The wedge

between the high pre-tax yield on assets generating taxable income and the low tax-free yield on capital gains assets is the result of the inflated prices of the latter tax-sheltered assets. The announcement effect of an unanticipated CGT which when introduced was expected to be permanent would be to depress these asset prices. However, the expected rate of systematic capital gains in the presence of a CGT must be higher, than in the absence of such a tax, if assets producing capital gains are to yield an after-tax return comparable with the after-tax return from income producing assets. At any point in time, however, values for assets generating capital gains will be lower with a CGT than they would be in the absence of the tax.

Accrual Basis Versus Realization Basis For Capital Gains Taxation

There has been considerable debate about whether capital gains and losses should be counted for tax purposes as they accrue or as they are actually realized in a legal sense. It is clear that a realization basis for a CGT is a very distant second-best solution to the 'ideal' accruals basis. Indefinite deferral of a tax is, of course, equivalent to complete exemption. It is worthwhile now outlining and illustrating in more depth the main characteristics of an accruals CGT. It is perhaps simplest to begin with the more familiar tax treatment of capital losses associated with depreciating assets. (See Appendix A). The accruals basis of permitting tax-deductibility of capital losses on these assets would base the assessment on economic depreciation. That is to say, the decline in value of the asset over the period of the tax year attributable to aging and the associated reduction in the present value of the future flow of services provided by the asset. Simple depreciation formula based on historic cost, like straight-line depreciation for 'standard-life' asset classifications, provide a rough accrual approximation to economic depreciation. In the presence of inflation, of course, the historic cost base of an asset should be indexed for inflation. There is no such indexation in Australia.

Many types of investment in land development (e.g. land-clearing, swamp drainage, establishment of improved pasture, contour-banking and construction of dams) result in a higher valued asset which can be maintained in its improved state forever. For all practical purposes, the life of of such assets in their improved state is infinite and true economic depreciation is zero. Consequently, only repairs and maintenance necessary to maintain the asset in its improved state should be permitted as a tax-deductible expense. While the concept is clear, it is often difficult in practice to accurately separate and measure current repairs and maintenance

expenditure and capital expenditure. Prior to the first Whitlam government many of the above forms of investment expenditure were not only tax-deductible, but could be immediately expensed. Effectively, savings channelled into these investments could be accumulated tax-free. In this respect, the income tax was like a consumption tax insofar as savings destined for investments that created permanently higher-valued assets, in the form of improved land, were mostly tax exempt. Today, immediate expensing of capital expenditure is confined to expenditure on combating or preventing land degradation (Sec. 75D). In addition, primary producers may claim equal annual deductions over three years for capital expenditure on water storage and reticulation. Deductions for certain land improvements, like land clearing, are permitted only if undertaken no later than August 1983 and then in equal instalments over ten years.

In summary, the essential characteristics of a comprehensive income tax on an accruals basis may be stated as follows:

1. Current receipts and current outlays (i.e. outlays which make their full contribution to production within a single year) should be subject to tax and deductible from taxable income, respectively, at the time they are incurred.

2. The true loss of economic value of an asset should be allowed as a tax-deductible depreciation expense as it accrues.

3. The increase in the real value of an appreciating asset should be subject to tax as it accrues.

Forestry as a Long-life Appreciating Asset Case

One of the best illustrations of the complete arbitrariness of any distinction between capital gains and income is the example of a growing forest.

Equations for determining the net present value of an infinite sequence of forest rotations for the before-tax situation and for several alternative income tax regimes (Chisholm, 1975) are given below. An annual discrete time period model is used since this model would seem to best represent the annual income tax accounting period of the real world. The following notation is used:

S = before-tax present value (site value),
S^* = net-of-tax present value (site value),
H_n = undiscounted value of each harvest (stumpage value),
C_o = establishment cost incurred at the beginning of each rotation,
G_k = value of the annual forest growth increment for the kth year,
i = before-tax discount rate,
r = net-of-tax discount rate,
t = rate of tax,
n = rotation period measured in years.

The net present value, S, of the tree harvests determines the site value of the land. The length of the rotation cycle, n, which maximizes S, can be viewed as a trade-off between size and frequency of harvests. Equation (1) defines the before-tax site value assuming constant real values over all rotations for H_n and C_o.

$$(1) \qquad S = \frac{[H_n - C_o(1+i)^n]}{[(1+i)^n - 1]}$$

Equation (1) may be modified to incorporate an accrued income tax as expressed in equation (2). It should be noted that in equation (2) the taxable income assessed at the end of the first year of a forest's life, G_1, is equal to the value of the one year old stand less planting costs, C_o.

$$(2) \qquad S^* = \frac{H_n - t\left[\sum_{n=1}^{k=1} G_{k(Hr)}^{n-k} + G_n\right] - C_o(1+r)^n}{(1+r)^n - 1}$$

Application of equations (1) and (2) will give identical values for S and S^*, providing that a net-of-tax discount rate, r, equal to i(1 - t) is used in equation (2). The discounted present valuation of all investments in timber production will be independent of the tax to which each firm is subject. The tax will not alter the profitability of forestry viz á viz alternative investments, nor will it affect the choice of the optimal growth period for a particular tree species, nor will it influence the choice between short- and long-maturing tree species.

A second type of income tax - applying to the forestry sector in Australia - allows planting costs to be "immediately expensed" but delays taxing forest income

until it is realized at harvest. The equation defining S^* under this 'fully-expensing' income tax is

$$(3) \qquad S^* = \frac{H_n(1-t) - (1-t)[C_o(1+r)^n]}{(1+r)^n - 1}$$

The final type of income tax (realized income tax) differs from the above income tax in that planting costs must be capitalized and deducted from realized income at the time of harvest. The equation for S^* under a realized income tax is

$$(4) \qquad S^* = \frac{H_n(1-t) + tC_o - C_o(1+r)^n}{(1+r)^n - 1}$$

Comparing equations (2), (3) and (4) it is clear that the only differences between the three types of income tax relate to differences in the timing of the tax deductibility of costs and/or the taxing of income. However, these differences in timing can have striking effects as shown by the inputed site values for the three income tax regimes in the numerical illustration (Chisholm 1975) shown in Table 1. Under an accrued income tax, the forest land is assumed to have a site value, S^*, of $50 and a planting cost of $25 for establishing each rotation. The forest is assumed to grow at a constant annual compound rate just sufficient to provide a gross rate of return of 10 percent on both the initial planting outlay and the site value. This allows the impact of a tax change on site values to be highlighted since under an accrued income tax all rotation periods are equally profitable. A tax rate of 50 percent is assumed and the corresponding net-of-tax discount rate is therefore 5 percent. The supply of land to forestry is assumed to be perfectly inelastic so that the full incidence of a change in the tax regime is on site values.

TABLE 1: Imputed Site Values for Alternative Income Tax Regimes

Rotation period	Stumpage value	Site values		
		Accrued income tax	Full-expensing income tax	Realized income tax
Years		Dollars		
1	32.50	50	63	50
5	70.79	50	70	58
10	144.53	50	83	70
15	263.29	50	98	85
20	454.56	50	117	105
25	762.60	50	142	130
35	2,057.68	50	213	200
50	8,754.31	50	404	392

The most striking point from the above results is the size of the increase in site values and the associated tax-induced bias towards longer rotation periods when an accrued income tax is replaced with a full-expensing or realized income tax. For a 50-year rotation cycle, changing the timing only of taxing income and allowing the tax deductibility of production costs results in an approximately eightfold increase in site values.

A related example is the case of systematic capital gains accruing on land in the central business district of an expanding city or an adjacent farmland. Assume that expected annual capital gains are 10 percent and the rate of ncome tax is 50 percent. The results shown in Table 2 compare an accrual basis with a realization basis capital gains tax and show the tax rate required for a tax at realization to be equivalent to a 50 percent accruals tax.

Table 2: Accruals versus Realization Basis Capital Gains Tax

Years	Percentage by which net-of-tax capital gain on a realisation basis exceeds accruals basis tax	Tax rate required for a realisation tax to be equivalent to a 50 percent accruals tax
1	0	50
5	10	55
10	27	61
20	46	71
30	113	80
40	214	86
50	407	91

In the forestry example (Table 2), the relatively small differences between imputed site values for the full-expensing and realized income tax show that the major influence, in this example, stems from the postponement of the taxation of income until realization at harvest rather than differences in the timing of the tax-deductibility of planting costs. The higher the imputed site value relative to planting costs the more the former effect will be.

The present income tax treatment of forestry in Australia appears to permit all establishment and planting costs to be deducted from taxable income on an accruals basis whilst postponing taxation of forest revenue until realization, thus providing a significant tax concession to forestry. Some investment outlays, e.g. roads, made at the time of initial establishment of a forest create assets having a perpetual economic life or a life spanning a number of forest rotations. The rule that such assets should be written-off over their economic life applies to these assets. The importance of the timing of the tax-deductibility of expenditure outlays is clearly recognized in the New Zealand (1986) study of forestry taxation.

A further relevant issue that is beyond the scope of this paper is the appropriate choice of a discount rate for the large public forestry sector. This sector is not subject to income tax and competes with the private forestry sector. It would

appear that in order to attain the appropriate mix between public and private forestry the discount rate used by the public sector should equal the gross-of-tax discount rate applying in the private forestry sector.

A related and very important group of rural investment activities include increases in flock and herd size via natural increase in livestock, and establishment, and expansion in size, of orchards and vineyards. Under an accruals CGT such changes in asset values, net of production costs, would be subject to tax as they occur. Existing procedures for valuing natural increase in livestock numbers require that such livestock increases are valued for tax purposes at not less than specified minimum values. Thus in this area Australian farmers have long been subject to a form of accruals CGT. However, the set minimum livestock values for natural increase have been extremely low and were raised fourfold for the 1988-89 income year. The minimum values for sheep and cattle are now $4 and $20, respectively. The revised values would still appear to be significant underestimates of market livestock values. An accruals CGT would apply similarly to the establishment and expansion of orchards and vineyards. In Australia these economic activities appear to be treated like forestry for purposes of income tax assessment with a similar element of tax-concession.

Problems with CGT on an Accruals Basis

Many tax economists have strongly emphasized the practical advantages of accrual taxation in terms of income tax simplication, e.g. Shoup (1937), Vickrey (1947), Krever (1984). The realization criterion, on the other hand, poses great complexities in designing mechanisms to control tax avoidance which at the same time do not inhibit normal business transactions and reorganizations.

The main stumbling block usually offered to the use of an accruals based CGT is valuation difficulties. However, as Krever (1984) points out this issue seems to pose little or no problem for countries imposing wealth taxes or for the fair market value estimates of property that are almost universally made as a valuation base for calculating rates and various real estate taxes. The valuation of many assets on which capital gains are earned are quoted in daily newspapers. Some assets, like shares in private companies, though do pose significant valuation problems.

A second reason that is often given for the practical superiority of a realization basis CGT is that it largely overcomes liquidity problems that some taxpayers would face with an accruals basis CGT. Such liquidity problems may be exacerbated for assets which are subject to large year-to-year fluctuations in value. An accruals tax system based on asset valuation every two, three, or even five years, would help ameliorate such problems and may have greater administrative feasibility.

Problems with a CGT on a Realization Basis

The CGT actually introduced in Australia that took effect from September 1985 was, by world standards, fairly comprehensive. However, it is a 'far-cry' from an ideal CGT and is significantly less comprehensive than what was originally proposed in the Draft White Paper (1985) on tax reform in Australia.

The main features of the Australian CGT are:

- adopts a realization, rather than accruals, basis of assessment;
- applies only to real capital gains made on assets acquired after 19 September, 1985;
- real capital gain is defined as the net proceeds of asset sale less original cost indexed for inflation less indexed costs of any improvements made during the holding period of the asset;
- allow realized nominal losses to be offset against capital gains realized in the current year or be carried forward and offset against gains in subsequent years;
- exempts gains on taxpayer's principal residence (including up to 2 hectares curtilage);
- exempts (largely) gains with respect to superannuation and life insurance; and
- liberal rollover provisions, particularly at death.

Perhaps the most striking weakness of this CGT is the extreme "lock-in" effects it generates. To begin with the grandfathering concession whereby all assets acquired prior to 20 September 1985 are completely exempt from CGT provides a strong lock-in effect. This concession introduced severe inequities and inefficiencies from the outset of the CGT in Australia. Moreover, there appears to be little justification for the concession on the grounds of either political expediency or administrative costs. The Canadian government, for instance, when it introduced a

CGT in 1972 was able to apply the tax to real estate gains applying from the date of introduction of the CGT. A list of all real estate transactions occurring over a reasonable period prior to valuation date was compiled and a computer was then used to determine an approximate value for almost any property in the country(Krever, 1984). Such a task would have been more straightforward in Australia where, unlike Canada, values for all property sales are recorded for stamp duty purposes.

For assets acquired after 19 September 1985 the "lock-in" effect results from the use of a realization basis. The magnitude of the effective interest-free loan to a taxpayer varies directly with the length of the period of deferral. In the Draft White Paper (1985) it was clearly recognized that it was necessary to place some ultimate limits on the extent of deferral through deemed realization upon death or disposal of assets by gift. However, government responded to strong lobbying, particularly from the farm and small business sectors, and a decision was made not to treat the death of an asset holder as giving rise to a deemed realization unless his or her assets are actually realized by the administrator of the deceased estate or disposed of by a beneficiary of the estate.

The magnitude of the "lock-in" effect is illustrated in Appendix B.

The existing CGT clearly discriminates strongly against farmers heirs who do not wish to continue farming. It should be noted here that there is a provision in the CGT legislation that permits rollover of capital gains into another business which is judged to be similar. This rollover provision ameliorates some of the most severe resource distorting effects of the lock-in effects associated with a realization basis. But, there is a significant element of arbitrariness in determining what is and what is not a similar business. Moreover, in terms of efficient resource allocation it is not at all obvious that reinvesting capital in a similar business is better than reinvesting in a different business.

If valuation and liquidity problems mitigate against universal application of a direct accruals CGT a possibility first proposed by Helliwell (1969) is the application of an indirect accrual tax administered on a realization basis. The indirect accrual tax would be payable only at the time of deemed realization, but the amount of the tax paid at that time would include an interest charges adjustment to make the present value of the payment commensurate with that of an annual accrual tax

throughout the holding period of the asset. Under this approach there would be no advantage of tax deferral per se in adopting a realization basis. However, a weakness of the indirect accruals tax has been pointed out to the author by Matt Benge (pers. comm.), namely, that it would provide a stronger incentive for investors to stay "locked-in" and not realize investments.

Risk and CGT

It is commonly proposed that investments that are expected to generate capital gains tend to have higher than average levels of risk associated with them. To proceed from this claim to a proposal that Government should subsidize such investment activities via lighter taxation of riskier assets is an argument which I believe has little merit. At the same time, it is important that a CGT treat realized gains and losses as symmetrically as possible.

Under the existing CGT, capital losses are not treated symmetrically with gains insofar as realized nominal capital losses can be offset only against capital gains realized in the current year or carried forward and offset against gains in subsequent years. As a consequence, the CGT reduces the expected rate of return on a risky investment by more than the rate of tax. The reason is that the effective subsidy rate on capital losses under the CGT, should a bad 'state of nature' occur, is less than the effective tax rate for a good 'state of nature'. In other words, a higher effective tax rate applies to riskier investments.

Some assets which generate both income and expected capital gains may be negatively geared. Under the present unindexed income tax system, nominal interest payments on debt financed investment are tax deductible. In inflationary times non-indexation of interest payments provides a strong incentive toward debt-financed investment for which there is an implicit subsidy. This force may encourage risk-taking.

CGT and Liquidity Problems

The major argument put forward by farmers and small business against the CGT was that it would cause 'fragmentation' of businesses as a result of having to meet CGT payments at the time of asset transfer. The very favourable capital gains

rollover provisions under the existing CGT largely reflect the effectiveness of the above argument in the political arena.

In my view the liquidity argument is not persuasive. In the first place, although we do not have hard data, it seems unlikely that long-run capital gains on most farmland would accrue at a rate much above the rate of inflation. With an inflation rate of 7 per cent, for instance, rural land values would have to double every ten years just to maintain a constant real value. For rural land, with no competing uses outside agriculture, sustained real capital gains on farmland would require expectations of continuously rising real commodity prices, or, sustained technological advance in Australian agriculture at a rate significantly above that of our overseas counterparts. Real capital gains as a result of these forces are matched by increases in real farm incomes out of which CGT payments could be made. Furthermore, the broadening of the income tax base is part of an overall tax package to reduce rates of income tax below what they would otherwise be. CGT payments would be offset, at least to some degree, by lower income tax payments. Finally, as Lloyd (1985) has argued, given the fixed land base in agriculture the sale and 'fragmentation' of some farms generally assists adjustment in agriculture and allows some farmers to expand their land base.

So long as real capital gains on farmland are matched by increases in real farm income, payment of CGT on an accrual basis should not pose liquidity problems. Nor should a CGT on a realization basis obstruct smooth transfer of farms from one generation to the next providing that adequate provision is made for payment. Unlike death duties which are based on total values, a CGT is based on change in real values. And while it is difficult to plan on a date known well in advance for the former payments, planning can proceed on the basis of firm known date(s) for the latter.

From an efficiency viewpoint, the exemption of owner-occupied real estate from a CGT combined with the non-taxation of imputed rent has undoubtedly led to over-investment in expensive housing and real estate. This discriminates against farmers who by virtue of their rural location generally own less expensive housing and against those who are unable or disinclined to invest in such assets. One procedure would be to modify the CGT so that a taxpayer's principal residence was subject to CGT with an exemption of, say, $5,000. That is to say, tax would be paid only on real capital gains exceeding $5,000 per year. The case for removing the

generous rollover capital gains provisions applying to agriculture and other small businesses is weakened, at least on political grounds, so long as the principal residence of a taxpayer remains tax exempt and the proceeds from superannuation and life insurance are taxed at low effective rates.

There appears to be no compelling arguments on economic or administrative cost grounds against the use of some form of accruals basis CGT in Australia. Depending upon administrative costs and liquidity considerations, a CGT could be levied on a 2-5 year direct accruals basis. Alternatively, an indirect accruals basis could be adopted by assuming a deemed realization at the end of, say, each 10 year asset holding-period with appropriate interest adjustment charges to account for the period of deferral. The important point is that whatever means of CGT or income assessment are used the advantages to the taxpayer from deferred payment are kept to a practical minimum. So long as the CGT remains on a realization basis and the existing exemptions and generous roll-over provisions continue attempts to obtain an efficient and equitable comprehensive income tax system appear to be doomed to failure.

APPENDIX A

The focus of this Appendix is on how depreciating assets should be treated so that an income tax will not distort investment decisions. The analysis draws from Chisholm (1976) and complements the appreciating asset case.

The following two definitions of taxable income provide a logical point of departure:

1. Fundamental theorem of tax rate invariance: if, and only if, true loss of economic value is permitted as a tax-deductible expense will the present discounted value of a cash-receipt stream be independent of the rate of tax. (Samuelson, 1964, p.604).

2. Furthermore, there appears to exist no administratively feasible way to specify neutral write-off rules except to define taxable income as gross income minus all cash outlays including investment. This amounts to permitting businesses to expense fully capital expenditure for tax purposes

and represents the maximum rate of accelerated depreciation. (Smith, 1963, p.604).

The "neutrality" claims for both the true economic depreciation and immediate expensing (instantaneous depreciation) versions of taxable income are basically correct, but quite different assumptions underlie each. It is shown in the latter part of the Appendix that a general "income" tax that permits immediate expensing of all investment outlays is effectively a tax on pure profits. Pure profits may be defined as those returns to an asset (if any) that are net of economic depreciation plus the explicit, or implicit, interest cost of holding a capital good. On the other hand, an income tax that permits the write-off of true economic depreciation taxes both the "normal" interest earned on investments plus pure profits. It is clearly intended, primarily on equity grounds, that a comprehensive income tax base should include interest income earned on equity capital. Given this decision, it is of course not possible to specify a personal income tax base which does not distort individuals savings consumption choices.

In an annual discrete time period model, true economic depreciation is defined as the difference between the present value of the net receipt stream generated by a capital asset at the beginning and end of an annual period. In any annual period, economic depreciation can be shown to be equal to the annual net receipts less annual interest on the value of the capital good. Denoting the present value of the expected future earnings stream of the asset at the beginning of the kth year as V_k, annual net receipts as N_k, and i as the market rate of interest, economic depreciation is therefore defined as

$$(1) \qquad V_k - V_{k+1} = V_k - [V_k(1 + i) - N_k]$$
$$= N_k - iV_k.$$

And rearranging terms we obtain

$$(2) \qquad N_k = V_k - V_{k+1} + iV_k$$

where N_k now can be interpreted as the implicit rental price (user cost) of capital, namely, the sum of economic depreciation plus the market rate of interest on the value of the capital asset. For an investment that is wholly debt-financed, it follows that an investor will be indifferent between an income tax which allows tax-

deductibility of true economic depreciation plus explicit (debt) interest payments, and a tax which permits immediate expensing but no tax-deductibility of interest payments.

Under a comprehensive income tax which permits write-off of economic depreciation and which is fully equity financed, taxable income, Y, is defined as

$$(3) \qquad Y = N_k - (V_k - V_{k+1}) = iV_k$$

Annual tax payments of tiV_k are made and after-tax income, Y^* is:

$$(4) \qquad Y^* = (1 - t)[N_k - (V_k - V_{k+1})] = i(1 - t)V_k$$

Thus when true economic depreciation is permitted as a tax-deductible expense, the present value of a cash-receipt stream will be independent of the rate of tax each investor is subject to if, and only if, a private net-of-tax discount rate equal to i(1 - t) is used to evaluate all investments. Under a fully comprehensive income tax with write-off of economic depreciation, the amount of the gross-of-tax rate of return siphoned off as taxation is always precisely proportional to each investor's tax rate. Adoption by an investor of their net-of-tax rate of return i(1 - t) as the relevant rate of discount will leave the structure of optimal decision rules unaltered.

In the presence of inflation, to convert the tax base from nominal to real income it is necessary to allow an additional deduction in each period for the capital appreciation in the money value of the asset attributable to inflation. In addition, for debt-financed investments, nominal interest payments should be deflated so that only real interest payments are tax-deductible.

The time pattern of economic depreciation is a function of the time path of the flow of annual cash-receipts. For instance, a capital asset yielding a constant real annuity over its life span and having zero scrap value, has economic depreciation beginning at a relatively low rate and rising exponentially. For such assets, application of the straight-line depreciation formula would permit too rapid write-off and bias investment toward long-lived assets. For many assets, increasing

annual outlays on repairs and maintenance are required to maintain output. For these assets, straight-line depreciation provides a reasonable approximation to true economic depreciation since annual net-receipts typically become progressively smaller over an assets life.

We now turn to the analysis of immediate expensing (instantaneous depreciation) for all investment outlays. The before-tax net present value, P, of an investment outlay that provides a flow of annual net receipts, N_k, over a time span of n years is defined as,

$$(5) \qquad P = \left(\sum_{k=1}^{n} N_k(1+i)^{-k}\right) - C$$

where c = the price of the capital good, and
i = the market rate of interest.

Assume now that an income tax is imposed at a uniform rate, T, and that initially there is a zero tax allowance for depreciation. The after-tax net present value, in the absence of any depreciation allowance, p_o, is defined by

$$(6) \qquad P_o^* = \left(\sum_{k=1}^{n} N_k(1+i)^{-k}\right)(1-T) - C$$

Using equation (5) it should be noted for future use that equation (6) may be rewritten in the following form:

$$(7) \qquad P_o^* = P(1-T) - TC$$

Expanding relation (6) to incorporate a positive annual tax-deductible depreciation allowance, D_k, the after-tax net present value, P^*, is now defined by relation (8)

$$(8) \qquad P^* = \left(\sum_{k=1}^{n} N_k(1+i)^{-k}\right)(1-T) + T\left(\sum_{k=0}^{n} D_k(1+i)^{-k}\right) - C$$

It is helpful at this point to define a parameter, K, where K defines the ratio of the value of the cumulative discounted depreciation allowance to the price of the capital good:

(9) $$K = \left(\sum_{k=0}^{n} D_k(1+i)^{-k}\right)/C$$

Now, from equations (6), (7) and (9), relation (8) may be rewritten as

(10) $$P^* = P(1-T) - TC + TCK$$

which simplifies to

(11) $$P^* = P(1-T) - TC(1-K)$$

The parameter (1 - K) provides a measure of the rate at which depreciation can be written off for tax purposes. If no depreciation write-off is permitted, the value of K equals zero and equation (11) simply collapses to equation (7). At the opposite extreme, when K has a value equal to unity, the discounted present value of the depreciation allowance equals the acquisition price of the capital good. One method of depreciation, for which the value of K is equal to unity, is "immediate expensing," that is, a tax depreciation policy which permits the full price of a new capital good to be deducted from taxable income at the time of its acquisition. Immediate expensing thus represents the most extreme form of accelerated depreciation.

Under a general tax that permits immediate expensing of all capital outlays, only pure profits will be taxed. This important point is more easily explained by noting that with immediate expensing equation (11) reduces to

(12) $$P^* = P(1-T)$$

Now for a marginal investment, pure profits and the net present value, P, are zero. Also, the net present value of tax payments associated with the investment will be zero, since the value of the tax savings made at the time the investment outlay is expensed equals the present value of the sum of annual tax payments associated with the cash-receipt flow, N_k. Hence, investments that were marginal before tax will continue to be marginal after the imposition of a general tax that permits immediate expensing. However, for all investments that earn pure profits, and thus have a positive net present value, tax will be paid in proportion to the pure profits earned, and the after-tax net present value of these investments will equal P(1 - T). A general tax which permits immediate expensing of all investment

outlays is thus perfectly neutral on the criterion that the before-tax net present values of all investments are reduced in exact proportion to the tax rate.

APPENDIX B

Consider an owner of a farm acquired before 20 September, 1985 who dies on 1 January 1987. Assume a son retains the property until his death (say, 30 June, 2017) and it passes on to the grandson. The grandson can rollover the capital gain until he either dies or sells the property.

After farming for five years the grandson decides that his business interests and talents lie elsewhere. However, if he sells the farm on 1 January, 2022, then the indexed cost for purposes of CGT assessment is calculated by reference to the original value when the grandfather died on 1 January, 1987, (35 years earlier). If real capital gains had steadily accumulated at, say, 2 per cent per annum, and the farm was worth $500,000 in 1987, its real value in 2022 would be $1,000,000. If the grandson were to sell the farm and use the realized capital for a different business activity, better suited to his interests and business talents, he would be liable for a CGT payment of $245,000, equivalent to nearly 25 per cent of the value of the property, assuming that his marginal tax was 49 cents for each dollar of capital gain. In practice, the rate of tax to be applied to the capital gain is determined by including 20 per cent of the capital gain in the taxpayer's taxable income for the year of disposal of the property and calculating the marginal tax rate applicable to that amount. The assessed 'marginal rate' is then applied to the total capital gain to calculate the CGT. This measure is designed to ameliorate the 'bunching' problem that arises with a progressive income tax and a CGT on a realization basis. For a comprehensive discussion of averaging procedures see Jeffery (1981).

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