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Abstract

This paper reconsiders the income-splitting rules of the Nordic dual income tax system, introduced to address the incentives to shift income between labor and capital income tax bases. These rules impute a return on equity, categorized as capital income, and tax the residual roughly at the rates levied on labor income. There are broadly two ways to calculate the capital income part. One is to impute a return on the acquisition price of shares (Sweden and Norway) and the second is to calculate a return on the net book assets of the firm (Finland). This paper addresses the economic effects of the net asset-based splitting method, which has not been studied thoroughly in earlier literature. Using a dynamic investment model, we show that at appropriately chosen parameter values the net assets-based split exhibits the key properties of the reportedly neutral ACE corporation tax. Our analysis, therefore, implies that the incentive problems of Finnish taxation of closely held companies, found in some earlier studies, derive from wrong parameter values rather than from wrong principles.

Key words: dual income tax, income-splitting, neutral taxation, investment, depreciation allowances

JEL classes: H21, H24, H25, H32

Contents

1. Introduction

In recent decades, the Nordic dual income tax (DIT) has been discussed as a blueprint for tax reform in several countries in Europe and beyond.[1] The distinctive feature of DIT is that it systematically separates the tax treatment of capital income from the taxation of other types of income. A flat rate is levied on capital income from all sources, while other income forms are subject to a conventional progressive tax schedule.

It is widely recognized that one central issue in implementing a DIT is how to treat the business income of entrepreneurs who both work in their businesses and have invested their wealth therein.[2] The nature of the problem is slightly different depending on the organizational form. In the case of closely held companies (CHC), the question is how to prevent owner-managers from misreporting their remuneration as leniently taxed capital income. The solution to this income-shifting problem adopted by the Nordic countries was to split the income of entrepreneurs into capital income and labor income components. This was implemented by first calculating an imputed return on the equity invested in the firm (normal return), categorizing this as capital income, and taxing the rest of the remuneration (excess return) as labor income at progressive rates.

The current rules for splitting income received from CHCs basically comprise two different approaches. In Sweden the normal return part of an owner's income is calculated as a return on the initial purchase price of the firm's shares. Norway subsequently adopted this rule to calculate the rate-of-return allowance (RRA), the key element of its much-discussed shareholder model (see Sørensen, 2005).

The second approach is the one chosen by Finland, where the normal return part is calculated as an imputed return on the net assets recorded in the firm's financial accounts.

However, while designed to address income-shifting, the splitting systems may have some unintended side effects too. In particular they may distort the investment and financing decisions. So the key economic question is how the alternative designs fare in this respect. These aspects of the Nordic systems have been subject to considerable attention in economic research. For example, the studies by Lindhe et al. (2004) and Sørensen (2005) argue that the (Swedish and

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[1] DIT was first implemented by the three Nordic countries Sweden, Norway and Finland. Variants of DIT have been proposed by Sinn (2003) and Spengel and Wiegard (2004) for Germany, by Keuschnigg and Dietz (2007) for Switzerland, Sørensen (2009) for New Zealand, Sørensen and Johnson (2010) for Australia, and Kleinbard (2010) for the USA. Meanwhile, dualistic aspects have become increasingly common, particularly in Europe in the form of low final withholding taxes on certain types of capital income.

[2] See for example Sørensen (1994) and Boadway (2004).

Norwegian) purchase price approach is theoretically consistent, and yields neutral taxation along several margins if designed appropriately.

In particular, the literature on the effects of the Norwegian shareholder model argues that if the RRA allowance is calculated using an appropriately chosen imputed rate of return, the present value of future allowances will correspond to the initial investment (Sørensen, 2005). This implies that, in the form of the ACE tax (the Allowance for Corporate Equity), the shareholder model is a present value equivalent to a cash-flow tax, and therefore the tax system is neutral with respect to investment and financing decisions. The literature also argues that the RRA allowance makes the tax system neutral with respect to the timing of dividend distributions and realizations of capital gains, and therefore removes the lock-in effect, a problem of standard gains taxes. (Sørensen, 2005; Lindhe and Södersten, 2012)

In contrast, Lindhe, Södersten and Öberg (2002, 2004), Hietala and Kari (2006) and Kari and Karikallio (2007) argue that the Finnish tax rules for the owners of CHCs distort the investment and financing decisions of firms. They claim that the cost of capital varies between firms depending on the marginal tax rate on the labor income of the principal owners and may in extreme cases even be negative.

These studies seem to have led to a prevailing understanding that the RRA model is the ideal way to calculate the normal return part of shareholder income, and that it is clearly better than the net asset method practiced in Finland. However, the academic literature has paid little attention to whether this approach could be designed to yield neutrality. In 2010, a committee in Finland argued that this could be implemented through some rather small modifications to the tax rules (Ministry of Finance, 2010).

To reconsider the issue, we set up a dynamic investment model to analyze the incentive effects of a stylized version of the Finnish net asset-based splitting system. We closely follow the approach by Boadway and Bruce (1984) and show that under rather mild assumptions concerning the tax parameters the model satisfies many of the neutrality properties of the so-called generalized cash flow tax (GCFT). There is an even more direct link to the ACE tax, a special case of GCFT. (IFS, 1991) Unlike the RRA but with the ACE tax, the net asset-based imputed income method does not require an alignment of fiscal depreciation with economic depreciation. Similarly, the system seems to improve investment neutrality for all sources of financing, which is also a property of the ACE tax. We conclude that the failures of the past and current Finnish system are not in its principles but rather in an inappropriate choice of parameter values (such as that of the imputed rate-of-return).

The remainder of this paper is organized as follows. Section 2 provides some background of the tax systems we analyze. Section 3 presents the analysis of the incentive properties of the net assets-based imputed income method. Section 4 concludes.

2. Institutional backdrop – Income-splitting under Nordic dual income tax

The distinctive feature of the Nordic dual income tax is that it divides personal income into capital income and labor income shares and taxes these two tax bases using different tax schedules. While net capital income is subject to a proportional tax rate, labor income is taxed using a conventional progressive tax schedule.

In its most streamlined version, defined in Sørensen (1994), the DIT aligns the flat personal tax rate on capital income with the corporate income tax rate and also with the marginal tax rate of the lowest labor income tax bracket. In order to achieve neutrality in capital income taxation, tax bases should be as broad as possible and the double taxation of corporate-source income should be fully alleviated. In this design DIT can be seen as a flat tax on all net income plus a surtax on high labor income.[3]

The Nordic applications followed many aspects of the prototype model, Norway being perhaps the closest and Finland coming next. Norway, for example, took the broadening of the tax base for capital income furthest and eliminated double taxation of both distributed and retained corporate profits.[4]

Over the years the income tax systems of these countries have been subject to several adjustments (in both tax rates and tax bases), but the essential aspects of DIT have remained. Table 1 summarizes the main features of the Nordic income tax systems in force in 2012.

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[3] In fact, Norway's income tax is designed in this way. See for example NOU (2014).

[4] Norway included an imputed return on owner-occupied housing into taxable income subject to the proportional rate and adopted a full imputation system for the taxation of dividends and a corresponding system to achieve "single" taxation of capital gains (Sørensen, 2007).

Table 1. Main aspects of the dual income tax systems of Norway, Sweden and Finland in 2012

	Norway	Sweden	Finland
Year of introduction of DIT	1992	1991	1993
Personal tax rate on capital income, 2012	28	30	28
Personal MTR on earned income, 2012	28-47,8	31,5-56,6	27-55,5
Corporate tax rate, 2012	28	28	26
Tax base of capital income	net income from nearly all sources	net income from nearly all sources	net income from nearly all sources
Taxation of interest income	as capital income	as capital income	final withholding tax, 28 %
Integration of corporation and personal income tax, main rule	Dividends and capital gains in excess of an imputed return are taxable capital income	Classical system, dividends are included in taxable capital income	70 % of dividends are taxable capital income

Main source: OECD Tax data base 2012, http://www.oecd.org/tax/tax-policy/tax-database.htm

We observe that the key aspects of the tax systems still follow the principles underlying dual income taxation. However, Sweden and Finland have diverted from the original principle that personal capital income and corporate profits are taxed at the same rate. Similarly, Norway and Finland have diverged with their full imputation systems.

It was clear from the beginning that DIT requires some mechanism to distinguish labor income from capital income when these two income forms are mixed together as business income (labor-capital income centrifuge in Kleinbard, 2010). The problem is common but differs slightly between sole proprietors and entrepreneurs that operate their businesses in a company form.

If all the business income of a sole proprietor (or an active partner of a partnership) were taxed as labor income at the progressive schedule with high marginal tax rates, the compensation that she receives for investing her wealth in the firm, would be over-taxed compared to other types of capital income. The Nordic countries solved this problem by first calculating an imputed return on business assets and categorizing this as capital income and considering the residual as labor income. The capital income part was calculated by multiplying the gross (Norway) or net (Sweden and Finland) business assets of the firm by an assumed rate of return. Hagen and Sørensen (1998) and Sørensen (2007) discuss the alternative approaches and the methods applied in practice in the three Nordic countries.

If there weren't any analogous rules for the income of an owner/manager of a CHC her salary paid by the company would constitute labor income whereas dividends received and realized capital gains would constitute capital income for taxation purposes. Due to the wide gap between the marginal tax rates on labor and capital income, owners would face strong incentives to withdraw most of their income in the form of leniently taxed capital income (dividends and capital gains).

Therefore, some rules for splitting of income from CHCs are needed. The design of the method is not as obvious as in the case of sole proprietors. This has been reflected in the differences between the solutions adopted by the three Nordic countries and also in the frequent changes made to the rules over the years. As an example, Norway treated income from CHCs broadly similarly as a sole proprietor's income. The profit was divided into capital and labor income parts, and these parts were directly taxed as the income of the owner/manager (for more detail, see Hagen and Sørensen, 1998). However, in 2006 Norway abandoned this full integration scheme and moved to more traditional taxation of company-source income where the remuneration paid by the company is subject to taxation at the owner level (salaries and dividends).

Table 2 summarizes the central aspects of the current practices in the tax treatment of income from CHCs.

Table 2. Splitting of income from closely held companies under DIT in 2012

	Norway	Sweden	Finland
Is the split targeted at small companies?	No, dividends from all companies subject to splitting	Yes, at the dividend income of active owners of CHCs	Yes, at dividends of owners of non-listed companies
What is split	Dividends and capital gains	Dividends	Dividends
Imputed rate of return	After-tax interest on 3-month gov. bonds; 2012: 1,1%	Gov. bond rate plus 6%; 2012: 10.65%	Fixed, 8%
Capital base	Adj. purchase price of shares	Adj. purchase price of shares	Net assets of the CHC
Other elements	-	The imputed capital income includes a "wage addendum" (1)	-
Tax treatment of the imputed return	Tax exempt	Taxed as capital income at reduced rate of 20%	Exempt up to 60,000 euros; 70% of any return beyond taxable capital income
Tax treatment of excess return	Capital income (28%)	Full inclusion as labor income (progressive schedule)	70% included in taxable labor income (progressive schedule)
Carry-forward rules	Yes	Yes	No

Sources: Alstadsaeter and Jacob (2012), Sørensen (2007), OECD Tax Data Base

(1) See Alstadsaeter and Jacob (2012) Box 3.1 for the details of the Swedish system.

In 2006, after the repeal of its original method for taxing active owners of CHCs, Norway introduced its current system, where an imputed normal return is separated from the sum of dividends and realized capital gains (shareholder income) and is treated as being tax-exempt in personal taxation (rate-of-return allowance, RRA). Any amount exceeding the RRA is taxed as capital income at a rate 28 %.

The Norwegian shareholder tax is not targeted at CHCs only but applies to all dividends and realized gains received by individual shareholders. The RRA allowance is calculated as an imputed rate of return times the purchase price of the shares stepped up by any unutilized RRA-allowances. This step-up procedure effectively implies that unused allowances can be carried forward with interest. The main reason for this step-up mechanism is so that only capital gains in excess of normal returns are subject to tax. In Norway the imputed rate of return is set at the three-month government bond rate after tax. Hence the rate does not include any risk premium.

In Sweden the splitting rules are targeted at owners of CHCs working in the firm (‘active owners’). Imputed capital income is calculated broadly as in Norway, by factoring the adjusted purchase price of shares by the imputed rate of return. The adjustments include stepping-up by unutilized allowances, as in Norway. This imputed part of dividend income is taxed as capital income but at a concessional rate of 20%. Any amount in excess of this imputed income is fully included in taxable labor income.[5]

While the goals of the Finnish splitting system for closely held companies are broadly the same as in Norway and Sweden, there are two important differences. First, the rules apply to all shareholders of non-listed companies. Hence the coverage of the rules is much broader than in Sweden but somewhat narrower than in Norway where the RRA allowance is part of the general dividend tax system. A second important difference is that while imputed capital income is calculated similarly by factoring the capital base by an imputed rate of return, the capital base is the firm’s net assets (gross assets minus debt). In 2012, the imputed return was tax exempt up to 60,000 euros and partly taxable (70 %) as capital income on any excess amount. 70% of any dividends in excess of the imputed return was added to labor income. As in Sweden, the imputed rate of return includes a risk premium reflecting the dominant views at the time the systems were designed. In 2012 the rate was set at 8%.

Observe the different practices in the tax treatment of excess dividend. While Sweden and Finland include such dividends in the recipient’s taxable labor income, subject to a progressive tax schedule with high top marginal tax rates, Norway taxes them as capital income at the standard proportional tax rate. To avoid incentives to shift profits between the two tax bases, Norway aims to maintain the combined effective rate on excess dividends broadly at the level of the top marginal rates on labor income. Hence, the tax rates should satisfy the following equality:

(1) $$\tau_f + (1 - \tau_f)\tau_d = \tau_w,$$

[5] On top of the capital return is also included a very specific element, a share of wages paid by the firm (see e.g. Alstadsaeter and Jacob 2012).

where τ_f denotes the corporate tax rate, τ_d the tax rate on excess dividend and τ_w the top marginal tax rate on labor income. Norway taxed in 2012 the excess dividends as capital income at the standard rate τ_p. Hence, in Norway, $\tau_f = \tau_p$ and τ_w were chosen in such a way that condition (1) was satisfied when $\tau_d = \tau_p$. We address the relative merits of the alternative approaches to tax excess dividends in section 3.3.

While we can observe a series of interesting differences between the splitting systems of the three Nordic countries, from the point of view of this paper the principal difference is in how they calculate the imputed normal return part of dividends. Finland has chosen the net assets in the company's balance sheet as the capital base, while Norway and Sweden calculate the imputed return based on the adjusted purchase price of the shares. In the Nordic debate the latter approach has been seen as the standard, a theoretically consistent method, and the Finnish one inferior and theoretically obscure. The purpose of this paper is to elaborate whether this view is too black and white.

3. Net assets-based splitting system in a dynamic model

This section is composed as follows. First, in section 3.1 we consider a relatively simple case and show how the neutrality properties are achieved in this case. Second, in section 3.2 we show the neutrality properties in the most general case and provide a discussion of the results. Section 3.3 shows the neutrality properties in some interesting special cases.

3.1 Simple case ($\tau_d = \tau_p = \tau_f$)

In this section we consider a model where a closely held company (CHC) maximizes the present value of the revenue flow to its shareholders net of taxes and new equity, and takes into account both firm-level taxation and individual-level taxation.

The firm produces using capital as the only input and finances from retained profits and new equity Q. Its operating profit is denoted by $\pi(K)$ and it spends the accruing resources on dividends D, investment I and corporate taxes T_f. The firm's budget constraint is

(2) $$\pi(K) + Q = D + I + T_f$$

The profit function is strictly concave ($\pi'(K) > 0$ and $\pi''(K) < 0$). Debt financing is ruled out and all prices are normalized to one in our calculations.[6] D and Q are both chosen to be non-negative. The lower boundary for Q implies that the CHC cannot distribute profits through repurchases of shares. This constraint is not grounded in current regulations, rather it is an assumption chosen to simplify the analysis. However, the actual practice among Nordic CHC's supports it. Such firms rarely buy back shares. They usually have a small stock of initial equity, collected at the time the firm was set up, and a larger stock of accumulated profits.

The firm's capital stock depreciates at an exponential rate δ. Therefore, the equation of motion for capital reads as follows:

(3) $$\dot{K} = I - \delta K$$

[6] Debt financing might provide additional interesting insights, but in this paper our focus is on the effects of income- splitting on investment incentives, not on the choice between debt and equity.

The accounting stock of capital, A, depreciates at an exponential rate α (fiscal depreciation) which may differ from δ. The equation of motion for A is thus:

(4) $$\dot{A} = I - \alpha A$$

Corporate taxes are paid on profits after fiscal depreciation. By denoting the corporate tax rate by τ_f the corporate tax reads as follows:

(5) $$T_f = \tau_f[\pi(K) - \alpha A].$$

Thus, with given profits ($\pi(K)$) corporate tax is the lower the higher the fiscal depreciation rate (α) and the higher the accounting stock (A).

To model the owner-level taxation in a simple form, let us assume that tax is paid on dividends at the rate τ_d and all other forms of capital income at the proportional effective rate τ_p.[7] The tax rates generally satisfy $\tau_d \geq \tau_p \geq \tau_f$. In our model there is another difference between the tax treatment of dividends and other types of capital income. An equity allowance, iE, is deducted from dividend income. Here i is called the imputed rate of return (or normal rate of return) and E is the value of the firm's equity capital. Thus the tax on dividends reads as follows:

(6) $$T_D = \tau_d(D - iE).$$

Dividend income net of taxes is hence:

(7) $$D_{Net} = D - T_D = (1 - \tau_d)D + \tau_d iE.$$

In the remainder of this subsection we assume the tax rates to be equal, $\tau_d = \tau_p = \tau_f$ (simple case).

The firm maximizes the value of the revenue flow from the firm to the shareholders net of taxes and new equity issues:

(8) $$\max V_0 = \int_0^{\infty}(\gamma D_{Net} - Q)e^{-\rho t}dt.$$

[7] This means that the effective tax rate on capital gains is the same as the standard rate on capital income. Even if many related studies have chosen the effective tax rate on capital gains to be lower, we choose these to be the same since this choice provides simpler calculations and is still capable of illustrating our main conclusion.

Here $\gamma = \frac{1}{1-\tau_p}$ and ρ is the discount factor.

The term $\gamma D_{Net} - Q$ in the objective function is equivalent to the following expression:[8]

(9) $$\gamma D_{Net} - Q = (1 - \tau_f)\pi(K) - I + \tau_f \alpha A + \frac{\tau_p}{1-\tau_p} iE.$$

In the net asset-based splitting system the normal return on equity is calculated as a return on the firm's net book assets (total assets minus debt). As we are considering an equity-financed firm we may align the value of the firm's equity capital (E) with the firm's accounting stock of capital A, i.e. E = A. Thus we have

(10) $$\gamma D_{Net} - Q = (1 - \tau_f)\pi(K) - I + \tau_f \alpha A + \frac{\tau_p}{1-\tau_p} iA.$$

This is equivalent to:

(11) $$\gamma D_{Net} - Q = (1 - \tau_f)[\pi(K) - I] - \tau_f[\dot{A} - \frac{\tau_p}{\tau_f(1-\tau_p)} iA].$$

And our objective function (eq. (8)) reads as

(12) $$\max V_0 = \int_0^\infty (\gamma D_{Net} - Q)e^{-\rho t}dt = (1 - \tau_f)\int_0^\infty [\pi(K) - I]e^{-\rho t}dt - \tau_f \int_0^\infty [\dot{A} - \frac{\tau_p}{\tau_f(1-\tau_p)} iA]e^{-\rho t}dt.$$

With a suitable choice of the imputed rate of return, i, the latter integral becomes a constant and the optimization problem reduces to that which would obtain in the absence of taxation. By choosing $i = \frac{\tau_f(1-\tau_p)}{\tau_p}\rho$ this is the case. The latter term can then be written as follows:[9] $\tau_f A_0$, which is a constant.

Therefore, with the choice

(13) $$i = \frac{\tau_f(1-\tau_p)}{\tau_p}\rho$$

[8] See equations (A1) and (A2) in the Appendix.

[9] See equation (A4) in the Appendix.

the original maximization problem becomes equivalent to the following:

(14) $$\max V_1 = (1-\tau_f)\int_0^{\infty}[\pi(K) - I]e^{-\rho t}dt$$

Since the tax term $(1-\tau_f)$ is factored out, the problem is equal to the original problem in the absence of any taxes, $T_f = 0, T_D = 0$, and has the following solution:[10]

(15) $$\pi'(K) = \rho + \delta.$$

Hence, under certain conditions concerning tax rates and the imputed rate of return, the net asset-based splitting system becomes neutral with respect to the firm's investment decisions. In this simple model the system is in fact equivalent to the ACE tax. Therefore it also exhibits the ACE's well-known property that fiscal depreciation rates have no effect on investment (Boadway and Bruce 1984 and Devereux and Freeman 1991). We will develop and interpret the results in the following sections.

3.2 General case ($\tau_d \geq \tau_p \geq \tau_f$)

Above we employed a methodology similar to Boadway and Bruce (1984). Even if this allows us to derive the optimal conditions in a convenient way, it still has its own restrictions. In what follows we generalize the above result, derive an additional result regarding the effects of fiscal depreciation allowances and provide the intuition and reasoning behind the results. For this we need to augment the model and employ dynamic optimization.

Compared to the above we now relax the assumption regarding the similarity of the tax rates and study the properties of the splitting system in a more general framework, where the corporate tax rate τ_f, the tax rate on capital income τ_p and the tax rate on excess dividends τ_d are allowed to differ in the following way: $\tau_d \geq \tau_p \geq \tau_f$. Furthermore, with the case $\tau_f < \tau_p$ in mind, we add a new element. A share s of the normal return on equity is included in the owner's taxable income taxed at rate τ_p. Dividend income net of taxes becomes:

(16) $$D_{Net} = D - [\tau_p siA + \tau_d(D - iA)] = (1-\tau_d)D + (\tau_d - \tau_p s)iA.$$

[10] See equation (A5) in the Appendix.

Including the share s of normal dividend in taxable capital income can be justified as follows. It is compensation for the low corporate tax rate. Without it the normal return of dividend would be taxed at a lower rate than the owner's direct investment in interest-bearing alternative assets. To make the system neutral with this respect the difference in effective tax rates should be removed (henceforth the second neutrality). This happens when:

$$(17) \qquad \tau_f + (1-\tau_f)s\tau_p = \tau_p \iff s = \frac{\tau_p - \tau_f}{(1-\tau_f)\tau_p} \ .$$

Observe that $s = 0$ when $\tau_p = \tau_f$ and $s > 0$ when $\tau_p > \tau_f$.

The marginal condition corresponding to equation (15) for the augmented model can be written as follows (see Appendix):

$$(18) \qquad \mathrm{F}'(\mathrm{K}) = \pi'(\mathrm{K}) - \delta = \frac{\rho}{1-\tau_f}\left[1 - \tau_f \frac{\alpha-\delta}{\rho+\alpha}\right] - \frac{\tau_d - s\tau_p}{(1-\tau_f)(1-\tau_d)}\, i\left[1 - \frac{\alpha-\delta}{\rho+\alpha}\right]$$

where $\mathrm{F}'(\mathrm{K})$ is the marginal rate of return after true economic depreciation. The interpretation of the condition goes as follows. The first of the two terms on the right-hand side stands for the effective cost of equity financing, where $\frac{\rho}{1-\tau_f}$ is the unit cost of equity, and the bracketed term is the share of marginal investment that is financed with equity. The term $\tau_f \frac{\alpha-\delta}{\rho+\alpha}$ reflects the deferral of corporate taxes due to accelerated depreciation and is interpreted as the (average) share of investment financed by deferred taxes. So, we may consider that part of the investment is financed with equity and the rest from deferred taxes. The latter element has a zero unit cost, and therefore does not show up.[11]

The second term on the right-hand side is the effect of personal level equity allowance on the cost of capital. Observe that accelerated depreciation $\alpha > \delta$ decreases this effect (- $\frac{\alpha-\delta}{\rho+\alpha} < 0$) . The intuition is that with accelerated depreciation the average book value of equity is lower, and the allowance smaller, than with fiscal deprecation that corresponds to economic depreciation, $\alpha = \delta$.

In order to get another angle on our interpretations, let us rewrite equation (18) in the following way:

$$(19) \qquad \mathrm{F}'(\mathrm{K}) = \frac{\rho}{1-\tau_f} - \frac{\tau_d - s\tau_p}{(1-\tau_f)(1-\tau_d)}\, i + \left[\frac{\alpha-\delta}{\rho+\alpha}\frac{\tau_d - s\tau_p}{(1-\tau_f)(1-\tau_d)}\, i - \frac{\alpha-\delta}{\rho+\alpha}\frac{\rho\tau_f}{1-\tau_f}\right].$$

[11] See e.g. Södersten (1982) and Kanniainen and Södersten (1995).

The bracketed term on the right-hand side collects the two routes through which accelerated fiscal depreciation affects the cost of capital. The latter term within the brackets, $-\frac{\alpha-\delta}{\rho+\alpha}\frac{\rho\tau_f}{1-\tau_f}$, describes the saving in corporate tax due to accelerated depreciation, and the first term, $\frac{\alpha-\delta}{\rho+\alpha}\frac{\tau_d-s\tau_p}{(1-\tau_f)(1-\tau_d)}i$, the effect on the size of the equity allowance. We observe that with $\alpha > \delta$ the two elements are of opposite sign; accelerated depreciation decreases the cost of capital via corporate income tax, but increases it via personal taxation on dividends.

Even if we observe the effects of accelerated depreciation on the cost of capital, with a suitable choice for the normal rate of return, i, we can make the cost of capital independent of accelerated depreciation. Choosing the normal rate of return as follows:

(20)
$$\mathrm{i} = \frac{\tau_f}{\tau_d - s\tau_p}(1-\tau_d)\rho,$$

makes the bracketed term in equation (19) to take the value of zero, and the two first terms to melt into ρ. Hence, the marginal condition for investment becomes:

(21)
$$F'(K) = \rho,$$

which is exactly the same as condition (15) where there was no taxation at all ($\tau_d = \tau_p = \tau_f = 0$), and is independent of the accelerated depreciation.

3.3 Selected special cases

Now let us concentrate on some interesting special cases of the above general model. Table 3 describes these cases. [12]

[12] Observe that we allow the combination of $s = 0$ and $\tau_p > \tau_f$ which violates the condition (17). We do this to highlight the implications of the tax treatment of normal return on neutrality.

Table 3. Optimal imputed rates of return in selected special cases

Tax Rates	Parameter S	Optimal Normal Rate of Return	
Simple Case: $\tau_d = \tau_p = \tau_f$	$s = 0$	$i = (1 - \tau_p)\rho$	
Case 2A: $\tau_d = \tau_p > \tau_f$	$s > 0$	$i = (1 - \tau_f)\rho$	
Case 2B: $\tau_d = \tau_p > \tau_f$	$s = 0$	$i = \frac{\tau_f}{\tau_p}(1 - \tau_p)\rho$	
Case 3A: $\tau_d > \tau_p > \tau_f$	$s > 0$	$i = \frac{\tau_f}{\tau_d^*}(1 - \tau_d)\rho$	$\tau_d^* = \tau_d - \frac{\tau_p - \tau_f}{1 - \tau_f}$
Case 3B: $\tau_d > \tau_p > \tau_f$	$s = 0$	$i = \frac{\tau_f}{\tau_d}(1 - \tau_d)\rho$	

The first row in Table 3 describes the simple case, which was studied in section 3.1. In this case neutrality is achieved by choosing the normal rate of return to be the after-tax interest rate, $i = (1 - \tau_p)\rho$.[13] This corresponds to the rule applied in the Norwegian shareholder model and analyzed by e.g. Sørensen (2005). As explained in Section 2, Norway has maintained equality of the tax rates, while Sweden and Finland have diverted from it.

The second and third rows describe the cases where the corporate tax rate is lower than personal-level tax rate on capital income. Case 2A assumes that the low tax rate at the firm level is compensated by taxing a share of normal dividends distributed to the owner. Now the optimal imputed rate of return is $i = (1 - \tau_f)\rho$. This case closely corresponds to the reform proposal of a tax committee in Finland (Ministry of Finance, 2010; Eerola and Kari, 2010). The committee proposed to keep the net assets-based split method but to reform the prevailing parametrization of the system. It proposed taxing excess dividends as capital income at the standard rate (instead of as labor income) and including a compensating share of normal dividends in taxable capital income. It also proposed defining the imputed rate of return as in case 2A.

Case 2B shows that neutral treatment of investment and irrelevance of depreciation allowances do not require $s > 0$. A suitable choice of i with $s = 0$ can yields similar properties. Observe that now the rate required to yield neutrality is lower than in case 2A. This result is intuitive: the normal return is taxed more leniently but the return is calculated using a lower rate. However, it is worth noting that whenever we have $\tau_p > \tau_f$, but $s = 0$ we cannot have equal treatment between a firm's investment in low-yielding assets (bonds or savings

[13] The discount factor ρ is typically considered to be aligned with the interest rate r.

accounts) and direct investment by owners in such assets. Rather, the relatively low rate of corporate tax favors investment canalized through the firm. Therefore, compared to case 2A, in case 2B we lose the second neutrality property, but achieve neutrality with respect to (high-yielding) business investment.

Cases 3A and 3B in Table 3 consider the case where excess dividends are taxed at the rate $\tau_d > \tau_p$. Assume first that the rate is proportional. According to the results a neutrality-yielding i can be found in both cases $s > 0$ and $s = 0$. Again, in the latter case a relatively lower rate is required to yield neutrality.[14]

If the tax rate is progressive and CHC owners are spread across the tax brackets of the tax schedule, the system cannot be made to satisfy the same neutrality properties as the cases above. The cost of capital varies across different owners depending on the marginal tax rate on excess dividends. The current Swedish and Finnish splitting systems tax excess dividends as labor income at progressive rates, and therefore face this challenge.[15]

It may be worthwhile to remark that, despite its favorable properties, case 3A with a proportional tax rate has not been studied before. It clearly provides an interesting policy option particularly if $\tau_d > \tau_p$ is required to satisfy the no income-shifting condition (1).

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[14] In case 3B we again lose the second neutrality property since $\tau_p > \tau_f$ and $s = 0$.

[15] A more important source of non-neutrality in these applications might yet be that the countries have not targeted the imputed rate of return at the level of the tax-adjusted interest rate. Rather they apply rates which are much higher than the regular rates.

4. Conclusions

We have studied the neutrality properties of a dual income tax system, where the income received from a CHC is split into capital and labor income parts according to net assets of a company. We start from a case where the tax rates on capital income and corporate profits are equal, and show that with a suitable choice of parameters such a system can be made neutral with respect to investment. We also demonstrate that this set of parameters makes the choice of the rate of fiscal depreciation irrelevant, a well-known property of a different tax system, the ACE tax.

We also investigate whether neutrality can be achieved when tax rates differ. We again report neutrality-yielding combinations of parameters for a broad selection of combinations of proportional tax rates. The results imply that the key parameters provide the tax system designers (surprisingly) powerful tools to implement neutrality.

The results also imply that the net assets-based splitting system can have broadly as favorable neutrality properties as those DIT systems where the splitting is done according to the purchase price of shares. There are some trade-offs, of course. While the purchase-price method can be designed to eliminate the incentive to defer capital gains realizations (Sørensen, 2005), the existing net assets-based models do not carry this property. On the other hand, the irrelevance of fiscal depreciations is a property of the net assets-based split but not of the alternative model.

These considerations suggest that the net assets-based splitting system should not be considered inferior to purchase price-based splitting. The structure of the system is not a problem per se, but wrong parameters are.

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Appendix

The first term in the objective function in equation 8 can be written as follows:[16]

(A1)
$$\gamma D_{Net} = \gamma\left[\left(1-\tau_p\right)D + \tau_p iE\right] =$$
$$= \gamma\left[\left(1-\tau_p\right)[Q - I - T_f + \pi(K)] + \tau_p iE\right] =$$
$$= Q + \gamma\left[\left(1-\tau_p\right)[\pi(K) - I - T_f] + \tau_p iE\right] =$$
$$= Q + \gamma\left[\left(1-\tau_p\right)\left[\pi(K) - I - \tau_f[\pi(K) - \alpha A]\right] + \tau_p iE\right] =$$
$$= Q + (1-\tau_f)\pi(K) - I + \tau_f\alpha A + \gamma\tau_p iE =$$
$$= Q + (1-\tau_f)\pi(K) - I + \tau_f\alpha A + \frac{\tau_p}{1-\tau_p} iE$$

Thus we can write

(A2)
$$\gamma D_{Net} - Q = (1-\tau_f)\pi(K) - I + \tau_f\alpha A + \frac{\tau_p}{1-\tau_p} iE$$

By substituting I from equation (4) into equation (10) we get

(A3)
$$\gamma D_{Net} - Q = (1-\tau_f)\pi(K) - [(1-\tau_f)I + \tau_f I] + \tau_f\alpha A + \frac{\tau_p}{1-\tau_p} iA =$$
$$= (1-\tau_f)[\pi(K) - I] - \tau_f I + \tau_f\alpha A + \frac{\tau_p}{1-\tau_p} iA =$$
$$= (1-\tau_f)[\pi(K) - I] - \tau_f[I - \alpha A] + \frac{\tau_p}{1-\tau_p} iA =$$
$$= (1-\tau_f)[\pi(K) - I] - \tau_f\dot{A} + \frac{\tau_p}{1-\tau_p} iA =$$
$$= (1-\tau_f)[\pi(K) - I] - \tau_f[\dot{A} - \frac{\tau_p}{\tau_f\left(1-\tau_p\right)} iA]$$

The latter term at the end of equation (12) can then be written as follows:[17]

[16] First use eq. (7), second the budget constraint (eq. (2)), third the identity $= \frac{1}{1-\tau_p}$, fourth eq. (5), fifth rearrange the terms and finally use the identity $\gamma = \frac{1}{1-\tau_p}$ again.

[17] The last equality follows from the fact that the upper bound vanishes when t goes to infinity.

(A4) $$-\tau_f \int_0^\infty [\dot{A} - \frac{\tau_p}{\tau_f(1-\tau_p)} iA] e^{-\rho t} dt = -\tau_f \int_0^\infty [\dot{A} - \rho A] e^{-\rho t} dt = -\tau_f \int_0^\infty \frac{d}{dt}[A\, e^{-\rho t}] dt = \tau_f A_0$$

The solution to the original problem, but without any taxes is $\pi'(K) = \rho + \delta$, because

(A5)
$$\max \int_0^\infty [\pi(K) - I] e^{-\rho t} dt =$$
$$= \max \int_0^\infty [\pi(K) - \dot{K} - \delta K] e^{-\rho t} dt =$$
$$= \max \int_0^\infty [\pi(K) - \delta K] e^{-\rho t} dt - \max \int_0^\infty \dot{K} e^{-\rho t} dt =$$
$$= \max \int_0^\infty [\pi(K) - \delta K] e^{-\rho t} dt - K_0 - \max \int_0^\infty \rho K e^{-\rho t} dt =$$
$$= \max \int_0^\infty [\pi(K) - (\delta + \rho)K] e^{-\rho t} dt - K_0,$$

which has a solution (just taking a derivative with respect to K) $\pi'(K) = \rho + \delta$.[18]

Let us next derive equation (18). The Lagrangian for the constrained optimization problem reads as follows:[19]

(A6) $$L = \frac{1-\tau_d}{1-\tau_p} D + \frac{\tau_d - \tau_p s}{1-\tau_p} iA - Q + q_1[(1-\tau_f)\pi(K) + \tau_f \alpha A + Q - D - \delta K] + $$
$$+ q_2[(1-\tau_f)\pi(K) + Q - D - (1-\tau_f)\alpha A] + \lambda_1\big[D - u\big(1-\tau_f\big)\pi(K)\big] + \lambda_2 Q$$

Here, as above, D stands for dividends, A is the accounting stock, Q is new equity and K is the capital stock. q_1, q_2, λ_1 and λ_2 are the Lagrangean multipliers that

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[18] First use eq. (3), second manipulate the terms, third integrate by parts and fourth manipulate the terms again.

[19] The maximization problem is the following (D_{Net} is given in eq. (16): $D_{Net} = (1-\tau_d)D + (\tau_d - \tau_p s)iA$):

$$\max V_0 = \int_0^\infty (\gamma D_{Net} - Q) e^{-\rho t} dt = \int_0^\infty (\frac{1-\tau_d}{1-\tau_p} D + \frac{\tau_d - \tau_p s}{1-\tau_p} iA$$
$$s.t.$$

(2’) $\pi(K) + Q = D + I + T_f$

(3’) $\dot{K} = I - \delta K$

(4’) $\dot{A} = I - \alpha A$

(5’) $T_f = \tau_f[\pi(K) - \alpha A]$

(Aa) $D \geq u\pi(K)(1-\tau_f)$

(Ab) $Q \geq 0$

First using (2’) and (5’) for solving I and then plugging this solution to one of (3’) and (4’) each time gives the constraints in the Lagrangian (eq. (A6)).

can be considered as the shadow prices for K, A and the lower bound restrictions for D and Q, respectively.

The solution for the optimization problem reads as follows:

(A7) $\frac{\partial L}{\partial D} = \frac{1-\tau_d}{1-\tau_p} - q_1 - q_2 + \lambda_1 = 0 \Leftrightarrow q_1 + q_2 = \frac{1-\tau_d}{1-\tau_p} + \lambda_1$

(A8) $\frac{\partial L}{\partial Q} = -1 - q_1 - q_2 + \lambda_2 = 0 \Leftrightarrow q_1 + q_2 = 1 - \lambda_2$

(A9) $\dot{q}_1 = \rho q_1 - (1-\tau_f)F'(K)(q_1+q_2) + \delta q_1 + u(1-\tau_f)\pi'(K)\lambda_1$

(A10) $\dot{q}_2 = \rho q_2 - (\frac{\tau_d - \tau_p s}{1-\tau_p})i - \tau_f \alpha q_1 + (1-\tau_f)\alpha q_2$

Now we consider a steady solution, where the firm does not increase its capital stock, but distributes all its profits as dividends. In this case $D > u(1-\tau_f)\pi(K)$ and therefore $\lambda_1 = 0$. Eq. (A7) then reduces to

(A7') $q_1 + q_2 = \frac{1-\tau_d}{1-\tau_p}$

and eq. (A9) to

(A9') $\dot{q}_1 = \rho q_1 - (1-\tau_f)\pi'(K)(q_1+q_2) + \delta q_1$

In a steady state $\dot{q}_1 = \dot{q}_2 = 0$. Thus, in this case we may solve the shadow price q_2 for the accounting stock, A, from eq. (A9') straightforwardly (and using (A7')).

(A11) $q_2 = \frac{(\tau_d - \tau_p s)i}{(\rho+\alpha)(1-\tau_p)} + \frac{\tau_f \alpha(1-\tau_d)}{(\rho+\alpha)(1-\tau_p)}$

The terms have intuitive interpretations. The first term describes the present value of increasing the normal rate of return in dividend taxation, which takes place at the individual level. The second term describes the present value of increasing deductibility.

By summing equations (A9') and (A10) and using the steady-state conditions $\dot{q}_1 = \dot{q}_2 = 0$ we get

$$\Rightarrow \pi'(K) = \frac{\delta + \rho}{(1-\tau_f)} + \frac{(\alpha - \delta)q_2}{(1-\tau_f)(q_1+q_2)} - \frac{(\tau_d - \tau_p s)i}{(1-\tau_p)(1-\tau_f)(q_1+q_2)} - \frac{\tau_f \alpha}{(1-\tau_f)} =$$

$$= \frac{\delta + \rho}{(1-\tau_f)} - \frac{(\alpha-\delta)(\tau_d - \tau_p s)\mathrm{i}}{(1-\tau_f)(\rho+\alpha)(1-\tau_d)} + \frac{\tau_f \alpha(\alpha-\delta)}{(1-\tau_f)(\rho+\alpha)} - \frac{(\tau_d - \tau_p s)\mathrm{i}}{(1-\tau_f)(1-\tau_d)} - \frac{\tau_f \alpha}{(1-\tau_f)} =$$

$$= \delta + \frac{\rho}{(1-\tau_f)} + \frac{\tau_f \delta}{(1-\tau_f)} - \frac{\tau_f \alpha}{(1-\tau_f)}\left[1 - \frac{\alpha-\delta}{\rho+\alpha}\right] - \frac{(\tau_d - \tau_p s)\mathrm{i}}{(1-\tau_f)(1-\tau_d)}\left[1 - \frac{\alpha-\delta}{\rho+\alpha}\right] =$$

$$= \delta + \frac{\rho}{(1-\tau_f)} + \frac{\tau_f}{(1-\tau_f)}\left[\delta - \frac{\alpha(\rho+\delta)}{\rho+\alpha}\right] - \frac{(\tau_d - \tau_p s)\mathrm{i}}{(1-\tau_f)(1-\tau_d)}\left[1 - \frac{\alpha-\delta}{\rho+\alpha}\right] =$$

$$= \delta + \frac{\rho}{(1-\tau_f)}\left[1 - \tau_f \frac{\alpha-\delta}{\rho+\alpha}\right] - \frac{(\tau_d - \tau_p s)\mathrm{i}}{(1-\tau_f)(1-\tau_d)}\left[1 - \frac{\alpha-\delta}{\rho+\alpha}\right]$$

That is

(A12) $$\pi'(K) = \delta + \frac{\rho}{(1-\tau_f)}\left[1 - \tau_f \frac{\alpha-\delta}{\rho+\alpha}\right] - \frac{(\tau_d - \tau_p s)\mathrm{i}}{(1-\tau_f)(1-\tau_d)}\left[1 - \frac{\alpha-\delta}{\rho+\alpha}\right]$$