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The investment and financing decisions of closely held firms when there is a tax on the equity premium

Abstract:
This paper analyzes a tax system where personal share income in excess of the risk-free return on equity (the equity premium) is taxed. The rate of return allowance (RRA) in the Norwegian shareholder income tax system is, to the best of our knowledge, the first attempt of implementing such taxation in practice, and represents an innovation. This paper analyzes the effects of this form of taxation on the investment and financing decisions of closely held firms. Such firms typically have limited access to capital markets, but a high degree of financial flexibility that allows them to participate in tax planning. We show that even if the RRA reduces distortions compared to traditional dividend taxation, the tax system is not neutral if the shareowners' discount rate exceeds the risk-free interest rate used in the computation of the RRA. We find empirical support to the view that a tax on shareholder income without sufficient allowance for the opportunity cost of capital discourages investment in corporate equity. This finding is particularly relevant for entrepreneurship and investment in closely held firms.

Keywords: Dividend taxation, shareholder income tax, corporate financial policy

JEL classification: G32, G35, H24, H25

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1 Introduction

This paper analyzes a tax system where personal share income in excess of the risk-free return on equity (the equity premium) is taxed. The rate of return allowance (RRA) in the Norwegian shareholder income tax system is, to the best of our knowledge, the first attempt of implementing such taxation in practice, and represents an innovation. It is currently attracting wide interest internationally as other countries contemplate the introduction of similar systems (cf. Auerbach, Devereux and Simpson, 2008). The shareholder income tax with RRA works in a similar way to a corporate income tax with allowances for corporate equity (ACE), cf. IFS (1991), but is levied on individual shareholders; i.e., at the personal level.

A challenge in the design of shareholder taxation lies in the tension between the consideration with regard to income shifting, tax revenue and equality on the one hand, and investment incentives and efficiency on the other. In Norway, this dilemma was resolved by the introduction of the new shareholder tax in 2006, that equalized the marginal tax rates on labor and shareholder income. The intention was that this tax should avoid the distortions relating to equity issues and tax capitalization, by allowing the shareholder a risk-free rate of return protected from taxation through the RRA. Sørensen (2005), for instance, argues that this property secures neutrality with regard to corporate investment and financing decisions. Therefore, the system should be of great interest for tax policy generally, as it enables taxation of personal shareholder income more in line with the taxation of wage earners.

This paper analyzes the effects of this form of taxation on the investment and financing decisions of closely held firms by means of a theoretical model, where firms have limited access to capital markets, and shareholders' discount rates are allowed to differ from the risk-free rate of return used in the computation of the RRA. To do this we develop a theoretical framework building on Korinek and Stiglitz (2009), which is especially relevant for closely held firms and facilitates a comparative analysis of tax systems.

There are different views on the impact of dividend taxes on firms' investment and financing decisions and the discussion goes far back in the literature. Under the so called "old view" on dividend taxation, the marginal source of funds is assumed to be new share issues. Dividend taxes then reduce the present value of share income and increase the cost of raising new equity by reducing the investors' willingness to pay for shares. This makes debt more attractive as a source of finance. It will also reduce real investment in the corporate sector if equity cannot be fully replaced by debt and can also prevent the founding of new firms. Thus, according to this view, and as argued by Harberger (1962, 1966), dividend taxes distort the investment decisions of the firm and may prevent the free allocation of capital in the economy.

Under the "new view" (or trapped equity view) on dividend taxation developed by King (1974), Auerbach (1979) and Bradford (1981), the double taxation of dividends does not necessarily distort the firm's investment decisions. According to this view, retained earnings are the marginal source of financing, and dividends are paid out of the remaining cash flow after investment expenditure. Dividend taxes then reduce both the after-tax opportunity cost and the after-tax return on investments. Thus, as long as the opportunity cost of retained earnings (i.e., the after-tax dividend income) is reduced by the same proportion as the corresponding after-tax profit from the investment, the dividend tax does not distort the firm's investment decisions.

Another view builds on a life-cycle model of the firm with three phases; start-up, growth, and maturity (Sinn, 1991). Young firms are assumed to rely on an initial injection of equity that, because of the tax distortion, is insufficient to reach a steady state growth path. The firm will then retain all earnings until it reaches a steady-state where the marginal productivity is equal to the discount rate. Accordingly, a dividend tax will reduce initial investments in a startup firm and slow its growth rate for the same reasons as in the old view. However, at maturity, dividend taxation is neutral so long as the firm retains some profits and pays dividends (as under the new view). Thus, shareholder taxation is a more severe problem for entrepreneurship and the foundation of new firms than existing firms, and the efficiency effects are potentially larger if there is a significant portion of young firms relying on external equity in the corporate sector.

The literature on corporate taxes has mostly focused on listed corporations with separation of ownership and control and where shares are traded in the market, with well defined risk and returns, capitalization of taxes in the share prices, etc. In this setting, a symmetric tax on corporate income, such as capital gains or dividends, may be argued to be neutral with regard to portfolio decisions because the after-tax risk is reduced proportionally to the reduction in the after tax reward to risk taking. However, when the equity premium is not due to market risk but to other factors, the standard risk sharing argument no longer holds. As first pointed out by Mehra and Prescott (1985), the much higher return on equity compared with government bonds in the United States in the past century implies that individuals must have had implausibly high risk aversion according to standard economic models. Since then, similar observations have been documented in many other countries (see Graham and Harvey, 2007). One of several explanations for the equity premium puzzle is market failure, first and foremost adverse selection and moral hazard problems, transaction costs and liquidity constraints that prevent individuals from consumption smoothing over time. Gordon and Hausman (2009) too discuss the concept of corporate profit in light of the high observed rates of return and propose yet other explanations. That investors' subjective discount rates may exceed the risk-adjusted discount rate is also a central assumption in Korinek and Stiglitz (2009). Building on Sinn's (1991) life cycle view, they argue that information costs related to adverse selection or agency costs increase the cost of equity through the discount rate for dividends, and thereby induce firms to hold a cash buffer to smooth random investment expenditures. In turn, this has implications for the working of dividend taxes when it comes to anticipated changes in tax rates.

In most countries, closely held companies constitute by far the majority of companies. They have in common that they do not have the same access to capital markets as traded firms and are reliant on cash credit and their own working capital.[1] In most cases, the owner–manager will be one and the same person, which means that company-changing decisions can be made more rapidly. Also, the proximity between the private corporation and its owner has implications for the financial policy of the firm. Generally, the owner (or owner group) will have full control and can easily transfer equity in and out of the firm without regard to the preferences of other shareholders and conflicts of interest. This gives the firm a high level of flexibility when it comes to tax planning. For example, previously

[1] In most countries, the number of publicly listed firms rarely exceeds two percent of all firms (Wymeersch, 2008). According to Caggese (2007), financing constraints are mostly relevant for small and privately owned firms. Caggese (2007) also reports that small firms with less than 100 employees accounted for about 38 percent of total employment in the US in 1995.

issued equity can be transferred to the owner tax exempt, similarly to share repurchases in traded firms. This means that an entrepreneur who initially invests a large amount of capital in a business project owned by himself does not face a full equity trap but can withdraw the means any time as only the profit from the investment is taxed. This fact has been given surprisingly little attention in the literature. Furthermore, retained profits can instantaneously be converted to issued equity or debt if the owner reinvests the dividends paid as either new equity or loans. This means that dividends can be stepped up prior to anticipated tax increases without reducing the financial strength of the firm (the latter possibility is disregarded by Korinek and Stiglitz, 2009).

One important implication of the model put forward in this paper is that externally provided equity is a more costly source of funds for firms than retained earnings. We argue that the RRA based on the risk-free interest rate is not a sufficient allowance (and thus generates an "old view" type of distortion), while retained earnings are subsidized by the tax that otherwise would have been paid on dividend distributions; i.e., the tax irrelevance argument of the "new view". If this result holds, the optimal financial strategy of firms with holdings of original equity that can be distributed tax exempt (but at the cost of increased future taxes) would be to retain profits and distribute original equity (i.e., repurchase shares). Indeed, when confronting our model predictions with trends in aggregate data before and after the implementation of the shareholder income tax in Norway in 2006, it appears that closely held firms have adopted exactly this strategy. This provides some indirect empirical support to the argument that a tax on shareholder income (with no or insufficient allowance for the opportunity cost of capital) discourages share issues.

The rest of this paper is organized as follows: Section 2 discusses the basic functioning of the Norwegian shareholder tax system and the role of the RRA. In particular, we present an equivalent representation of this system, showing that the present value of all taxes on share income from a given firm under the RRA system equals the present value of a corporate tax on the equity premium in each period. In Section 3 we derive expressions for the cost of capital and discuss the financing incentives for the RRA system, when firms have limited access to capital markets. We demonstrate that while a tax on the equity premium is not necessarily neutral when the firm can repurchase shares or return to the shareholders the equity raised by an initial share issue, it will be neutral in a steady state. That is, for a mature firm that relies on retained earnings to fund marginal investment projects. Section 4 discusses some empirical implications of the model, and shows that main trends in financial accounts data before and after the introduction of the tax reform in Norway in 2006 are in line with the predictions of our theoretical model. Section 5 concludes.

2 Background: How does the RRA system work?

The basic concept of the Norwegian shareholder tax system is the rate of return allowance (RRA). Here we examine this system at the level of a closely held firm; i.e., aggregating all the shares in a given firm, and treating them as controlled by a single shareholder.

In the first year of a startup firm, the RRA equals the risk-free return[2] on the injected share capital, E_0:

$$RRA_1 = rE_0. \tag{1}$$

If D_t denotes dividends distributed in period t and T_t is shareholder taxes paid in period t, then

$$T_t = \tau(D_t - RRA_t)^+, \tag{2}$$

where $x^+ \equiv \max(x, 0)$. The evolution of RRA (at the firm level), provided there is no change in the share capital (new share issuance or repurchases of shares), is determined by the difference equation

$$RRA_t = rE_0 + (1+r)(RRA_{t-1} - D_{t-1})^+,\, t = 2, ..., T. \tag{3}$$

Thus, current RRA is obtained by adding the previous period's *unused* RRA, $(RRA_{t-1} - D_{t-1})^+$, *with interests*, to the risk-free return on the initial share capital, rE_0. In (3), E_0 is the *basis* for RRA and r is the risk-free interest rate. If new share capital is injected into the firm or original share capital is distributed to the shareholder through share repurchases, the basis is changed by the same amount (and may thus generally differ from the original share capital, E_0). The case of share repurchases is deferred to Section 4. If

[2]Since interest-bearing securities are taxed, the rate of return is calculated by the after tax rate on short-term government securities.

not explicitly stated otherwise, it is henceforth assumed that the basis is unchanged and equal to E_0 for all t.

The above system is not very intuitive, except for the first period, where the tax is a pure equity premium tax: $T_1 = \tau(D_1 - rE_0)^+$; i.e., dividends in excess of the risk-free rate of return on equity are taxed at rate τ in the first period. It is thus interesting to consider the case where $D_s = 0$ for $s = 1, ..., t$; i.e., all earnings are retained by the firm in t consecutive periods. Then

$$\begin{aligned} RRA_{t+1} &= r[1 + (1 + r) + ... + (1 + r)^t]E_0 \\ &= \left[(1 + r)^{t+1} - 1\right] E_0. \end{aligned}$$

We see that RRA_t is equal to the accumulated earnings after t periods of an initial investment E_0 with an annual rate of return equal to r. This shows that the RRA system shields the risk-free returns on an investment from taxation, regardless of *when* shareholder income is realized. To illustrate the working of the system in the case where the shareholder earns a return in excess of the risk-free return, we next, after introducing some notation that will be used throughout the paper, consider a two-period example.

Let M_t denote the firm's working capital at the end of period t *after* the realization of profits, Π_t, but *before* payment of dividends, D_t. Furthermore, let E_t denote the firm's equity after dividends, D_t, have been distributed. Thus

$$M_t = E_{t-1} + \Pi_t,\ E_t = M_t - D_t \tag{4}$$

(assuming no share repurchases or issuance of new equity). In the example, let the rate of return in period 1 be αr where r is the risk-free interest rate and $\alpha > 1$. Dividends paid at the *end* of period 1 are $D_1 = \delta r E_0$. We require that $\delta \leq \alpha$ so that the initial share capital is not reduced. This is a pure technicality, as the difference $(\delta - \alpha)^+$ would correspond to the repurchase of initial share capital, that is tax exempt. At the end of period 2, all retained profits are distributed to the shareholder. We assume that the rate of return in period 2 is equal to r. The firm's decision problem at the beginning of period 1 is then to maximize the present value of share income net of taxes with respect to δ. By assuming that the rate of return in period 2 is r, any investment decision problem in period 1 is abstracted away, so the problem is equivalent to minimizing the present value of the tax liabilities. The neutrality of the tax system would imply that the choice of δ does *not* affect this present value.

Example 1: *(RRA in a two-period model). Assume that* $\Pi_1 = \alpha r E_0$ *with* $\alpha > 1$, $D_1 = \delta r E_0$ *with* $\delta \leq \alpha$, $\Pi_2 = r E_1$ *and* $D_2 = M_2 - E_2$ *(thus* $E_2 = E_0$*). Shareholder taxes paid in period 1 and 2 are, respectively,*

$$T_1 = \tau(\delta - 1)^+ r E_0 \text{ and } T_2 = \tau(1 + r)\left[(\alpha - 1) - (\delta - 1)^+\right] r E_0,$$

and the present value of all paid taxes is given by

$$T_1 + \frac{1}{1+r} T_2 = \tau(\alpha - 1) r E_0. \tag{5}$$

The detailed calculations are shown in the Appendix. Since the present value is independent of δ*, the neutrality claim in Sørensen (2005) is confirmed in this example.*

An equivalent formulation of the RRA system We now show that there is an equivalent representation of the tax system discussed above, which is more intuitive and also mathematically more transparent. First, we distinguish between the taxes the shareholder actually pays in period t, T_t, and the tax liabilities, AT_t. These are related by a linear difference equation:

$$AT_{t+1} = \tau(\Pi_{t+1} - r E_t) + (1 + r)(AT_t - T_t), \text{ with } AT_0 = T_0 = 0, \tag{6}$$

where T_t is paid taxes according to the RRA system (2). Tax liabilities at the end of year $t + 1$ can now in *each* period be decomposed into two parts:

$$\text{accrued tax: } \tau(\Pi_{t+1} - r E_t) \tag{7}$$

and

$$\begin{aligned} \text{tax liability carried forward:} \qquad & (1 + r)(AT_t - T_t) \\ = \; & (1 + r)(AT_t - \tau(D_t - RRA_t)^+), \end{aligned}$$

i.e., the tax liability from the previous period less the actual tax payment, $AT_t - T_t$, carried forward with interests. It follows directly from (6) that

$$\begin{aligned} (1 + r)^{-t} AT_t + (1 + r)^{-t+1} T_{t-1} + ... + (1 + r)^{-1} T_1 \;&=\; (1 + r)^{-t}\tau(\Pi_t - r E_{t-1}) + ... \\ &\quad + (1 + r)^{-1}\tau(\Pi_1 - r E_0). \end{aligned} \tag{8}$$

Thus, if $AT_t = T_t$ in any *termination period* t (when all capital gains are realized), the present value of all tax payments is equal to the right hand side of (8) – regardless of the periodization of taxes. The reason is that any tax liability carries forward with interests to the next period. That this condition *is* fulfilled for the RRA system is established in Proposition 1.

Proposition 1 *Assuming that T_s, $s \leq t$, is determined by the RRA system (2), then in any termination period t when all share income is realized*

$$T_t = AT_t \tag{9}$$

and

$$\begin{aligned}(1+r)^{-t}T_t + (1+r)^{-t+1}T_{t-1} + ... + (1+r)^{-1}T_1 &= (1+r)^{-t}\tau(\Pi_t - rE_{t-1}) + ... \\ &\quad +(1+r)^{-1}\tau(\Pi_1 - rE_0). \end{aligned}\tag{10}$$

The proof is given in the Appendix. The proof requires that any negative tax liability in the termination period, $AT_t < 0$, can be converted to a negative tax (or transferred to a new shareholder).[3] Proposition 1 thus establishes a form of equivalence between the personal-based RRA and the corporate-based ACE systems. It is easy to show that Proposition 1 holds for the two-period model in Example 1:

Example 1 (continued). *We obtain*

$$\begin{aligned} AT_1 &= \tau(\alpha - 1)rE_0, T_1 = \tau(\delta - 1)^+ rE_0 \\ AT_2 &= \tau(1+r)\left[(\alpha - 1) - (\delta - 1)^+\right] rE_0 = T_2 \end{aligned}$$

(cf. (31) and (33) in the Appendix).

Proposition 1 can be modified to the case with infinitely lived firms (or shares that are held for an indefinite period of time). Then the termination condition (9) does not apply, but if $(1+r)^{-t}(\Pi_t - rE_{t-1}) \to 0$, then (10) holds in the limit as $t \to \infty$. This case is illustrated below.

[3] In the Norwegian implementation of the RRA system, unutilized RRA cannot be converted into a negative tax or transferred when shares are sold or the firm is liquidated, contrary to what is assumed here. Our assumption is, however, in accordance with the original proposal of Sørensen (2005).

Example 1 (continued). *Assume that $\delta = 1$ in the first period: $D_1 = rE_0$ and that, from period 2 and onwards, $D_t = \Pi_t = rE_t$, i.e., all profit is the normal return on the equity, E_t, which is distributed as dividends in each period. Thus $E_t = (1 + (\alpha - 1)r)E_0$ is a "steady state". In this example, $RRA_t = rE_0$ for all t by (3), as $D_t \geq RRA_t$ in all periods. Then $T_1 = 0$ and,*

$$\begin{aligned} T_t &= \tau(rE_t - RRA_t)^+ = \tau r(E_t - E_0) \\ &= \tau(\alpha - 1)r^2 E_0 \text{ for } t > 1. \end{aligned}$$

The present value in year 1 of paid taxes is thus

$$\sum_{s=1}^{\infty}(1+r)^{-s}\tau(\alpha - 1)r^2 E_0 = \tau(\alpha - 1)rE_0 = \tau(\Pi_1 - rE_0),$$

cf. (5).

It is important to remember that the neutrality results discussed here are contingent on after-tax profits and that investment and financing decisions are abstracted away. In particular, the possible effect of the tax on the cost of capital, or on the access to funding when firms are financially constrained, have not been addressed. Moreover, it is assumed that the risk-free interest rate is used to discount future share income. These issues are addressed in the remaineder of the paper.

3 Financing investments in the presence of a shareholder tax: A formal model

Korinek and Stiglitz (2009) build on the life cycle view of Sinn (1991). Here, growth firms are assumed to be capital constrained in the sense that it is costly to raise new capital in the short run. This means that firms will be reliant on some level of retained earnings in order to buffer random fluctuations in investment requirements. In accordance with the new view, Korinek and Stiglitz (2009) too conclude that a dividend tax will not affect a mature firm as long as the tax rate is expected to be constant. However, anticipated changes in the tax rate will induce firms to participate in intertemporal income shifting through the timing of dividend payments. This will affect the firm's cash holdings and, in turn, its level of investment. Similar to the life cycle view (and the old view), the optimal amount of new equity to be raised by a new firm is decreasing in the dividend tax rate and in the cost of raising external equity in the market.

Our model shares three features of the model in Korinek and Stiglitz (2009). First, investment opportunities occur randomly. Second, because firms have limited access to equity capital markets, investments are financed either by retained earnings or by debt – at a high interest rate $r_b > r$ that includes a premium to account for agency costs. (The latter opportunity is disregarded by Korinek and Stiglitz, but increases the realism of our model). Third, equity investors require more than the risk-free interest rate r for holding cash in the company, even in the absence of market risk. Thus, future cash flows are discounted at rate r^*, which is higher than the risk-free interest rate.

In closely held firms, the owners will normally be able to undertake capital withdrawals and injections or to convert equity to debt and vice versa without regard to the preferences of other shareholders and conflicts of interest. This gives a high degree of flexibility when it comes to tax planning. In contrast, the Korinek and Stiglitz (2009) model is an example of a full equity trap with all payments from the firm to the shareholder being taxed at the rate τ. We modify this model such that: (i) only share income in excess of the RRA is taxed and (ii) the payback of injected equity capital is tax exempt. Assumption (ii) is consistent with the tax systems in all countries we are know of and is clearly important for closely held firms. While the tax motivated acceleration of dividends in advance of an anticipated tax hike (to avoid the equity trap) will lead to capital drain in the model in Korinek and Stiglitz (2009), in our setup, dividends can be reinvested as new equity because of the close relationship between the firm and its owner. Consequently, dividends can serve as a remedy for converting accumulated retained earnings into "new", external equity. In our model, temporary distortions related to anticipated tax changes will therefore be of less importance.

The discount rate on firms' future dividend distributions. In Korinek and Stiglitz's (2009) model, the high discount rate that applies to dividends is justified by assuming agency problems between the owners and managers of firms. As originally formulated by Myers and Majluf (1984), such agency problems arise because of asymmetric information between insiders and external investors. Consequently, when a closely held corporation applies for a loan or invites outsiders to contribute with new equity, an external investor will take into consideration the possibility that a disloyal owner with access to external funds will increase withdrawals from the firm through dividends or the owner's wage, to finance private expenses. This is an example of the moral hazard element of external financing. A corresponding problem of more widely held firms with hired management is agency costs relating to the possibility that hired management will maximize size (growth) rather than profits. Also, a rational owner-manager with inside information may prefer to finance "good" projects using his own resources but go to external investors (new shareholders or lending institutions) if the project implies more risk for a given expected return. This is the adverse selection element of external financing. Of course, these agency problems that contribute to reduce the discount factor on firms' future dividend payments apply equally to listed firms with publicly traded shares and closely held firms, but obviously they will be more prevalent the stronger the influence of one dominant owner (or group of owners) and the closer the link between management and the owner(s). In the pure case of one owner who also manages the firm, there will be a significant risk that banks or other external investors will be misled. This results in countermeasures such as collateral requirements and a substantial information premium on capital.

Even if agency problems are important, there are several other reasons why investors could discount dividends at a higher rate than the risk-free interest rate (apart from the risk premium associated with market risk[4]): First, historically, the equity premium is worldwide (much) greater than what can be justified as a reasonable trade-off between risk and return (Fama and French, 2002, Graham and Harvey, 2007, Mehra and Prescott, 1985, and Mehra, 2003). There are several proposed explanations for this equity premium puzzle; see Mehra (2003). One of the latest contributions is provided by Constantinides, Donaldson and Mehra (2002). Here, young investors have higher willingness to pay for equity than the middle aged, but they are prevented from doing so by borrowing constraints. Thus, risky securities are underpriced because the middle aged to a greater extent prefer less risky securities. Second, borrowing constraints may also work directly, as owner–managers of closely held firms themselves can be liquidity constrained, implying that the owners' discount rate would be at least as high as the interest rate on risky debt,

[4]As in Korinek and Stiglitz (2009), we do not focus on market risk in this paper.

r_b.[5] Rather than acquiring loans in the market for risky debt or even more costly external equity, a liquidity-constrained owner–manager may "borrow from himself" by postponing the distribution of profits. In that case, the owner–manager will be impatient, in the sense that the reward to waiting determined by the interest rate is less than the cost of waiting. The more impatient the owner is, the more costly is the retention of profits, and following, for example, Carrol (2001), the degree of impatience will depend on preferences and expected income growth. A liquidity-constrained owner–manager will face a higher discount rate, the more current consumption is forsaken to undertake an investment.

A formal model We consider a decision problem, where dividends are paid at the end of the current period ("period 1") and investment decisions are made at the beginning of the next period ("period 2"). The firm optimizes the after-tax present value of dividends paid at the end of period 1 and the firm's net worth at the end of period 2 (as if all shares were sold). Under the conditions in Korinek and Stiglitz (2009), it is easily shown that this two-period decision problem is equivalent to the infinite horizon decision problem where investors maximize the present value of dividends net of taxes. For the same reasons we also assume away ordinary taxes on corporate profit.

The decision problem at the *end* of period 1 is to choose D, given the predetermined variables M, AT_1 and RRA_1 ("period 1" can denote an arbitrary period in the firm's life history). Then $E = M - D$ is equity after dividend payments at the end of period 1. Period 2 consists of two stages (two information sets): before and after the realization of the binary random variable λ, which takes the value of 1 if an investment opportunity occurs during period 2 and 0 otherwise. We assume that $\Pr(\lambda = 1) = p$. Moreover, I is investments made during period 2, and $F(I)$ is the profit function (before capital costs, but net of variable factor costs), satisfying $F''(I) < 0$. The investment is fully depreciated after one period. The risk-free interest rate (net of taxes) is r, and the firm's discount rate is $\beta = 1/(1 + r^*)$ with $r^* > r$. The firm can finance the investments from working capital $M - D$ or by external funds by issuing bonds, B, at an interest rate $r_b > r^*$. Thus,

[5] For the theoretical basis and empirical significance of borrowing constraints among households in general, see Deaton (1991), Gourinchas and Parker (2002), Gross and Souleles (2002) and Zeldes (1989). For the significance of of borrowing constraints on business owners and the relationship between initial personal wealth and subsequent business entry see Evans and Jovanovic (1989), Evans and Leighton (1989) and Quadrini (1999).

we can decompose the firm's decision problem into two stages:

- In period 1 (before λ is realized): choose D given M, AT_1 and RRA_1
- In period 2 (after λ is realized): choose I and B.

The period 2 optimization problem: Optimal B and I We denote with $V(0)$ and $V(1)$, respectively, the firm's total assets in period 2 *net of the accrued tax* (7), given that $\lambda = 0$ and $\lambda = 1$, respectively. Since, obviously, there is no equity premium when $\lambda = 0$ and, moreover, $\lambda = 0 \Rightarrow B = 0$, it is clear that

$$V(0) = (1 + r)(M - D).$$

Conversely, if $\lambda = 1$, there is a taxation of profits in excess of the risk-free returns on equity, $r(M - D)$:

$$\text{accrued tax: } \tau(\Pi - r(M - D)).$$

From (6), the total tax liabilities, AT_2, at the beginning of period 2 are

$$AT_2 = \text{accrued tax} + (1 + r)(AT_1 - T_1), \tag{11}$$

where

$$T_1 = \tau(D - RRA_1)^+ \tag{12}$$

and AT_1 and RRA_1 are predetermined at the beginning of period 1.

Revenue in period 2 if $\lambda = 1$ then consists of

$$\begin{aligned} \text{revenue from risk-free financial investment:} &\quad r(M + B - D - I) \\ +\text{revenue from real investment:} &\quad F(I). \end{aligned}$$

The costs consist of

$$\begin{aligned} \text{interest payments on bonds:} &\quad r_b B \\ +\text{depreciation:} &\quad I. \end{aligned}$$

Thus,

$$\Pi = r(M + B - D - I) + F(I) - r_b B - I.$$

Accrued tax in period 2 can be expressed as

$$\begin{aligned}
& \tau(\Pi - r(M-D)) \\
= \; & \tau\left[r(M+B-D-I) + F(I) - r_b B - I) - r(M-D)\right] \\
= \; & \tau\left[F(I) - (r_b - r)B - (1+r)I\right].
\end{aligned}$$

Thus,

$$\begin{aligned}
V(1) &= \max_{I\geq 0, B\geq 0} \left[(1+r)(M+B-D-I) - (1+r_b)B + F(I) - \tau\left(F(I) - (1+r)I - (r_b - r)B\right)\right] \\
&= \max_{I\geq 0, B\geq 0} \left[(1+r)(M-D) + (1-\tau)(F(I) - (1+r)I - (r_b - r)B)\right],
\end{aligned}$$

subject to

$$I - B \leq M - D. \tag{13}$$

The corresponding Lagrangian is

$$\mathcal{L}(\mu, I, B) = (1+r)(M-D) + (1-\tau)(F(I) - (1+r)I - (r_b - r)B) - \mu(I - B - M + D).$$

Assuming $I > 0$, the first-order conditions are

$$\begin{aligned}
\frac{\partial \mathcal{L}(\mu, I, B)}{\partial I} &= (1-\tau)(F'(I) - (1+r)) - \mu = 0 \\
&\Leftrightarrow F'(I) = (1+r) + \frac{\mu}{1-\tau} \\
\frac{\partial \mathcal{L}(\mu, I, B)}{\partial B} &= -(1-\tau)(r_b - r) + \mu \leq 0 \; (=0 \text{ if } B > 0).
\end{aligned} \tag{14}$$

If $B > 0$, then

$$\begin{aligned}
\mu &= (1-\tau)(r_b - r) \\
F'(I) &= 1 + r_b.
\end{aligned}$$

On the other hand, if (13) is not binding, then $\mu = 0$, $B = 0$ and

$$F'(I) = (1+r).$$

Finally, if (13) *is* binding and $B = 0$, then

$$\mu = (1-\tau)(F'(M-D) - (1+r)). \tag{15}$$

The period 1 optimization problem: Optimal D Let us now consider the problem of finding the optimal dividend policy. As $V(0)$ and $V(1)$ are functions only of $M - D$, we define

$$V(M - D) = (1 - p)V(0) + pV(1).$$

Using the envelope theorem for non-linear programming (see Sydsæter and Hammond, 1995, p. 680)

$$\frac{dV(0)}{dM} = (1 + r), \frac{dV(1)}{dM} = (1 + r + \mu),$$

implying

$$V'(M - D) = 1 + r + p\mu. \tag{16}$$

The expected present value of share income net of total tax liabilities (11) at the end of period 1 (when λ is not yet realized) is

$$\max_D \phi(D, M, AT_1, RRA_1), \tag{17}$$

where M, AT_1, RRA_1 are predetermined, and

$$\phi(D, M, AT_1, RRA_1) = D - \tau(D - RRA_1)^+ + \beta\left[V(M - D) - (1 + r)(AT_1 - \tau(D - RRA_1)^+)\right]. \tag{18}$$

The general solution must satisfy either $D = 0$, $D = M$ (a corner solution), $D = RRA_1$ (a kink point) or

$$\frac{\partial\phi(D, M, AT_1, RRA_1)}{\partial D} = 0 \tag{19}$$

(a stationary point). Let us first look at an optimum point that satisfies (19) with $D < RRA_1$. By (18) and (19):

$$1 = \beta V'(M - D). \tag{20}$$

That is, the after-tax present value of a unit investment financed by retained earnings must equal one. From (16)

$$\begin{aligned} \beta(1 + r + p\mu) &= 1 \Longleftrightarrow \\ \mu &= \frac{(r^* - r)}{p} \leq (1 - \tau)(r_b - r) \end{aligned} \tag{21}$$

(using (14)). Finally, combining (15) and (21) and defining E' as the solution to the equation

$$F'(E') = (1 + r) + \frac{r^* - r}{p(1 - \tau)}, \tag{22}$$

we can conclude that in an optimum with $0 < D < RRA_1$:

$$\begin{aligned}\frac{(r^*-r)}{p(1-\tau)} &> r_b - r \Rightarrow M-D=0,\ I=B \text{ and } F'(I)=1+r_b\\ \frac{(r^*-r)}{p(1-\tau)} &\leq r_b - r \ \Rightarrow M-D=E^{'},\ B=0,\ I=E^{'}.\end{aligned}$$

The tax on the equity premium unambiguously increases the marginal cost of capital for firms that satisfy $\frac{(r^*-r)}{p} \leq r_b - r$, i.e., whose marginal source of funding is retained earnings. Their marginal cost increases from $(1+r)+(r^*-r)/p$ to either $1+r_b$ or $(1+r)+(r^*-r)/p(1-\tau)$.

Next consider a solution with $D > RRA_1$. Then, the first order condition (19) gives

$$1-\tau = \beta\left[V'(M-D)-(1+r)\tau\right]. \tag{23}$$

The left-hand side of (23) expresses the opportunity cost of a unit investment financed by retained earnings otherwise subject to dividend taxation. The right-hand side comprises two parts: (i) the present value of a unit investment net of accrued tax, $\beta V'(M-D)$, and (ii) the negative present value of the postponed tax, $-\beta(1+r)\tau$. Combining (16) and (23), we obtain

$$\begin{aligned}1-\tau &= \beta\left[p\mu+(1+r)(1-\tau)\right] \Longleftrightarrow\\ \mu &= (1-\tau)\frac{(r^*-r)}{p}.\end{aligned} \tag{24}$$

Then, from (15) and (24), it follows that the optimal D is given by $D = M - E^{''} > RRA_1$, where $E^{''}$ is the solution to

$$F'(E^{''}) = (1+r)+\frac{(r^*-r)}{p}. \tag{25}$$

Hence, in this case the tax does not distort the marginal investment decision. The reason is that the marginal source of financing is retained earnings which otherwise would have been taxed at the rate τ. The general solution is summed up in Proposition 2.

Proposition 2 *(Optimal dividends policy) For a firm with positive equity, $M-D>0$, the optimal choice of D as a function of M and RRA_1 is characterized by*

$$\begin{aligned}M &\leq E^{'} \Rightarrow D=0\\ M &\in (E^{'},E^{''}) \Rightarrow D=\min(M-E',RRA_1)\\ M &\geq E^{''} \Rightarrow D=\max(M-E^{''},RRA_1).\end{aligned} \tag{26}$$

The proof is in the Appendix. It follows immediately that if $r = r^*$, the tax is neutral, as then $E' = E''$ and $F'(E') = 1 + r$ (from (22) and (25)). The firm's dividends policy will then be independent of τ.

By replacing "period 1" with "period t", the above results suggest a life cycle path towards the steady state. However, if $r^* > r$, there are two candidates for a steady state: E' and E''. The first requires that $D_t = M_t - E' < RRA_t$, whereas the second requires that $D_t = M_t - E'' > RRA_t$. We next show that the only possible steady state is $E_t = E''$, where the firm's dividends policy is unaffected by the tax.

Proposition 3 *(Steady state) In steady state $E_t = E''$, where E'' is defined in (25), $D_t = M_t - E''$ and $RRA_t = rE_0$.*

The proof is in the Appendix.

A life cycle interpretation of Proposition 2 and Proposition 3 is as follows: Equipped with an initial share capital E_0, the firm will grow internally by retaining all profits until $E_t = E'$, where the marginal return to a unit investment is 1. Since the RRA will be large when the firm starts paying dividends, the condition $M_t - E' < RRA_t$ will be satisfied initially, so $E' = M_t - D_t'$. However, by paying out all subsequent profits as dividends, eventually $D_t \geq RRA_t$, implying that $RRA_{t+1} = rE_0$. Then the level of dividends consistent with $E_t = E'$, i.e., $D_t = M_t - E'$, implies that dividends will be taxed at the margin. It is then optimal to retain all profits exceeding RRA_t (which would otherwise be taxed, and therefore have a lower opportunity costs). The firm will then grow towards E''. Beyond that point, the firm will return all profits as dividends and the steady state is reached.

As in Korinek and Stiglitz (2009), it is straightforward to analyze the decision to inject equity into the firm. Assume that for each unit of equity raised by share issuance, E_0, the investor pays an additional premium of $\kappa \geq 0$ in transaction costs. The optimal amount of equity raised is then as follows:

Proposition 4 *(Equity issuance) The optimal amount of equity E_0 raised is determined by the condition*

$$F'(E_0) = (1 + r) + \frac{(r^* - r) + \kappa(1 + r^*)}{p(1 - \tau)}. \tag{27}$$

The proof follows immediately by noting that an injection of new capital is equivalent to a negative D in (18) – except for the marginal cost, κ, of raising equity. Thus the first order condition follows from (21), with the right hand side equal to $1 + \kappa$ instead of 1. We can see that the tax is not neutral with respect to share issuance unless $r = r^*$ and $\kappa = 0$. However, it is also clear that a flat tax without RRA leads to the condition

$$F'(E_0) = \frac{1}{1-\tau}\left[(1+r) + \frac{(r^* - r) + \kappa(1 + r^*)}{p}\right]. \tag{28}$$

Thus, the shareholder tax with RRA distorts the initial investment to a lesser degree.

4 Some empirical implications: How do firms perceive their after-tax cost of equity capital?

The above analysis did not take into consideration the possibility that firms may return the original equity to the investors as an alternative to paying dividends. Nevertheless, when previously issued equity can be transferred tax exempt and

$$F'(E_t) < (1+r) + \frac{(r^* - r)}{p(1-\tau)}, \tag{29}$$

this is exactly what the firm should do. The condition (29) follows from (27) with $\kappa = 0$, i.e., assuming that no costs are related to the payback of original share capital. Firms should then use retained profits to finance these cash distributions. This possibility is certainly recognized by Sinn (1991, p. 294): "..(by payback of injected share capital, firms may).. largely avoid the double taxation of dividends.. (indicating).. a loophole in the classical imputation systems of capital income taxation". However, Sinn (1991) rules this possibility out of the model, as he argues that most countries have closed this loophole[6]. As it would be highly discouraging for anyone to invest in shares or to inject capital into his own business if not only the return but also the injected capital itself were subject to taxation, we find this assumption untenable. In Norway, tax-exempt return of original equity is legal until the firm eventually reaches the minimum share capital requirement of NOK 50,000. In the European Union, share repurchases are limited to 10 percent of the subscribed capital, but to our knowledge, there are no similar restrictions

[6] For example, in the US at that time, the return of capital could not occur before current profits and all accumulated reserves had been paid out.

on the write-down of share capital with the return of capital to shareowners.[7] Lindhe and Södersten (2009) construct a model with dividend taxes where the optimal payout policy of a young firm with a remaining stock from past equity injections would be first to use current profits and possibly some disinvestment to undertake repayment of the original equity. Then, after all injected equity has been repaid, the firm will retain profits and grow using internal funds until the marginal product of capital net of depreciation is equal to the discount rate, as in Sinn (1991). This policy of repayment of equity simply means that the firm's payout is re-labeled to avoid taxation, and need not necessarily affect the firm's equity or total assets. So, one should expect to find share repurchases (i.e., distribution of past equity injections) among immature firms when there is a tax on shareholder income.

It remains an unresolved empirical question to what extent dividend taxation actually does discourage investments through its effect on the cost of external equity. For example, the findings in Poterba and Summers (1985) support the traditional view, while Auerbach and Hassett (2003) find evidence in support of the tax irrelevance view. In addition, the life cycle view implies that firms may have different financial strategies in different stages of their life cycle. We shall now illustrate how a mature, dividend-paying firm that possesses original equity that can be returned tax exempt to the shareowners can increase the after-tax present value of the cash flow to the owners by delaying tax payments. Technically, this means that the firm will retain profits instead of paying dividends, and the total amount of equity in the firm need not be affected. This policy would then only be worthwhile if the discount rate r^* exceeded the risk-free interest rate r and would only be possible if the firm had sufficient original equity to redistribute. The latter condition is typically fulfilled after the introduction of a dividend tax, as is currently the case in Norway.

A formal discussion of this issue requires that the basis E_0 in (3) be replaced by a time varying basis, $\mathcal{B}_t$. Initially $\mathcal{B}_0 = E_0$, whereas

$$\begin{aligned}\mathcal{B}_{t+1} &= \mathcal{B}_t + \text{new equity issuance} \\ &\quad -\text{return of injected share capital.}\end{aligned}$$

[7] However, share repurchases at overcharge would be considered tax evasion.

Assume now that the profit rate including an equity premium is $\rho > r$.[8] Thus, with the notation of Example 1, $\Pi_t = \rho E_t, \rho = \alpha r$ and $\alpha > 1$. Assume also that the firm distributes all its profits in the two periods 1 and 2 and that all share capital is returned to the owner at the end of period 2. At the beginning of period 1, the firm is endowed with an amount of initial equity E_0 which also forms the basis for the RRA: $\mathcal{B}_1 = E_0$. While the profit is ρE_0, the tax is $T_1 = \tau(\rho - r)E_0$. If the firm chooses to distribute an amount ρE_0 out of the initial equity rather than paying dividends, $T_1 = 0$ and the shareholders receive an additional amount of $\tau(\rho - r)E_0$ compared with the alternative of paying dividends. In period 2, the profit of ρE_0 is distributed as dividends and the equity is returned to the owner. With both policies $E_t = E_0$ and $\Pi_t = \rho E_t$ for $t = 1, 2$. If dividends are paid this gives a tax of $T_2 = \tau(\rho - r)E_0$ also in period 2, but if the firm distributes original equity, the tax is $T_2 = AT_2 = \tau(\rho - r)E_0 + (1 + r)\tau(\rho - r)E_0$ – using (6), with $T_1 = 0$, and Proposition 1.[9] The period 1 present value of the tax savings in both periods of repayment of original equity rather than dividend payment is then

$$\begin{aligned} & \tau(\rho - r)E_0 - \frac{(1 + r)\tau(\rho - r)E_0}{(1 + r^*)}E_0 \\ = \quad & \tau(\rho - r)\frac{(r^* - r)}{(1 + r^*)}E_0 > 0. \end{aligned}$$

Firms with available initial equity then potentially gain from substituting the past equity injections with retained profits and pay back initial equity rather than paying out dividends. Retained profits will eventually be subject to tax in the future, either as a capital gains tax or when the profits are distributed, but there is still a substantial tax advantage from this policy.

The significance of the tax credit can also be illustrated by holding the net cash flow to the shareowners constant in all periods from $t = 1$ until T and assuming that the tax credit $\tau(\rho - r)E_0$ is retained in the firm. In period T, all capital gains are realized.

[8] If the profit rate only reflects the equity premium then ρ simply equals r^*, but the unpaid work effort from active owner-managers can increase the profit rate as measured in the accounts far beyond r^*.

[9] Proposition 1 is also valid for the case where the original share capital is returned to the owner (i.e., there is a change in the basis for RRA): The basis for RRA in period 2, $\mathcal{B}_2$, is reduced to $\mathcal{B}_2 = (1 - \rho)E_0$, whereas $RRA_2 = r\mathcal{B}_2 + (1 + r)rE_0$. Total share income in period 2 is therefore the sum of profits, ρE_0, and (taxable) capital gains $E_0 - \mathcal{B}_2 = \rho E_0$. Total share income tax in period 2 is therefore $T_2 = \tau(2\rho E_0 - RRA_2)$, which is easily seen to be equal to the expression for AT_2 in this example.

Furthermore, assume that $\rho = r^*$ and, with reference to the formal model in Section 3, $p = 1$. Then $D_t = \rho E_t$ and $E_t = E_0$ for all t satisfy the optimiality condition (25), although this is not a unique steady state, as we have now assumed constant returns-to-scale. The net dividend received by the owners is $\rho E_0 - \tau(\rho - r)E_0$. Note that (29) also holds, so tax planning opportunities *do* exist. For example, if the firm chooses instead to distribute the same annual amount by repayment of equity, it will be able to retain an amount of $R_t = \rho E_t - \rho E_0 + \tau(\rho - r)E_0 = \rho(E_t - E_0) + \tau(\rho - r)E_0$ each year, where $\tau(\rho - r)E_0$ is the annual tax saving compared with the alternative of paying dividends and $\rho(E_t - E_0)$ is the additional profit in period t from the accumulation of capital in previous periods. This strategy will induce a tax-driven growth rate of the firm given by

$$g_t = \frac{E_{t+1}}{E_t} - 1 = \rho\left(1 - \frac{E_0}{E_t}\right) + \tau\left(\rho - r\right)\frac{E_0}{E_t}. \tag{30}$$

Then $g_0 = \tau\left(\rho - r\right)$, $\lim_{t\to\infty} g_t = \rho$, $\Delta g_t > 0$ and $\Delta^2 g_t < 0$. The growth rate of E_t is then decreasing towards ρ as t increases.

Figure 1 displays two examples of how the value of a tax-planning firm that repays original equity rather than paying dividends may evolve over time. The profit rate ($\rho = r^*$) is assumed to be 6 percent, while $r = 0.03$ and $\tau = 0.28$. Total total value of initial assets (E_0) is normalized to 1. The benchmark policy is that the entire annual profit, ρE_t, is paid out as dividends. This will give the owner a cash flow equal to $CF = \rho - \tau(\rho - r)$, while $E_t = 1$ for all t. To examine the potential gain by using repayment of original equity as a substitute for paying dividends, the values corresponding to two tax planning alternatives, net of accrued future tax liabilities, are displayed in Figure 1. The first alternative is to retain all profits ($D_t = 0$) and to pay the whole amount CF from the initial equity. As all the subsequent returns fed by these tax savings are kept in the firm, the firm's value will grow approximately exponentially at rate ρ when T becomes large, as in (30). This increase in value will continue, even if the original equity is drained (in which case $\mathcal{B}_t = 0$). The second alternative is to pay dividends equal to the tax-free amount ($D_t = RRA_t$), and paying the difference $CF - D_t$ out of the initial equity. As shown in Figure 1, this gives a smaller tax advantage than paying all cash to the owners out of the original equity. The reason is that the unused RRA that arises when $D_t < RRA_t$ is carried forward with interest giving an amount of $(1 + r)r$ of increased RRA per unit, while one unit of $\mathcal{B}_t$ that is saved for the next period only gives r. Thus, it is optimal to choose D_t as small as possible (given CF).

Some evidence from aggregate data In principle, the introduction of the shareholder income tax in Norway in 2006 provides an opportunity to test empirically how firms perceive the cost of external equity versus the retention of profits. Fjærli and Alstadsæter (2009) document strong timing effects in dividend payments immediately before and after the 2006 tax reform. This is in line with Korinek and Stiglitz (2009), who predict that an anticipated tax increase will lead to accelerated dividend payments prior to the reform, and possibly a shortage of funds. According to our model firms would commence the repayment of equity after the introduction of a shareholder income tax rather than paying dividends, until all repayable equity is returned to shareowners. The possibility to repay external equity later on means that an owner-manager could then be willing to reinvest the increase in dividend payments prior to the reform in order to maintain the desired level of working capital.

A microeconometric investigation of the effects of the reform on financial policy is beyond the scope of the present paper, but our results appear to be in accordance with prevailing patterns of equity repayments found in the latest aggregate statistics from Statistics Norway. Table 1 shows the net reinvestment of dividends by households minus the firms' repayment of equity to the same shareholders from the National Accounts (Financial Accounts). These are based on the tax return data for the largest individual shareowners, in turn accounting for the bulk of total dividends in the household sector. As shown in Table 1, large shareowners reinvest dividends before the 2006 tax reform, implying a conversion of retained earnings to external equity. In 2001, when there was a temporary tax on dividends, the repayment of equity exceeded reinvestments, and this recurs from 2006 onwards. Table 1 illustrates the financial flexibility of closely held firms, and clearly indicates that these firms and their principal owners are aware of the diverse costs of different types of equity. Table 2 shows the time profile of dividends paid to the household sector from 2004 to 2008, using the shareholder statistics (all households). [10] Figure 2 shows how the observed change in corporate distributions affects the ratio of

[10] The latest figures from the shareholder register show that for the sum of total distributions from non-listed and listed firms, return of equity was around 42 per cent of total cash payments to individuals in 2007 and 21 per cent in 2008. (http://www.ssb.no/aksjer_en/tab-2009-06-24-01-en.html)

accumulated retained earnings to the accumulated issued equity in the balance sheets of some 15,000 closely held firms owned by the largest recipients of dividends in Norway in 2004. Before the 2006 tax reform, the stock of retained earnings falls because of high dividend distributions, partly reinvested as “new” equity. Following the reform, retained earnings increase sharply compared with issued equity as repayment of equity replaces distribution of dividends.

Overall, the aggregate data from different sources illustrate our point in Section 3 that closely held firms have a high degree of financial flexibility that allows them to participate in tax planning. Most importantly, their behavior is consistent with the view that firms minimize their after tax cost of capital, by disposing of the previously injected external equity and increasing the use of retained profits.

5 Concluding remarks

It is generally believed that full taxation of shareholder income distorts investments financed by new equity issues because of tax capitalization but not investments financed with retained earnings as they are taxed at the margin. Therefore, the taxation of shareholder income is probably a less severe problem for mature firms than for the formation of new firms. In turn, this can hamper change-over in the economy through the adverse effect on entrepreneurship from a lower after-tax yield. The shareholder income tax with rate of return allowance has the same nice properties with respect to the investment incentives for mature, dividend-paying firms as the standard dividend tax under the “new” view. Even if the shareholder income tax with RRA is not neutral when it comes to investments financed by new equity when the discount rate exceeds the risk-free rate, taxing only the equity premium still reduces distortions compared with a full taxation of shareholder income.

An important point to keep in mind is that closely held firms have greater financial flexibility than listed firms. Retained earnings can be converted into external, “new” equity through reinvestment of dividends. This means that tax rate changes give less distortons than in the Korinek–Stiglitz model where anticipated tax increases cause cash outflows and temporary shortage of funds.

In line with our model, aggregate statistics provide clear indications that closely held firms behave fundamentally differently than widely held and listed firms. Aggregate accounts data from the initial years following the implementation of the shareholder income tax in Norway indicate that firms really do behave as if external equity is more costly than internal equity, and this is consistent with the predictions of our model.

References

[1] Alstadsæter, A. and E. Fjærli (2009). Neutral taxation of shareholder income? Corporate responses to an announced dividend tax. *International Tax and Public Finance*, 16, 571-604.

[2] Auerbach, A.J. (1979). Wealth maximization and the cost of capital. *Quarterly Journal of Economics*, 94, 433–446.

[3] Auerbach, A.J., M.P. Devereux and H. Simpson (2008). Taxing corporate income. Paper prepared for The Mirrlees Review, *Reforming the Tax System for the 21st Century*. Available at http://www.ifs.org.uk/mirrleesreview/press_docs/corporate.pdf.

[4] Auerbach, A.J. and K.A. Hassett (2003). On The Marginal Source Of Investment Funds. *Journal of Public Economics*, 87, 205–232.

[5] Bradford, D.F. (1981). The incidence and allocation effects of a tax on corporate distributions. *Journal of Public Economics*, 15, 1–22.

[6] Caggese, L.A. (2007). Testing financing constraints on firm investment using variable capital. *Journal of Financial Economics*, 86(3), 683–723

[7] Carrol, C. (2001). A Theory of the Consumption Function, with and without Liquidity Constraints. *Journal of Economic Perspectives*, 15 (3) 23–45.

[8] Constantinides, G.M., J.B. Donaldson and R. Mehra (2002). Junior Can't Borrow: A New Perspective On The Equity Premium Puzzle. *Quarterly Journal of Economics*, 117(1), 269–296.

[9] DeAngelo, H., L. DeAngelo and D.J. Skinner (2004). Are dividends disappearing? Dividend concentration and the consolidation of earnings. *Journal of Financial Economics*, 72, 425–456.

[10] Denis, D.J. and I. Osobov (2008). Why do firms pay dividends? International evidence on the determinants of dividend policy. *Journal of Financial Economics*, 89, 62–82.

[11] Evans, D.S. and B. Jovanovic (1989). An Estimated Model of Entrepreneurial Choice under Liquidity Constraints. *Journal of Political Economy*, 97, 808–827.

[12] Evans, D.S. and L.S. Leighton (1989). Some Empirical Aspects of Entrepreneurship. *American Economic Review*, 79, 519–535.

[13] Fama, E.F. and K.R. French (2001). Disappearing dividends. Changing firm characteristics or lower propensity to pay? *Journal of Financial Economics*, 60, 3–43.

[14] Fama, E.F. and K.R. French (2002). The Equity Premium. *Journal of Finance*, 57(2), 637–659.

[15] Gordon, R.H. and J. Hausman (2009). Tax Policy when Corporate Profits are a Return to Labor. Commentary in The Mirrlees Review, Institute for Fiscal Studies (IFS) http://www.ifs.org.uk/mirrleesReview/publications.

[16] Gourinchas, P. O. and J.A. Parker (2002). Consumption over the Life Cycle. *Econometrica*, 70 (1), 47–89.

[17] Graham, J.R. and C.R. Harvey (2007). The Equity Risk Premium in January 2007: Evidence from the Global CFO Outlook Survey(January 25, 2007). Available at SSRN: http://ssrn.com/abstract=959703

[18] Gross, D.B. and N.S. Souleles (2002). Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence from Credit Card Data. *Quarterly Journal of Economics*, 117(1), 149–185.

[19] Harberger, A.C. (1962). The incidence of the corporation income tax. *Journal of Political Economy*, 70(3), 215–240.

[20] Harberger, A.C. (1966). Efficiency effects of taxes on income from capital. In M. Krzyzakniak, (ed.). *Effects of Corporation Income Tax*. Detroit Waine State University Press.

[21] King, M.A. (1974). Taxation and the cost of capital. *Review of Economic Studies*, 41(1), 21–35.

[22] IFS Capital Taxes Group (1991). Equity for Companies: A Corporation Tax for the 1990s, Commentary No. 26, The Institute for Fiscal Studies, London.

[23] Korinek A. and J.E. Stiglitz (2009). Dividend taxation and intertemporal tax arbitrage. *Journal of Public Economics*, 93, 142–159.

[24] Lindhe, T. and J. Södersten (2009). The Equity Trap, the Cost of Capital and the Firm's Growth Path. CESifo Working Paper Series CESifo Working Paper No. 2652.

[25] Mehra, R. (2003). The Equity Premium: Why is it a Puzzle? *Financial Analysts Journal*, 59(1), 54–69.

[26] Mehra, R. and E. C. Prescott (1985). The Equity Premium: A Puzzle. *Journal of Monetary Economics*, 15, 145–161.

[27] Myers, S.C . and N.S. Majluf (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13, 187–221.

[28] Poterba, J.M. and L.H. Summers (1985). The Economic Effects of Dividend Taxation, in E. Altman and M. Subrahmanyam, (eds.). *Recent Advances in Corporate finance,* (Homewood, IL: Richard D. Irwin), 227–284.

[29] Quadrini, V. (1999). The Importance of Entrepreneurship for Wealth Concentration and Mobility. Review of Income and Wealth, 45, 1–19.

[30] Sinn, H.-W. (1991). The vanishing Harberger triangle. Journal of Public Economics, 45, 271–300.

[31] Sørensen, P.B. (1994). From the global income tax to the dual income tax: Recent tax reforms in the Nordic countries. International Tax and Public Finance, 1, 57–79.

[32] Sørensen, P.B. (2005). Neutral taxation of shareholder income. International Tax and Public Finance 12, 777–801.

[33] Sydsæter, K. and P.J. Hammond (1995). *Mathematics for Economic Analysis*, Prentice-Hall.

[34] Wymeersch, E. (2008). Comparative study of the Company Types in Selected EU States. Working Paper No. 2008-10, Financial Law Institute, Universiteit Gent.

[35] Zeldes, S.P. (1989). Consumption and Liquidity Constraints: An Empirical Investigation. *Journal of Political Economy*, 97 (2), 305–346.

Figures and tables

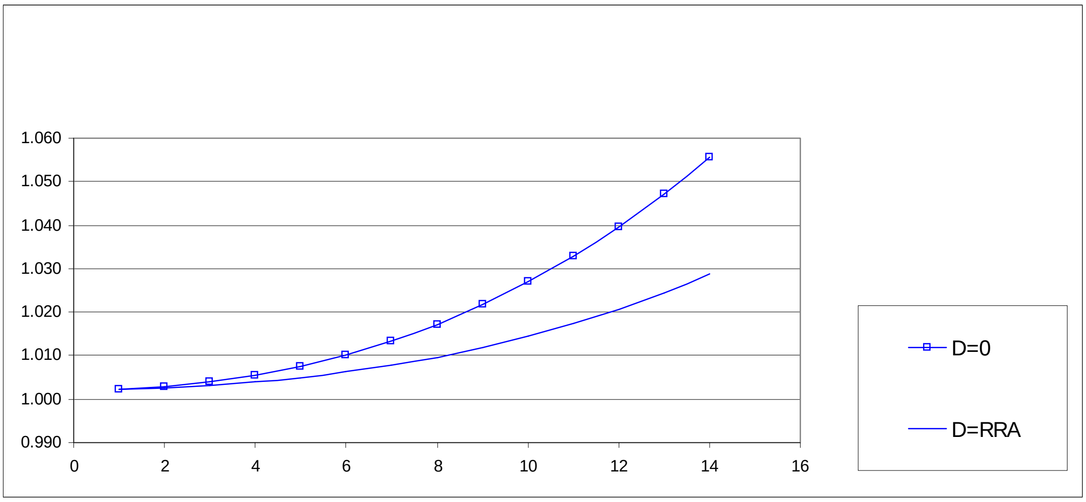

Figure 1: The relative after-tax value of a dividend paying firm (normalized to one) and a tax-planning firm that distributes original equity as a substitute for paying out dividends. The tax-planning firm is assumed to retain either all ($D = 0$) or parts of the profit ($D = RRA$). The annual after-tax cash flow to the owner is equal to CF for all three alternatives.

Table 1: **Reinvested dividends minus negative share issues (repaid equity) by year. Households. Bill. NOK**

Year	Reinvested dividends minus repayment of equity	Marginal tax rate on dividends (percent)
2000	12	0
2001	−3	11
2002	21	0
2003	37	0
2004	39	0
2005	75	0
2006	−14	28
2007	−15	28
2008	−12	28

Source: National Accounts. Financial Accounts (Statistics Norway)

Table 2: **Dividends paid to households and non-profit institutions serving households. Bill. NOK**

	2004	2005	2006	2007	2008
Listed firms	1.9	2.5	2.9	2.2	2.5
Unlisted firms	61.7	101.0	4.9	13.8	20.4

Source: Statistics Norway

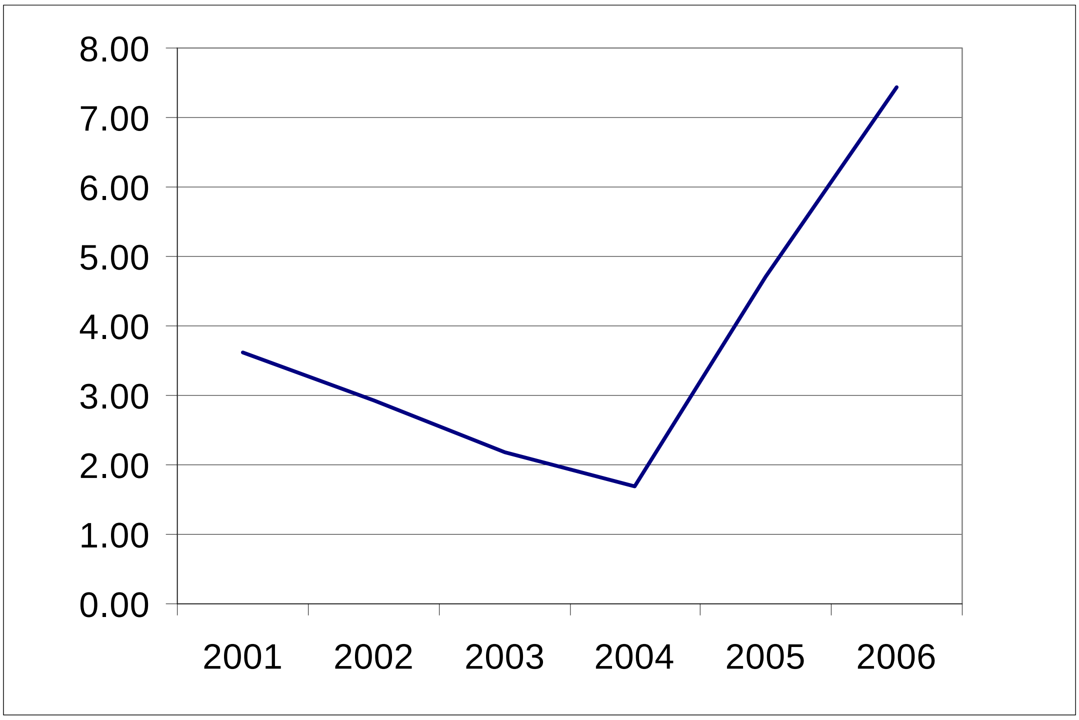

Figure 2: Ratio of accumulated retained earnings to accumulated issued equity in 13,815 closely held firms that paid more than 500,000 NOK in dividends to the principal shareholder in 2004. Source: Statistics Norway

Appendix

Example 1: Detailed calculations In period 1 we obtain, from (1):

$$
\begin{aligned}
D_1 &= \delta r E_0 \\
T_1 &= \tau(\delta - 1)^+ r E_0. \qquad (31)
\end{aligned}
$$

Equity (working capital) at the end of period 1 is then

$$E_1 = E_0 + \Pi_1 - D_1 = (1 + \alpha r - \delta r)E_0 = (1 + (\alpha - \delta)r)E_0.$$

Period 2's RRA equals

$$
\begin{aligned}
RRA_2 &= rE_0 + (1 + r)(RRA_1 - D_1)^+ \qquad (32) \\
&= r\left(1 + (1 + r)(1 - \delta)^+\right) E_0.
\end{aligned}
$$

In period 2, the firm's rate of return on E_1 is r:

$$\Pi_2 = rE_1 = r(1 + (\alpha - \delta)r)E_0,$$

while the firm's working capital at the end of period 2 is

$$M_2 = (1 + r)E_1 = (1 + r)(1 + (\alpha - \delta)r)E_0.$$

We have assumed that at the end of period 2 all capital gains are returned to the owner as dividends, i.e.

$$
\begin{aligned}
D_2 &= M_2 - E_0 = (r + (\alpha - \delta)r^2)E_0 + (\alpha - \delta)rE_0 \\
&= (1 + (\alpha - \delta)(1 + r))\, rE_0.
\end{aligned}
$$

Thus only the initial equity E_0 remains in the firm at the end of period 2: $E_2 = E_0$.

Let us now examine the optimal choice of δ. Let us first examine $\delta < 1$. Then

$$RRA_2 = r\,(1 + (1 + r)(1 - \delta))\, E_0$$

and

$$
\begin{aligned}
T_2 &= \tau[D_2 - RRA_2] = \tau\left[(1+(\alpha-\delta)(1+r))rE_0 - (1+(1+r)(1-\delta))\, rE_0\right]^+ \\
&= \tau\left[(\alpha-\delta)(1+r) - (1+r)(1-\delta)\right] rE_0 \\
&= \tau(1+r)(\alpha-1)rE_0. \qquad (33)
\end{aligned}
$$

Next, let us consider the choice $\delta \geq 1$. Then, since $\delta \leq \alpha$, we must have $\alpha \geq 1$ for this case to be relevant. Then

$$
\begin{aligned}
RRA_2 &= rE_0 \\
T_2 &= \tau\left[(1+(\alpha-\delta)(1+r))\, rE_0 - rE_0\right]^+ \\
&= \tau(\alpha-\delta)(1+r)rE_0.
\end{aligned}
$$

Proof of Proposition 1 We only prove the proposition for $t = 2$. The general case follows by analogy, but is more tedious. For $t = 2$ it is sufficient to prove that

$$
(1+r)T_1 + T_2 = (1+r)\tau(\Pi_1 - rE_0) + \tau(\Pi_2 - rE_1).
$$

Then $AT_2 = T_2$ follows from (8). From (4), $E_t = E_{t-1} + \Pi_t - D_t$. Hence $D_1 = E_0 - E_1 + \Pi_1$ and $D_2 = E_1 + \Pi_2 - E_0$ (since $E_2 = E_0$ by assumption). We then have

$$
\begin{aligned}
(1+r)T_1 + T_2 &= (1+r)\tau(D_1 - rE_0)^+ + \tau\left[D_2 - \left(rE_0 + (1+r)(rE_0 - D_1)^+\right)\right] \\
&= \tau\left[(1+r)\tau(D_1 - rE_0) + (D_2 - rE_0)\right].
\end{aligned}
$$

Moreover

$$
\begin{aligned}
(1+r)\tau(\Pi_1 - rE_0) + \tau(\Pi_2 - rE_1) &= \tau\left[(1+r)(D_1 + E_1 - E_0 - rE_0) + (D_2 - E_1 + E_0 - rE_1)\right] \\
&= \tau\left[(1+r)(D_1 - rE_0) + D_2 - rE_0\right],
\end{aligned}
$$

and the conclusion follows. Q.E.D.

Proof of Proposition 2 From (18) and the definitions of $E^{'}$ and $E^{''}$

$$\frac{\partial\phi(D,M,AT,RRA_1)}{\partial D} : \begin{cases} =0 & \text{if } M-D=E^{'}, D<RRA_1 \\ <0 & \text{if } M-D<E^{'}, D<RRA_1 \\ >0 & \text{if } M-D>E^{'}, D<RRA_1 \end{cases}$$

$$\frac{\partial\phi(D,M,AT,RRA_1)}{\partial D} : \begin{cases} =0 & \text{if } M-D=E^{''}, D>RRA_1 \\ <0 & \text{if } M-D<E^{''}, D>RRA_1 \\ >0 & \text{if } M-D>E^{''}, D>RRA_1. \end{cases}$$

Then $M \leq E^{'}$ implies $\frac{\partial\phi(D,M,AT,RRA_1)}{\partial D} < 0$ independently of RRA_1, hence $D=0$ in optimum. Moreover, $M \in (E^{'}, E^{''})$ implies

$$\begin{aligned} \frac{\partial\phi(D,M,AT,RRA_1)}{\partial D} &\leq 0 \text{ for } D \geq M-E', \ D<RRA_1 \\ \frac{\partial\phi(D,M,AT,RRA_1)}{\partial D} &> 0 \text{ for } D \leq M-E', \ D<RRA_1 \\ \frac{\partial\phi(D,M,AT,RRA_1)}{\partial D} &< 0 \text{ for } D>RRA_1. \end{aligned}$$

Hence, $\phi(D,M,AT,RRA_1)$ is increasing in D as long as $D \leq M-E'$ and $D<RRA_1$, and decreasing above this point. Since $\phi(D,M,AT,RRA_1)$ is continous, the maximizer must be at $\min(M-E', RRA_1)$, which is either a stationary point or a kinck point (if $D=RRA_1$). Finally, $M \geq E^{''}$ implies

$$\begin{aligned} \frac{\partial\phi(D,M,AT,RRA_1)}{\partial D} &\geq 0 \text{ for } D \leq M-E'', \ D<RRA_1 \\ \frac{\partial\phi(D,M,AT,RRA_1)}{\partial D} &< 0 \text{ for } D>M-E^{''}, \ D>RRA_1 \\ \frac{\partial\phi(D,M,AT,RRA_1)}{\partial D} &> 0 \text{ for } D<M-E^{''}, \ D>RRA_1. \end{aligned}$$

Thus $\phi(D,M,AT,RRA_1)$ is increasing in D until D is larger than *both* $M-E^{''}$ and RRA_1, and then decreasing. Thus $D=\max(M-E^{''}, RRA_1)$ by continuity. Q.E.D.

Proof of Proposition 3 By definition $E_t = M_t - D_t$. If $E_t = E^{''}$, $D_t = M_t - E^{''}$. We first show that $D_t < RRA_t$ is not possible in a steady state and hence that $E^{'}$ cannot be a steady state. Assume on the contrary that $D_t < RRA_t$. Since $D_t > 0$ in steady state, D_t must satisfy the first order condition (22). From (26), $D_t = 0$ until $M_t > E^{'}$. Let $t = t^*$ be the first t such that $E' = M_{t^*} - D_{t^*}$ and $D_{t^*} > 0$. Then

$$E' \geq M_{t^*-1} \geq (1+r)^{t^*-1} E_0$$

(since the return is at least r in each period and the firm did not pay dividends before t^*).

Since, by assumption, $rE' \leq D_t < RRA_t$ for all t in equilibrium, we must have for $t \geq t^*$

$$rE' < RRA_{t+1} \leq rE_0 + (1+r)(RRA_t - rE')^+,$$

which implies

$$RRA_t > rE' + \frac{r}{1+r}(E' - E_0).$$

The same reasoning must hold for RRA_{t+2} :

$$D_{t+2} < RRA_{t+2} \Rightarrow RRA_{t+1} > rE' + \frac{r}{1+r}(E' - E_0).$$

Thus

$$RRA_t > rE' + \frac{r}{1+r}(E' - E_0) + \frac{r}{(1+r)^2}(E' - E_0).$$

By induction

$$RRA_t > rE' + \sum_{i=1}^{k} \frac{r(E' - E_0)}{(1+r)^i} \text{ for any } k.$$

By letting $k \to \infty$,

$$RRA_t \geq (1+r)E' - E_0.$$

Since $RRA_t \leq ((1+r)^t - 1)E_0$ for any t,

$$\begin{aligned} ((1+r)^{t^*} - 1)E_0 &\geq RRA_{t^*} \geq (1+r)E' - E_0 \\ &\geq (1+r)^{t^*}E_0 - E_0 = ((1+r)^{t^*} - 1)E_0. \end{aligned}$$

We conclude that $RRA_{t^*} \equiv (1+r)E' - E_0$. But since

$$RRA_{t^*+1} \leq rE_0 + (1+r)(RRA_{t^*} - rE')^+ = RRA_{t^*},$$

we conclude that $RRA_{t^*+1} = (1+r)E' - E_0$, and by induction for all RRA_t in equilibrium ($t \geq t^*$). But then $D_t \equiv rM'$ for all $t > t^*$, which contradicts that $p > 0$.

We conclude that the only possible steady state is $E_t = E''$, with $D_t = M_t - E'' \geq rE''$. From (3), $D_t \geq RRA_t \Rightarrow RRA_{t+1} = rE_0$. By induction, $RRA_{t+k} = rE_0$ for all $k \geq 0$. Thus, $RRA_t = rE_0$ is an absorbing state. Q.E.D.