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NORDIC DUAL INCOME TAXATION OF ENTREPRENEURS

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Abstract: The paper shows how entrepreneurial taxes interact with the career choice of individuals, the quality of entrepreneurs, and their investment behavior. It is particularly relevant to differentiate the early effects on start-up enterprises with substantial uncertainty from the tax effects on mature firms where the uncertainty is resolved. Conditions are derived for the Nordic dual income tax to be neutral and they are found to be stringent. Profit expectations matter. The Nordic dual encourages (discourages) the establishment of new enterprises by entrepreneurs who anticipate high (low) profitability.

Key words: Dual income taxation, enterprise taxes

JEL code: H25

Tiivistelmä: Kirjoituksessa tarkastellaan yritystoiminnan verojen vaikutuksia yrittäjäuran valintaan, yrittäjien laadulliseen valikoitumiseen ja investointeihin eriytetyssä tuloverotuksessa. Tutkimus korostaa vaikutuseroja suuria riskejä kohtaavan aloittavan yrityksen ja kypsän yrityksen välillä. Verotuksen neutraalisuusehtojen havaitaan olevan vaikeasti toteutettavissa. Kannattavuusodotuksilla todetaan olevan vaikutuksia verotuksen synnyttämiin ohjausvaikutuksiin. Eriytetty tulovero kannustaa (vähentää) uusien yritysten perustamista yrittäjän odottaessa hyvää (heikkoa) kannattavuutta.

Asiasanat: Eriytetty tulovero, yritysverotus

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1 Introduction

Many countries carried out tax reforms towards the end of the 1980's by broadening the tax base and reducing marginal income tax rates and the top rate, in particular. Earlier rapid economic growth had pushed taxpayers upward along the progressive rate schedules and policy makers had reacted by granting concessions to the taxation of income from capital. The consequence was that average tax rates on capital income were rather low without necessarily any reduction in the marginal tax rates. Widespread inefficiencies were inevitable because of the non-uniform treatment of different kinds of income from capital. In the light of this background, the idea of a proportional tax on all types of capital income[1], separate from a progressive tax on labor income, was discovered. The associated benefits were thought to include not only the removal of the distortions in the old system, but such a tax system was also regarded as a revenue source to finance the reduction of marginal tax rates on labour income (King 1987, Sørensen 1988, Nielsen and Sørensen 1997 and Sørensen 2005b). Denmark was the first to implement such a system to later abandon it, but the Nordic dual income tax was born. Norway and Sweden adopted it in the early 1990s, Finland following suit.

The Nordic dual tax divides personal income into income from capital (interest receipts, dividends, rental income, realized capital gains, for example) and earned income (labor income, pensions and social benefits, for example). Only earned income is taxed at a progressive schedule while income from capital is taxed at a flat rate. The entrepreneurs are at the crossroads. Their income represents partly a return on capital invested and partly a compensation for labor, entrepreneurial effort and ability. Because the top marginal tax rate on

[1] A uniform tax on all capital income, net of true economic depreciation, is also neutral in respect of the choice of investment projects, explicated by Sinn (1987) as the Johansson-Samuelson theorem.

earned income typically exceeds the flat tax rate on income from capital, the dual tax creates an incentive to transform entrepreneurial labor income into capital income unless a constraint is set up. Therefore, the entrepreneur's personal income is divided into capital income and earned income. The split rule defines the maximum that is capital income for tax purposes, using a *presumptive rate of return* either on the gross or net assets of the enterprise, called the *capital base* below. The split applies to all unincorporated businesses and *closely-held* or *unlisted* companies. Prior to such a personal tax, profits from incorporated companies are subject to corporation tax, not necessarily at the same rate as the personal tax rate on income from capital. The Nordic dual tax always treats dividends and realized capital gains from *widely-held* or *listed* companies as income from capital.[2]

We ask under what conditions the Nordic approach satisfies the neutrality criterion in respect of the entrepreneurial choices. Is the Nordic approach a reasonable strategy to tax entrepreneurs? This is our research question. Moreover, we ask what effects it exerts on the start-up stage and expansion stage cost of capital and whether it interferes the occupational choice of potential entrepreneurs.

The idea of a dual income tax can be built into the tax system in various ways. In the recent Keuschnigg and Dietz (2005) proposal, income tax is dual in that taxation of earned income is progressive with the highest marginal tax rate exceeding the proportional tax rate on capital income. The entrepreneurs' income, however, is not split. The double tax on equity returns is mitigated by the ACE (=allowance for corporate equity) system. In regard to taxation of

[2] Dual income tax with its split rule has attracted wide interest as reflected in the recent DICE Report of CESifo (DICE 2004) which contains general expositions by Robin Boadway and Vidar Christiansen. In the German popular debate, the dual tax has been seen as a practical solution to tax competion from economies in transition. Indeed, the most recent contribution appears to be the detailed proposal for a comprehensive tax reform by the German Council of Economic Experts (2006).

economic rents, the top marginal tax rate on equity returns is aligned to the top marginal tax rate on earned income with the purpose to alleviate the incentive for income shifting.

Economic research on dual income taxation has most actively been carried out by Nordic economists. Sørensen (1994) suggested that dual income tax may cause fewer distortions than the conventional income tax. Nielsen and Sørensen (1997) argued that the latter has a distortionary bias against investment in non-human capital, which can be offset in the dual taxation. Tikka (1993) saw the Nordic dual as a small country response to increasing international capital mobility. Sørensen's (2005a, 2005b) recent articles reviewed the main arguments for dual income taxation and elaborate a new split rule that delivers neutrality of investment and financing decisions of entrepreneurs. Hagen and Sørensen (1998), Panteghini (2001) and Sørensen (2005a) addressed the important issue of whether the presumptive rate of return should, in addition to a default-free rate of interest, include a risk premium.

Though each country applies its own specific approach to Nordic dual income taxation, the major results of the studies on the incentive effects for enterprises under dual taxation may be summarized as follows. The steady-state cost of capital of an enterprise depends on the split rule and on the discrepancy between the tax rates on capital income and earned income and may be rather low because of a low opportunity cost of internal funds in the regime where marginal dividends are taxed as earned income (Kari 1999). Lindhe, Södersten and Öberg (2002, 2004) compared the Finnish, Norwegian and Swedish capital bases and suggested the Swedish scheme, where the asset base is defined in terms of the owners' original acquisition cost of shares, to have no effect on the steady-state cost of capital in a closely-held company (CHC) in respect of a widely-held company, when marginal investments are financed from retained earnings in both

kinds of companies. The previous Norwegian scheme was found to be distortive, too, because its capital base consisted of the current book value of shares as in the Finnish split rule. Alstadsæter (2003) considered the Norwegian case, suggesting that it provides entrepreneurs with great incentives to participate in tax-minimizing income shifting. She also concluded that the Norwegian dual income tax leads to overinvestment and that the corporate organizational form serves as a tax shelter for high-income entrepreneurs. Fjærli and Lund (2001) reported that the choice of the type of payout from the CHCs to their owners is strongly, but not uniquely, motivated by taxes. Moreover, following Sinn (1991) both Kari (1999) and Lindhe, Södersten and Öberg (2002) found that, because of taxing residual dividends as earned income, the split system raises substantially the cost of capital for initial investment compared to a flat tax on enterprise income. Lindhe, Södersten and Öberg (2002) simulated this to be three to five times the steady-state cost of capital.

In what follows we develop a model of an entrepreneur and contrast the essentials of an entrepreneurial career to remaining a laborer. An entrepreneur ventures his or her own funds on initial investment, sinks an entry cost (initial effort) and faces a failure risk in the start-up stage. The surviving entrepreneur decides on expansion investment and on the disposal of her venture at the mature stage either via a trade sale or a stock market introduction. We regard the risk-taking role of an entrepreneur as an important feature to be modeled because the government does not share losses from the start-up phase and moral hazard prevents insurance for the genuine business risk to develop. Fuest, Huber and Nielsen (2003) and Keuschnigg and Nielsen (2003) have recently discussed entrepreneurship and taxation. Outside equity finance is an essential requirement in their models and, therefore, they assume asymmetric information between the financiers and the entrepreneurs that generates the

problem of moral hazard. That is solved in their analyses of the optimal tax policy of the government.[3]

We assume neither outside equity nor debt finance and, therefore, work closer to the tradition of the neoclassical cost of capital. The enterprise is hosted by a small open economy. The wage rate is determined exogenously by productivity in the tradeables sector and the market interest rate in the world financial markets, with the residence principle being applied for the taxation of worldwide interest income. We focus solely on a start-up financed by the entrepreneur's own funds. Therefore the domestic taxes on dividends and capital gains remain relevant.

Our findings include some general results and some related to the Nordic dual in particular. We show it indispensable to differentiate the *early tax effects on start-up* enterprises *from the tax effects on mature firms*. Double taxation of dividends can raise the total tax rate on entrepreneurial income above that on earned income, making the dividend tax to act as an entry barrier. Though known from Sinn (1991), this is not emphasized too often. In addition, it interacts with the failure risk, another reason for a high cost of capital for start-ups. In the case of mature companies such uncertainty is more or less shaded away. These results do not depend on the Nordic dual.

In our analysis of the Nordic dual, some clear-cut rules are derived for tax neutrality of investment in unincorporated businesses; in the case of incorporated enterprises, the conditions are harder to implement in practice. If a non-neutral dual is chosen in practice, we show that heterogenous expectations of profitability generate a distribution for the cost of capital among entrepre-

[3] Fuest, Huber and Nielsen (2003) show that the government can improve the quality of equity finance and encourage entrepreneurship through tax policy by setting the rate of corporation tax - or, if the shareholder level taxes on equity are present, the overall tax rate on equity - lower than the personal income tax rate on interest income. Keuschnigg and Nielsen (2003) show that a capital gains (wage) tax reduces (increases) the number of entrepreneurs in their general equilibrium model, a uniform income tax with full loss offset is neutral and progressive taxation retards entrepreneurship.

neurs because of a different marginal tax rate on highly profitable enterprises from less profitable enterprises.[4] For an incorporated enterprise, we find that the entrepreneur's ability threshold rises with the tax rate even when there is a tax structure with uniform tax rates. In particular, Nordic dual encourages (discourages) the establishment of a new enterprise by an entrepreneur who expects high (low) profitability. The low types face a higher cost of capital for start-up and expansion investments. For enterprises with high expected profitability, the Nordic dual rules may give a boost to expansion investment and mitigate the penalty on start-up investment caused by taxing dividends as earned income.

The structure of the paper is as follows. Section 2 develops the components of the model without taxation. Section 3 introduces the Nordic dual rules for the taxation of unincorporated and section 4 for the taxation of incorporated enterprises. We analyse their effect on investment incentives as well as conditions for neutrality under the Nordic dual. Section 5 studies the career choice between an entrepreneur and a laborer. Section 6 concludes.

2 Model of an Entrepreneur

Entrepreneurial qualities Potential entrepreneurs have a unique ability to produce project ideas. Some are more productive and innovative than others. There is a continuum of entrepreneurs, indexed by ability $a \in (0, \overline{a})$. The decisions are made in three stages, indexed by time, $t = 0, 1, 2$. In stage $t = 0$ individuals face a career choice between forming an enterprise and entering the labor market. Commitment to entrepreneurship requires an initial effort, $e > 0$, and an initial investment, $k > 0$, at time $t = 0$. Effort represents a non-replicable input and the effort cost is convex, $c(e); c'(e) > 0, c''(e) > 0$. Entrepreneurs do

[4] Coelho, De Meza and Reyniers (2004) have suggested that entrepreneurs are typically overly optimistic. If correct, this proposal has implications when reading our results.

not know ex ante the true profitability θ of their idea, only its distribution. The first production stage provides entrepreneurs with a signal, θ, of the profitability. Investment in a first-stage project thus provides a risky return

$$R(e, k, \theta) = k + af(e, k; \theta).$$

Our notation here is non-standard but useful in showing that a successful entrepreneur recoups for his initial investment k and earns in addition a return $af(e, k; \theta^i)$ that is proportional to his ability. The signal can take three values, $\theta^o < \theta^L < \theta^H$. With the probabilities π^L, π^H, the project will be a success, an operating profit being made with $af(e, k; \theta^H) > af(e, k; \theta^L) > 0$.[5] We assume f to be jointly concave in e and k. The probability that the project is of type $\theta = \theta^o$ is $1 - \Sigma_i \pi^i$ $(i = L, H)$; the project is then a failure and returns nil, initial investment k being sunk. Enterprises with a bad signal θ^o leave the market. Those with a good signal have the option to allocate the first-stage cash flow to an immediate dividend, d, or to expansion investment $K > 0$ at time $t = 1$. To highlight the idea that risks are greatest at the early stage of a project, we assume that the second-stage return is not subject to uncertainty. The enterprise or its capital is assumed to be sold at its net asset value at time $t = 2$.

The differences between start-up enterprises and mature companies are emphasized by the technologies in the two stages, $af(e, k; \theta)$, $F(K; \theta)$. The second-stage technology can be viewed as an advanced version of the first-stage technology, but does not require specialized effort. Ability a is embedded in $F(K; \theta)$. The second-stage return is greater for an H-firm than for an L-firm, i.e. $F(K; \theta^H) > F(K; \theta^L)$ holds. We assume that the first-stage capital k depreciates fully and is no longer productive capital after the initial stage while the second-stage cap-

[5] For a moment, these probabilities can be interpreted as objective. Subsequently, we work with the assumption that they are subjective and can vary across entrepreneurs. Then, a natural background assumption is that entrepreneurial skill is, say industry-specific and the entrepreneurs cannot switch between industries.

ital retains its productivity and asset value K at time $t = 2$. This distinction highlights the heterogeneity of capital over the life-cycle of the enterprise.

The value of an entrepreneurial career Assume risk neutrality and let V denote the value of an entrepreneurial career in a risky industry. The cash flows in periods 1 and 2 are

$$d = af(e, k; \theta) + k - K; \quad D = F(K; \theta) + K. \tag{1}$$

The second-stage cash flow D is conditional on success in the initial stage, but deterministic for any successful project. We recognize that the entrepreneur may face liquidity constraints in both stages, but to keep the model focused we simply assume them away. Therefore we look only at an interior optimum in what follows. Let r be the interest (discount) rate. In terms of backward induction, the project value at the beginning of the second stage is

$$V_1(K; \theta) = -K + \frac{D}{1+r} \tag{2}$$

Then, the optimal risky career satisfies

$$V_0^*(a, \theta) = \max_{e,k} \left(-(c(e) + k) + \Sigma_i \pi^i \frac{1}{1+r} [af(e, k; \theta) + k + V_1^*(\theta)] \right), \tag{3}$$

where $V_1^*(\theta) = \max_K V_1(K; \theta)$. The first-order conditions for the maximization of (3) are the following:

$$F_K(K; \theta^i) = r; \quad i = H, L \tag{4}$$

$$\Sigma_i \pi^i a f_k(e, k; \theta^i) = r + (1 - \Sigma_i \pi^i) \tag{5}$$

$$\Sigma_i \pi^i a f_e(e, k; \theta^i) = c'(e)(1 + r). \tag{6}$$

The cost of capital for expansion investment of surviving enterprises is given by (4), the rate of interest. The more profitable enterprise invests more, $K^H > K^L$. The initial-stage cost of capital (5) accommodates the risk effect. The probability of success $\Sigma\pi^i$ raises the expected return (left-hand side) and the probability of failure $1 - \Sigma_i\pi^i$ increases the cost of capital (right-hand side). More able entrepreneurs invest more initially. Condition (6) gives optimal effort. The left-hand side represents the marginal expected return on effort. The right-hand side is the forward value of the marginal cost of effort. Higher ability entrepreneurs provide more effort.

The concept of the entry threshold in terms of the marginal entrepreneurial a^m ability completes our basic framework. At the outset, entrepreneurs do not know the true type of their project, θ, only its distribution. They evaluate the expected value of their career (3), compare it to the life-time value of an outside option, w, labor income insured by social insurance, and enter if

$$V_0^*(a) \geq w \tag{7}$$

holds true. The outside option is assumed to be unrelated to the entrepreneurial skill. When deriving the first-order conditions (4)-(6) it is assumed that the participation constraint (7) is satisfied. Evaluating the maximized value of a risky career in respect of ability, a, over the optimal choices, $\widehat{e}, \widehat{k}, \widehat{K}$, themselves depending on ability, a, it is known by the envelope theorem that $\partial V_0^*(a)/\partial a = \frac{\Sigma_i \pi^i}{1+r} f(\widehat{e}, \widehat{k}, \widehat{K}; \theta) > 0$ holds because we need to consider only the direct effect of a parameter change on the optimized function (3). The project value is then proportionately increasing in entrepreneurial ability, a. Hence the most able agents become entrepreneurs. The marginal entrepreneur with ability a^m is defined by $V_0^*(a^m) = w$.

3 Taxation of Unincorporated Businesses

Without a split, the business income of a sole proprietor or a partnership member is taxed as earned income. We assume the progressive rate schedule to take three values, τ_w^L, τ_w^p and τ_w^H, so that $\tau_w^L < \tau_w^p = \tau_p < \tau_w^H$ holds where τ_p is the tax rate on interest income. For profitable enterprises, it holds $\tau_p < \tau_w^H$, but we do not exclude the possibility that $\tau_w^L < \tau_p$ may exist for low-income entrepreneurs.[6] Consider first taxation without the split. To save in notation, r denotes the net rate of interest from now on, $r = (1 - \tau_p)\widetilde{r}$, with $\widetilde{r}$ being the market interest rate. Because we assume that the business is sold out at its net asset value at time $t = 2$ there is no taxable capital gain. Therefore under success, the tax liability is

$$T(e, k, K; a, \theta) = T_1 + T_2 = \tau_w^i \frac{af(e, k; \theta)}{1 + r} + \tau_w^i \frac{F(K; \theta)}{(1 + r)^2}. \tag{8}$$

The maximized value of the enterprise is

$$V^{\tau *}(\theta) = \max_{e,k,K} [V_o^*(e, k, K; a, \theta) - \Sigma_i \pi^i T(e, k, K; a, \theta)] \tag{9}$$

where $V_o^*(\cdot)$ is given by (3). The first-order conditions of this optimization problem are

$$F_K(K; \theta^i) = \frac{r}{1 - \tau_w^i}; \quad i = H, L \tag{10}$$

$$\Sigma_i \pi^i (1 - \tau_w^i) a f_k(e, k; \theta^i) = r + (1 - \Sigma_i \pi^i) \tag{11}$$

$$\Sigma_i \pi^i (1 - \tau_w^i) a f_e(e, k; \theta^i) = c'(e)(1 + r). \tag{12}$$

We notice that with $\tau_w^p = \tau_p$ these conditions are also the benchmark values of a Johansson-Samuelson (JS) tax, taxing all income comprehensively once,

[6] Actually, this has held true in Finland from the very beginning of the dual system.

including interest income. Thus the cost of capital for expansion investment is the market rate of interest, $\widetilde{r}$, but the *JS* tax clearly is not neutral in respect of the initial-stage investment subject to a prospective capital loss of $\left(1-\Sigma\pi^i\right)$ because such a loss is not deductible from taxable income. In contrast to the Domar-Musgrave (1944) case, for a given τ_w^i the tax-adjusted return which the entrepreneur must earn is $1/(1-\tau_w^i) > 1$ times the expected unrecoverable initial stake.

Expansion Investment: When Does the Split Lead to Neutrality? We now introduce the Nordic dual and ask when the split approach is neutral in respect of the initial-stage and expansion-stage cost of capital and thereafter whether the Nordic system deviates from the neutrality benchmark. The basic principles of taxation of unincorporated enterprises are the same in all Nordic countries. The *capital base* of the split rule consists of the entrepreneur's initial investment and reinvested business income and is denoted by B_1 and B_2 in the two stages. The tax authorities impute the amount of capital income by a *presumptive rate of return*, say ρ, and taxes ρB_1 and ρB_2 at the flat rate, τ_p. Any remaining business profits are taxed at the rate of earned income, τ_w^i. Remember that reinvested income once taxed is no longer subject to any tax at exit when the business is sold at its net asset value in the final stage.

The after-tax value of the entrepreneurial career in the second stage is then

$$V_1(\theta^i) = -K + \frac{F(K) + K - \left[\tau_p \rho B_2 + \tau_w^i (F(K) - \rho B_2)\right]}{1+r}. \tag{13}$$

Solving for the optimal expansion investment K,

$$F_K = \left(\frac{1-\tau_p}{1-\tau_w^i}\right)\widetilde{r} - \left(\frac{\tau_w^i - \tau_p}{1-\tau_w^i}\right)\rho B_2^{'}(K). \tag{14}$$

Require now in the tax system with τ_w^i different from τ_p that the pre-tax cost of

capital equals the one of a non-tax, small open economy, i.e. the market interest rate, $F_K = \widetilde{r}$. We obtain from (14) for the neutrality condition,

$$\rho B_2^{'}(K) = \widetilde{r}. \tag{15}$$

We thus have proved

Proposition 1 *For tax neutrality in respect of the expansion of the unincorporated enterprises, the marginal tax shield produced by the split system should equal the market rate of interest, i.e. satisfy* $\rho B_2^{'}(K) = \widetilde{r}$.

The legislator has therefore alternatives. It can introduce either a high presumptive rate ρ and low marginal base $B_2^{'}(K)$ or the other way round. The Nordic dual can be interpreted to be based on the idea that $B_2 = K$. Hence $B_2^{'}(K) = 1$. Neutrality requires $\rho = \widetilde{r}$, i.e. that the presumptive rate equals the market interest rate.[7]

Investment Incentive in the Expansion Stage If the legislator has ended up in a non-neutral taxation of entrepreneurs, we report a powerful result.

Proposition 2 *For those entrepreneurs whose realized profit was low (implying that* $\tau_w^L < \tau_p$*), the split system represents a penalty on expansion investment. For those enterprises which turned out to be highly profitable, the split system provides a strong investment incentive in the expansion stage.*

[7] Our proposition concerns small enterprises with domestic ownership and domestic investment in a small open economy. Departing from the assumption of domestic ownership raises a number of new issues. If tax rates are not harmonized, cross-border mixed ownership tends to create interest conflicts between domestic and foreign owners under the residence principle as the net interest rates may differ. It is an empirical matter which owner becomes decisive. For the investment neutrality to hold, the implementation of the dual tax should make the ρ-parameter determined by the tax treatment of the dominant owner. Under the source principle, instead, the net interest rates have to be equal across countries and owners are unanimous of the discount rate of the enterprise. Our result on the investment neutrality continues to hold though the gross domestic interest rate is of course determined by the relation of the domestic and foreign interest rates.

Proof. The conclusion follows from the sign of $\left(\frac{\tau_w^i - \tau_p}{1-\tau_w^i}\right)$ in the latter term of the first-order condition (14) above. ■

Uncertainty about θ is revealed before the expansion investment so that the tax relief is available for those entrepreneurs who expect their total business income to settle in the income band where they face a tax rate $\tau_w^H > \tau_p$. But, if the business generates relatively little total income so that $\tau_w^L < \tau_p$ holds in that income band, the Nordic split rule alters into an additional tax on the entrepreneur's expansion-stage capital, leading to a higher cost of capital than without the dual.

In deriving the above result, we have considered the tax rate structure as given. When a split system is introduced in an equilibrium where investment behavior is distorted by the existing tax system, the Nordic dual appears to provide a second-best improvement. Entrepreneurs with profitable ideas find that the tax on reinvested business income is reduced, making an expansion investment worthwhile at the margin.

Initial Investment The expected first-stage tax liability is

$$T_1 = \tau_p \rho B_1 + \Sigma_i \pi^i \tau_w^i (af(e,k,\theta) - \rho B_1).$$

Inserting this into the value function, the first-order condition in respect of the initial investment is

$$\Sigma_i \pi^i [(1-\tau_w^i) a f_k'(e,k;\theta)] = \widetilde{r}(1-\tau_p) + 1 - \Sigma_i \pi^i - \Sigma_i \pi^i (\tau_w^i - \tau_p) \rho B_1'(k)). \quad (16)$$

We contrast this to the comparable condition in a non-tax economy

$$\Sigma_i \pi_i a f_k'(e,k;\theta) = \widetilde{r} + 1 - \Sigma_i \pi^i.$$

Solving for $\rho B_1'(k)$ which maintains the investment equal to that in a non-tax economy, we obtain

$$\rho B_1'(k) = \frac{\Sigma_i \pi_i \tau_w^i a f_k'(e,k;\theta^i) - \widetilde{r}\tau_p}{\Sigma_i \pi^i \left(\tau_w^i - \tau_p\right)}; \qquad i = L, H.$$

To satisfy neutrality under uncertainty, the marginal capital base $\rho B_1'(k)$ ought to be industry- or even enterprise-specific as it depends on profit expectations and their probabilities. Moreover, it depends on the existing tax rates, τ_w^i, τ_p. Such a challenging system is unrealistic in the real world. However, it is useful to consider neutrality when only the risk of failure is involved.

Failure Risk and the Neutrality Condition Let us thus give up for a moment the distinction between high-profitable and low-profitable enterprises. Assume that all entrepreneurs face the risk of failure $(1-\pi)$ but in case of success (with probability π) have the same profitability. The above condition simplifies to

$$\rho B_1'(k) = \frac{\pi \tau_w a f_k'(e,k;\theta) - \widetilde{r}\tau_p}{\pi(\tau_w - \tau_p)}.$$

In a non-tax economy, $\pi a f_k'(e,k;\theta) = \widetilde{r} + 1 - \pi$ holds. Inserting, we obtain the neutrality condition

Proposition 3 *In the presence of a failure risk, the neutrality condition for the Nordic dual in respect of the initial investment is*

$$\rho B_1'(k) = \frac{\widetilde{r}}{\pi} + \left(\frac{\tau_w}{\tau_w - \tau_p}\right)\frac{1-\pi}{\pi}. \tag{17}$$

This gives the split rule which does not distort initial investment. We can interpret the Nordic approach such that the initial-stage capital base equals the capital invested, $B_1(k) = k,\ B_1'(k) = 1$. Then, the presumptive rate ρ should not only be related to the risk-adjusted interest rate $\frac{\widetilde{r}}{\pi}$ but also to the tax structure.

This creates some tedious practical problems. In practice, the Nordic countries have chosen to adjust the presumptive rate ρ for, say, an average economy-wide risk premium though inter-firm differences in risks somewhat distort the outcome.

Considering our Propositions 1 and 3 together, the government faces a trade-off. If the presumptive tax rate is chosen to satisfy neutrality of investment in the expansion stage, $\rho = \widetilde{r}$, this may clearly discourage the riskier initial investment. On the other, if the risk adjustment is carried out to achieve neutrality in respect of initial investment, mature enterprises may overinvest.[8]

Actual Investment Incentives How does the actual non-neutral split rule with capital bases $B_1 = k$ and $B_2 = K$ affect the behavioral incentives? We obtain

Proposition 4 *For those entrepreneurs who expect to face a tax rate $\tau_w^L < \tau_p$, the split system represents a penalty on start-up investment, magnifying the risk of failure effect. However, for those enterprises which expect to face a tax rate $\tau_w^H > \tau_p$, the split system provides a strong investment incentive in the early stage.*

Proof. The result derived from the first-order condition (16) above. ■

Furthermore we obtain that the capital base $B_1 = k$ does not distort the first-order condition (12). Therefore, the Nordic dual induces an entrepreneur expecting low income and a low tax rate $\tau_w^L < \tau_p$ to provide more effort than with $\tau_w^p = \tau_p$ and to substitute effort for start-up capital. In their influential proposition, De Meza and Webb (1999) have suggested that a tax on new enterprises results in a welfare gain. This policy proposition was derived in a model where firms resort to outside financing in conditions of asymmetric information.

[8] We are grateful to a referee for pointing out this implication.

Our result concerning the tax penalty in a non-neutral dual system on new enterprise capital with low expected profitability appears to represent such a tax on enterprises.

4 Dual Taxation of Incorporated Enterprises

While in the case of sole proprietors and partnerships the Nordic approach splits business income, it is the dividend that is split in the case of the closely-held corporation (CHC).[9] Our modelling can be interpreted to capture both the classical and the imputations systems, regarding an incorporated company and its owners as separate tax entities. One can think that the imputation systems are reflected in the magnitude of our tax rates τ_d and τ_w. Such an interpretation simplifies the notation.

Let τ_c, τ_d, τ_w denote the tax rates on profits, dividends and earned income. Write first the expression for the present value of the integrated tax liability of a successful CHC without the split rule

$$\begin{aligned} T(e,k,K,\theta) = \tau_c \frac{af(e,k,\theta)}{1+r} + \tau_d \frac{(1-\tau_c)af(e,k,\theta)+k-K}{1+r} \\ + \tau_c \frac{F(K,\theta)}{(1+r)^2} + \tau_d \frac{[F(K,\theta)(1-\tau_c)+K]-k}{(1+r)^2}. \end{aligned} \tag{18}$$

The operating profits $af(e,k,\theta)$ and $F(K,\theta)$ form the corporation tax base. The entrepreneur's dividend tax base is $d = (1-\tau_c)af(e,k,\theta)+k-K$ at time $t=1$. The assets of an enterprise are sold at their net asset value at time $t=2$ and the returns are paid out as dividends.

[9] In the taxation of unincorporated businesses, the various Nordic split approaches are quite similar, but in the case of corporations the details differ. Sweden and Finland split the dividend while Norway used to split the pre-tax profit, but after its most recent reform the entrepreneur's total equity income is split. Moreover, Finland defines the capital base as including the financial assets while Norway does not. In addition, expansion investment does not qualify for the capital base in Sweden while it does in Finland. The current Finnish capital base includes the distributed dividend while the earlier one did not.

Expansion Stage: Tax Neutrality Consider then the split rule applied to dividends. The taxman imputes the income from capital at a presumptive rate of return, ρ, taxes ρB_1, at the rate τ_d on dividends while the remaining distributed profit, $d - \rho B_1$, is taxed at the rate on earned income, τ_w^i. Then the personal dividend taxes paid by the entrepreneur at time $t = 1$ and $t = 2$ are

$$T_1^p = \tau_d \rho B_1 + \tau_w^i \left[(1-\tau_c) a f(e,k,\theta) + k - K - \rho B_1\right] \tag{19}$$

$$T_2^p = \tau_d \rho B_2 + \tau_w^i \left[(1-\tau_c) F(K) + K - k - \rho B_2\right] \tag{20}$$

making the present value of the integrated tax liability

$$\begin{aligned} T(e,k,K,\theta) = \tau_c \frac{a f(e,k,\theta)}{1+r} + \left(\tau_d \frac{\rho B_1}{1+r} + \tau_w^i \frac{\left[(1-\tau_c) a f(e,k,\theta) + k - K - \rho B_1\right]}{1+r}\right) \\ + \tau_c \frac{F(K,\theta)}{(1+r)^2} + \left(\tau_d \frac{\rho B_2}{(1+r)^2} + \tau_w^i \frac{\left[(1-\tau_c) F(K) + K - k - \rho B_2\right]}{(1+r)^2}\right). \end{aligned} \tag{21}$$

It is assumed that the taxman allows k to be deductible in the final period.[10] Inserting the tax liability in the valuation expression, we can analyze the issue of tax neutrality.

Using the value function in the second stage, the first-order condition in respect of K is

$$F_K = \widetilde{r} - \frac{\left(\tau_w^i - \tau_d\right) \rho B_2'}{(1-\tau_c)(1-\tau_w^i)}.$$

It appears that for investment neutrality in the expansion stage, the Nordic dual should make B_2 unrelated to the capital K, making $\rho B_2' = 0$. This gives $F_K = \widetilde{r}$, the condition in a non-tax economy. Interesting enough, Sweden has adopted a system where $B_2 = B_2(k)$ does not depend on the expansion invest-

[10] This is one of the many features which makes the enterprise taxation differ from a taxation of a widely-held corporation which continues its life regardess of changes in ownership. This has bearing on the initial-stage results.

ment K. Moreover, though Sweden has maintained classical double taxation, no investment distortion need to arise in the expansion stage. This follows from the Johansson-Samuelson tax ($\tau_p = \tau_c$). We notice that Lindhe, Södersten and Öberg (2004) were able to obtain neutrality between the behavior of a CHC and a widely-held company, but the investment neutrality was not possible to obtain.

In the case of the capital base, $B = K$, dual taxation appears to have clear-cut effects on the expansion stage, discriminating between high-and low-profitable companies due to their the tax rate differential $\tau_w^i - \tau_d$:

Proposition 5 *The Nordic dual encourages (punishes) the expansion of those enterprises which turned out to pass the initial stage with a high (low) profitability.*

Initial Investment We focus on the case where the entrepreneur knows that the tax authority allows him to deduct the cost of initial investment from the tax base in the final stage, as it cannot represent income. We obtain for the first-order condition

$$\Sigma_i \pi^i (1-\tau_c)\left(1-\tau_w^i\right) af'(k) = \widetilde{r}(1-\tau_p)+1-\Sigma_i \pi^i - \Sigma_i \pi^i \left(\tau_w^i - \tau_d\right) \rho B_1' - \frac{r \Sigma_i \pi^i \tau_w^i}{1+r}$$

which clearly incorporates the effect of double taxation of dividends on the left-hand side. Again in a non-tax economy, $\Sigma_i \pi^i a f_k'(e,k;\theta^i) = \widetilde{r} + 1 - \Sigma_i \pi^i$ holds. Solve for the neutrality condition

$$\rho B_1' = \frac{\Sigma_i \pi^i \left[1-(1-\tau_c)\left(1-\tau_w^i\right)\right] a f_k'(e,k;\theta^i) - \widetilde{r}\tau_p + \frac{r \Sigma_i \pi^i \tau_w^i}{1+r}}{\Sigma_i \pi^i \left(\tau_w^i - \tau_d\right)}.$$

Our earlier impression repeats itself here: it is hard to obtain neutrality within the Nordic dual taxation for the initial investment. Industry prospects may

determine success probabilities and operating profits and the tax rates τ_w vary across individuals.[11] Though this conclusion is pessimistic for those aiming at tax neutrality, we can see from the first-order condition that the actual Nordic dual has predictable implications for the investment behavior of the CHC's.

Proposition 6 *The Nordic split rule encourages the start-up investment of entrepreneurs expecting to be profitable facing a tax rate $\tau_w^H > \tau_p$ and discourages the investment of entrepreneurs expecting to run less profitable enterprises, facing a tax rate $\tau_w^L < \tau_p$.*

Because the capital base $B_1 = k$ does not affect the first-order condition (12) for effort supply, the tax effect of the Nordic dual on effort provision is opposite to its effect on the start-up investment of the two kinds of entrepreneurs.

Effects of Uncertainty We are, however, able to qualify the neutrality result when working with the success/failure but abstracting from the differences in the expected profitability. In the presence of the failure risk, the neutrality condition for the Nordic dual in respect of the initial investment k in the CHC's simplifies to

$$\rho B_1' = \widetilde{r}\frac{(1-\tau_p)-(1-\tau_c)(1-\tau_w)}{\pi(\tau_w-\tau_d)} + \frac{[1-(1-\tau_c)(1-\tau_w)](1-\pi)+\frac{r\Sigma_i\pi^i\tau_w^i}{1+r}}{\pi(\tau_w-\tau_d)}.$$

Regardless of the complications, the risk of failure has a predictable effect: for neutrality, *the failure risk enhances the required marginal capital base.* One can somewhat simplify this result in the case where the elimination of the double taxation is feasible. Then, set $\tau_c(1-\tau_w) = 0$ and the condition reads

[11] Sørensen (2005a, 793-794) discusses the choice of the capital base in the framework of the new Norwegian system. Our analysis provides an additional point to the debate on neutrality: the impracticability of the neutrality condition for initial investment as well as the general non-neutrality of the capital base consisting of the book value of corporate assets including expansion investment.

$$\rho B_1'(k) = \frac{\widetilde{r}}{\pi} + \frac{\tau_w}{(\tau_w - \tau_p)} \left(\frac{(1-\pi)}{\pi} + \frac{\widetilde{r}(1-\tau_p)}{\pi(1+\widetilde{r}(1-\tau_p))} \right).$$

5 Career Choice: Entrepreneur or Laborer?

It is a property of the Johansson-Samuelson tax with full loss offsets that it is neutral in respect of the career choice between the outside option and operating an unincorporated enterprise. Most small enterprises are incorporated. We argue that taxation need not be neutral in respect of the formation of incorporated companies, as CHC's. We examine the entry threshold for the CHC's in general and, thereafter, within the Nordic dual.

When incorporated, the maximized value of the enterprise is

$$V^{\tau *} = \max_{e,k,K} [V_o^*(e^\tau, k^\tau, K^\tau) - \sum_i \pi^i T(e^\tau, k^\tau, K^\tau)],$$

where the notation with the super index τ denotes the variables under taxation. Consider first the entrepreneurial choices under a uniform structure of tax rates, $\tau_c = \tau_d = \tau_p = \tau_w$. The occupational choice is distorted in the classical tax system with no imputation, the after-tax enterprise value being lower than the present value of the after-tax outside option with identical cash flows. Though this mechanism is implicitly discussed in the tax literature (Harberger (1962)), the earlier work on enterprise taxation has largely abstracted from the question of occupational choice. We can show formally the following[12]. Let a^τ denote the marginal talent of an incorporated entrepreneur under taxation. Consider the case of income taxation with full loss offsets and double taxation on income from incorporation. Then it follows that under a tax structure with uniform tax rates, i.e. $\tau = \tau_c = \tau_d = \tau_w = \tau_p$, there is a positive relationship between the

[12] The proof is available in the Technical Appendix.

tax rate and the marginal entrepreneurial talent, $\partial a^\tau/\partial\tau > 0$. This result holds strictly for a tax structure which is neutral in the traditional sense that it does not distort the effort choice e^τ and investments k^τ, K^τ. However, we expect it to hold more generally. We therefore prove

Proposition 7 *Let a^m and a^τ denote the marginal entrepreneurial talents in the absence of taxation and under taxation, respectively. Then it follows that under a tax structure with uniform tax rates, i.e. $\tau = \tau_c = \tau_d = \tau_w = \tau_p$, there is a linear dependence between the marginal entrepreneurial talents*

$$a^\tau = \beta_o + \beta_1 a^m, \tag{22}$$

where β_1 is a strictly positive constant and greater than one.

Proof. Available in the Technical Appendix. ■

The proposition suggests that even a uniform structure of tax rates is distortive in respect of enterprise formation. The dividend tax, unless an imputation is introduced, is distortionary and affects the career choice of individuals. For the equality $V_o^{\tau*}(a^m) = w(1-\tau_w)$ to hold, a^m must be greater with a uniform tax structure than in the absence of taxation, i.e. the new business idea must show greater profitability. With a non-uniform tax structure, an additional distortion may be created by the undervaluation at exit. Dividend taxation may thus have larger distortions on enterprise formation than has been previously recognized by the literature emphasizing its capitalization.

We next examine the effects of the Nordic dual on entrepreneurship. Take the Finnish case for the tax-adjusted value of the enterprise. We prove the following proposition, which also holds for the Swedish and Norwegian model.

Proposition 8 *The Nordic dual model encourages the establishment of new enterprises by optimistic entrepreneurs who expect with certainty ($\pi^H = 1$) to be*

of the high-profitability type. It discourages the establishment of new enterprises by entrepreneurs who expect with certainty ($\pi^L = 1$) *to be of the low-profitability type.*

Proof. Plug (17) into (16) and that into (9) to obtain $V_o^{\tau *}(a^\tau)$, the tax-adjusted value of an enterprise. Introduce it into the indifference condition, $Y = V_o^{\tau *}(a^\tau) - w(1-\tau_w) = 0$, totally differentiate it, arriving at

$$\frac{da^\tau}{d\rho} = -\frac{\partial Y/\partial \rho}{\partial Y/\partial a^\tau},$$

where

$$\begin{aligned} \partial Y/\partial \rho &= \frac{1}{1+r}(\tau_w^i - \tau_d)[B_1 + \frac{B_2}{1+r}] \\ \partial Y/\partial a^\tau &= \frac{1}{1+r}(1-\tau_w^i)(1-\tau_c)f(e,k;\theta^i) > 0, \end{aligned}$$

$i = H, L$. Therefore, $da^\tau/d\rho < 0$, when $(\tau_w^i - \tau_d) > 0$ and $da^\tau/d\rho > 0$, when $(\tau_w^i - \tau_d) < 0$. ■

Recently, Coelho, De Meza and Reyniers (2004) have suggested that entrepreneurs are typically overly optimistic. If correct, this proposal has implications when reading our results. The above proposition is informative on the effects of changing the presumptive rate ρ, with given tax rates, $\tau_w^H, \tau_w^L, \tau_d$ and given the degree of optimism or pessimism of the entrepreneur. The neutrality condition with respect to the Nordic dual requires $\left(\frac{da^\tau}{d\rho}\right) = -\frac{\partial Y/\partial \rho}{\partial Y/\partial a^\tau} = 0$. However, this is not satisfied apart from the case $\tau_w^i = \tau_d$ when the Nordic dual is not needed. When high profitability enterprises are concerned with $\tau_w^i - \tau_d > 0$, the Nordic dual encourages their entry as an increase in the presumptive rate ρ reduces both the marginal and the average tax rate of such enterprises, creating the incentive suggested by our proposition. When $\tau_w^i - \tau_d < 0$, enterprise formation is discouraged.

6 Concluding Discussion

In dual income taxation a split rule is needed for closely-held companies and unincorporated businesses to divide business income into income from capital and labor income. Its purpose is twofold: to avoid overtaxing the return on capital in unincorporated enterprises and to prevent the entrepreneurs organized as CHS's from shifting their labor income to the sphere of income from capital. This paper has studied the incentives created by such a split. We have emphasized the need to incorporate the neglected observation, the differential treatment of low and high profitability enterprises into the theory of enterprise taxation. The rules may in fact raise the tax burden of low-profitability small enterprises. These entrepreneurs face a higher cost of capital for start-up and expansion investments but a lower tax cost on effort provision than without the dual rules. The opposite incentives are offered to high-profitability enterprises. Their distributed profits would be taxed residually as earned income at a higher rate than the tax rate on capital income. By refraining from distributing such residual dividends and instead by investing and expanding their asset base, the basis of imputed future capital income, the entrepreneurs can smooth their tax payments.[13]

In our paper, we abstract from the outside financing for several reasons. Introducing outside finance would raise pertinent issues arising from informational asymmetries between the entrepreneurs and the financiers. We point to Fuest, Huber and Nielsen (2003) for discussion of those issues in the case of debt finance and to Keuschnigg and Nielsen (2003) in the case of venture capital finance. The earlier results by Kari (1999) and Lindhe, Södersten and Öberg (2004) point to the view that the introduction of debt financing does not raise

[13] The dual rules of the incorporated companies prevent the entrepreneur from avoiding the high marginal tax rate on earned income by raising her income at exit in the form of capital gains because they either double tax undistributed profits (Finland), tax only windfall capital gains (Norway) or apply the split rule to realized capital gains (Sweden).

behavioral incentives which would be particularly relevant to the dual tax.

As regards a comprehensive income tax with full offseting of losses, which is neutral in respect of the career choice between an entrepreneur and a laborer, we show that a tax rate increase in a system with a uniform rate structure for all kinds of income can increase the ability threshold of individuals who choose entrepreneurship. With such a rate structure, the effects of the dual rules themselves vanish by definition. A general tax rate cut within uniform tax rates thus induces a larger proportion of individuals to choose entrepreneurship. But, with non-uniform personal tax rates, the Nordic dual, with its embedded split rule, tends to lower (raise) the ability threshold of entrepreneurs who expect high (low) profitability from their enterprises. Therefore, we conclude that the Nordic dual enhances entrepreneurship where high profitability is expected.

Technical Appendix

Proof of the Career Choice

Plug the expression of tax liability (18) into the maximand (9) to derive the tax-adjusted value of the enterprise. We then prove the result that under a tax structure with uniform tax rates, i.e. $\tau = \tau_c = \tau_d = \tau_w = \tau_{p,}$ there is a positive relationship between the tax rate and the marginal entrepreneurial talent, $\partial a^\tau / \partial \tau > 0$, where the tax structure is constructed to be neutral in respect of effort choice e^τ and investments k^τ, K^τ. We assume that there is perfect loss-offset even for a start-up firm. Disallowing for perfect loss-offset would make our result hold for a further reason.

Consider thus the indifference (identity) condition for occupational choice

under taxation, i.e. an entrepreneur versus a laborer,

$$V_o^{\tau *}(a^\tau) = w(1-\tau_w),$$

or

$$\begin{aligned}
&-(c(e^\tau)+k^\tau)+\pi\frac{1}{1+\widehat{r}(1-\tau_p)}[a^\tau f(e^\tau,k^\tau)+k^\tau+V_1^{*\tau}(\theta)] \\
&-\pi\left[\tau_c\frac{a^\tau f(e^\tau,k^\tau)}{1+\widehat{r}(1-\tau_p)}+\tau_d\frac{(1-\tau_c)a^\tau f(e^\tau,k^\tau)+k^\tau-K^\tau}{1+\widehat{r}(1-\tau_p)}\right] \\
&-\pi\left[\tau_c\frac{F(K^\tau)}{(1+\widehat{r}(1-\tau_p))^2}+\tau_d\frac{(F(K^\tau)(1-\tau_c)+K^\tau)-k^\tau}{(1+\widehat{r}(1-\tau_p))^2}\right] \\
&-w(\tau_p)(1-\tau_w)=0.
\end{aligned}$$

Derive then the impact of an increase in the tax rate on the ability of the marginal entrepreneur. There will be three mechanisms to be considered. First, a marginal increase in tax rates reduces the after-tax cash flows to the enterprise in both production periods. This tends to raise the entrepreneurial threshold. However, there is an offsetting effect to the extent that the discount rate decreases. This effect will tend to push up the discounted value of the after-tax cash flows, though they are reduced in size. Third, an increased tax on interest income raises the present value of wage income in labor contracts. This is also bad news for entrepreneurship because it tends to push up the entrepreneurial threshold as labor market prospects are more attractive than they used to be. The present value of labor income, written explicitly, is

$$w(\tau_p) = w_o[\frac{1}{1+\widehat{r}(1-\tau_p)}+\left(\frac{1}{1+\widehat{r}(1-\tau_p)}\right)^2]$$

and we recall,

$$V_1^{*\tau}(\theta) = -K+\frac{F(K^\tau)+K^\tau}{1+\widehat{r}(1-\tau_p)}.$$

Inserting, we obtain

$$
\begin{aligned}
&-(c(e^\tau)+k^\tau)+\\
&\pi\frac{1}{1+\widehat{r}(1-\tau_p)}[(1-\tau_d)(1-\tau_c)af(e^\tau,k^\tau)-(1-\tau_d)K^\tau+(1-\tau_d)k^\tau]+\\
&\pi(\frac{1}{1+\widehat{r}(1-\tau_p)})^2[(1-\tau_d)(1-\tau_c)F(K^\tau)+(1-\tau_d)K^\tau+\tau_d k^\tau]\\
&=(1-\tau_w)w(\tau_p).
\end{aligned}
$$

Totally differentiating with respect to τ and a^τ, the entrepreneurial threshold is determined as

$$
\begin{aligned}
\frac{da^\tau}{d\tau}=&\frac{1}{(1-\tau)(2+r)f(e^\tau,k^\tau)}[\frac{2F(K^\tau)+af(e^\tau,k^\tau)(r^2+4r+2)}{1+r}+\\
&\frac{2(c(e^\tau)+k^\tau))}{\pi(1-\tau)^2}-\\
&\frac{2(1-\tau)rK^\tau+2(1-(1-\tau)r)k^\tau}{(1-\tau)^2(1+r).}].
\end{aligned}
$$

The entrepreneurial threshold is distorted by taxation even at uniform rates, basically because entrepreneurial income is subject to double taxation in an incorporated enterprise. This is the effect hinted at by King (1987). The ability threshold of the marginal entrepreneur is increased if $\frac{da^\tau}{d\tau}>0$. The expression for $\frac{da^\tau}{d\tau}$ can be grouped into two positive terms and one negative term. Recall that the opportunity cost r can be thought of as a compound return over a number of years and the operating cash flows are similarly accumulated returns over each stage. Therefore, the positive terms outweigh the negative term.

Proof of Proposition 7.

In the absence of taxation, the marginal entrepreneur a^m is identified from the condition $-(c(e)+k)+\pi\frac{1}{1+r}[a^m f(e,k)+k+V_1^*(\theta)]=w$. Inserting into the indifference condition under taxation, and recalling that $V_1^*(\theta)=-K+\frac{F(K)+K}{1+r(1-\tau)}$, we find that there is a linear dependence between the marginal abilities

$$a^\tau=\beta_o+\beta_1 a^m.$$

Its parameters are given by

$$\beta_1=\frac{(1-\tau_w)}{(1-\tau_c)(1-\tau_d)}\frac{f(e,k)}{f(e^\tau,k^\tau)}.$$

and by

$$\beta_o=\frac{1}{(1-\tau_c)(1-\tau_d)}[\frac{1}{\frac{\pi}{1+\widehat{r}(1-\tau)}f(e^\tau,k^\tau)}Z+\frac{w(\tau)-w}{1-\tau_w}]$$

where

$$\begin{aligned}Z=&(c(e^\tau)+k^\tau)-(1-\tau_w)(c(e)+k)\\&+\pi\frac{1}{1+\widehat{r}(1-\tau)}[(1-\tau_w)V_1^*(\theta)-V_1^{*\tau}(\theta)]\\&+\pi\frac{1}{1+\widehat{r}(1-\tau)}[(1-\tau_w)(k-(1+\tau_d)k^\tau)]\\&+\pi[\tau_d\frac{-K^\tau}{1+\widehat{r}(1-\tau)}+\tau_c\frac{F(K^\tau)}{(1+\widehat{r}(1-\tau))^2}\\&+\tau_d\frac{(F(K^\tau)(1-\tau_c)+K^\tau)}{(1+\widehat{r}(1-\tau))^2}]\end{aligned}$$

We know that under distortive taxes, $e^\tau<e$, $k^\tau<k$, and that $K^\tau<K$. Thus, $\frac{f(e,k)}{f(e^\tau,k^\tau)}>1$. With a uniform tax rate, $\frac{(1-\tau_w)}{(1-\tau_c)(1-\tau_d)}>1$. Therefore, $\beta_1>>1$. Moreover, the greater the dividend and the corporate tax rates are, the greater the coefficient β_1 is. This tends to make $a^\tau>a^m$. We notice that there are both

positive and negative terms in Z. Yet, the term $\frac{w(\tau)-w}{1-\tau_w}$ definitively is positive. Though we cannot determine the sign of Z for sure, the facts are that $\beta_1 >> 1$ and that $\frac{w(\tau)-w}{1-\tau_w} > 0$. This allow us to suggest that the dependence between a^τ and a^m is positive; as a matter of fact, $\beta_o \geq 0$ is not even needed for $a^\tau > a^m$.

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