The dual income tax and firms' income shifting through the choice of organizational form and real capital investments.

Annette Alstadsæter*
Norwegian School of Economics and Business Administration†

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Abstract

The dual income tax provides the self-employed entrepreneur with huge incentives to participate in tax minimizing income shifting to have more of his income taxed as capital income. The Norwegian split model is designed to remove these incentives, but it contains loopholes. The present paper concludes that the split model induces the self-employed entrepreneur to over-invest in firm real capital. In addition, the corporate organizational form serves as a tax shelter for high income entrepreneurs. The higher his income and the higher the difference between the marginal tax rates on labor and capital, the larger the incentives to incorporate.

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†Department of Economics, Norwegian School of Economics and Business Administration, Helleveien 30, N-5045 Bergen. Presently guest at: Research Department, Statistics Norway, Pb. 8131 Dep, N-0033 Oslo. Fax: +47 21 090040. e-mail: annette.alstadsater@nhh.no.

1 Introduction.

In line with the trend in the OECD-area, the Nordic countries carried out base broadening and rate cutting tax reforms in the early nineties. By introducing the dual income tax[1] they went even further and in a different direction than previous reforms in other countries. The dual income tax separates capital income from labor income. In contrast to the global income tax, which levies one tax schedule on the sum of income from all sources, the dual income tax combines a low proportional tax on capital income with a progressive tax on other income, mostly labor income. Later Belgium, France, Italy, and Japan also introduced versions of the dual income tax and have separate tax schedules for labor income and interest income[2]. This constitutes a huge natural experiment which needs to be studied more closely to draw lessons for future tax reforms.

The differential treatment of capital income and labor income under the dual income tax has several justifications[3]. First, the globalization of capital markets limits the scope of national taxation of mobile capital. Typically, labor is much less mobile than capital and may be taxed at a higher rate without risking an erosion of the tax base. Second, labor income constitutes the basis for future old age retirement benefits, as well as present health care privileges. Third, capital enters into taxable wealth. The efficient tax rate on capital income should hence be viewed in connection with the wealth tax rate. Fourth, a lower tax on capital income stimulates personal saving. Fifth, in the presence of inflation, a low tax on capital income compensates for the fact that the tax is levied on the nominal, and not the real return to capital. In addition to this, the justification for keeping the tax on capital income proportional is that a progressive tax on capital income would be highly exposed to avoidance.

One weakness of the dual income tax is the distributional implications of the taxation of entrepreneurs and small businesses. Income from self-employment and small businesses stems partially from return to the labor effort put in by the active owner, and partially from the return to capital invested in the firm. For medium and high income classes, there is a large difference in the marginal tax rates on capital

[1]The dual income tax was introduced in Sweden 1991, Norway 1992, and Finland 1993. The idea originated in Denmark, and was implemented in their 1985 tax reform. Later they introduced a hybrid system, mostly due to redistributive concerns.

[2]See Fuest and Weichenrieder (2002).

[3]See Sørensen (1998) and (2001).

and labor income[4], providing large incentives for income shifting from labor income to capital income in order to minimize tax payments. Owners of small businesses can easily do this by reducing their own wage payments and increase dividend payments, in order to maximize net income. In the extreme case, all individuals would start own businesses in order to participate in this tax arbitrage, which would totally erode the tax base. To prevent this, the dual income tax countries have implemented different versions of a "split" system of dual income taxation for self-employed entrepreneurs and corporations owned by the employees. Under this split system, one part of firm profits is taxed as capital income and the remaining profits are taxed as labor income.

The Norwegian split model of dual income taxation was introduced at the end of a depression, and a period of strong economic expansion followed. In the years after the tax reform, the number of self-employed individuals decreased, while the number of corporations increased. Does this mean that the split model discourages entrepreneurship, or does it mean that the activity of the entrepreneurs is unchanged, while their preferred organizational form has changed[5]? Also, the share of corporations taxed under the split model decreased from 52% in 1992, to 32% in 2000. Which factors make this type of behavior rational? The present paper studies the tax induced distortions in a small firm's investment decision and choice of organizational form in a theoretical model, and three questions are asked. First, which are the incentives to invest in real capital in the firm for a self-employed entrepreneur under the split model? Second, which are the incentives to invest in real capital in the firm for an incorporated entrepreneur not liable to the split model? And third, which are the entrepreneur's determinants for switching organizational from self-employed to corporation?

The tax code's effect on the firm's choice between debt and equity, as well as the choice of whether to retain or distribute earnings are thoroughly discussed in the literature[6]. Lindhe et al. (2002) analyze the effects of the Swedish, Finnish and Norwegian split models on the cost of capital in closely held corporations.

[4] At the present, the difference in the top marginal tax rates on labor income and capital income is 37.3 percentage points in Norway, including social security contributions.

[5] Slemrod (2001) states that in many cases, what appears to be real effects of tax changes are in fact only the result of creative re-labelling activity by the individuals, and this needs to be carefully considered when evaluating the effects of a tax reform.

[6] See for instance Gentry, 1994

Different levels of corporate and personal tax rates provide private investors with incentives to use corporations as a tax shelter to save their capital income from high personal tax rates, a point highlighted by Fuest and Weichenrieder (2002).

The combination of low corporate tax rate and high personal income tax rate provides managers with incentives to relabel labor income as capital income, effectively reducing their tax on salaries, an effect identified empirically on Norwegian micro data by Fjærli and Lund (2001)[7]. But this income shifting may not be optimal if the individual has a long term horizon. By receiving wages, he pays higher taxes, but he also becomes entitled to future pension payments from the public sector. Dividends do not entitle him to future pension. If the individual cares about his retirement, it might be optimal to pay more wages than the short-term tax minimization predicts, and Fjærli and Lund also document the presence of this effect.

There is an endogeneity of a firm's tax system: by changing organizational form the firm can experience a shift in the taxes it faces. Gravelle and Kotlikoff (1989, 1993) started a new strand of the literature on the firm's choice of organizational form following a tax reform altering the relative tax rates on personal and corporate income. If corporate tax rates increase relative to personal tax rates, this reduces the firm's incentives to incorporate, and vice versa. Empirical support for this is presented by Goolsbee (1998), Gordon and MacKie-Mason (1990, 1994), and MacKie-Mason and Gordon (1997).

Non-tax factors also play an important role in the firm's choice of organizational form, as Ayers et al (1996) thoroughly discuss. Business risk and default risk are factors that work in favor of the corporate organizational form. The self-employed individual carries all risk himself and is personal responsible for all claims. He may in case of a bankruptcy be liable to pay damages beyond the capital he has invested in the firm. In a corporation, the individual share holder has limited liability and may in case of a bankruptcy loose at most the capital he has invested in the firm. The higher the relative risk of the operation, the more likely the business will be organized as a corporation. Another important factor is the opportunity to raise new capital. A corporation may issue new shares and might more easily raise new capital than the self-employed entrepreneur. Also, size does matter. As firms become large, owners are more likely to hire professional managers and become less directly involved in

[7]This study utilizes rich micro data from 1991, a year prior to the full implementation of the 1992 tax reform. Hence the split model does not apply here.

management decisions. Similarly, the higher the number of owners in a firm, the higher the probability for conflict among them. Then conflicts may be minimized when choosing the corporate form with a more formal ownership structure. The self-employed entrepreneur has full control over the activity and strategy of his firm. This might change if he organizes as a corporation with passive shareholders who have strong opinions on how the firm should be run, and Andersen (1993) states that if the entrepreneur very much appreciates his freedom and wants to lay all business strategies himself, he should not incorporate.

The present paper concludes that the split model of dual income taxation provides the individual with large incentives to participating in tax minimizing income shifting. It actually induces the self-employed individual to over-invest in less risky firm real capital. Real capital investments is a device to shift income from labor income to capital income and to enjoy the lower capital income tax rate on a larger share of total income. In addition, the corporate organizational form serves as a tax shelter for high income entrepreneurs. The higher his income, and the larger the difference between the tax rates on labor income and capital income, the larger the incentives to incorporate (with less than two thirds of the shares held by the active owner) to escape the split model and reduce total tax payments. Only low-income entrepreneurs have incentives to stay under the split model in order to enjoy the forwarding of negative imputed return to labor, in order to deduct this against future positive imputed return to labor. Empirical observations support the predictions of the model.

Section 2 describes the Norwegian version of the split model of dual income taxation in detail. Section 3 presents the model, and sections 4 and 5 analyze the effect of the split model on the self-employed and incorporated entrepreneur's investment portfolio. Section 6 compares the two organizational forms, and section 7 extends the model to include inaccurate tax allowances for real capital depreciation. Section 8 presents empirical evidence and concludes.

2 The Norwegian split model.

The Norwegian tax reform of 1992 implemented the dual income tax in the purest form of all the Nordic countries. When considering how to solve the problems of a consistent tax treatment of small businesses, the split model of dual income taxation

was chosen, separating income from different sources. Under the split model, an imputed return to the capital invested in the firm is calculated by multiplying the value of the capital assets[8] by a fixed rate of return on capital[9]. The imputed return to capital is taxed at the corporate rate, which equals the capital income tax rate at the individual level. Business profits net of imputed capital return[10] is the imputed return to labor, which is taxed as labor income whether the wages are actually paid to the owner or not. This reduces the possibility for the self-employed individual to classify all income as capital income in order to reduce taxes. If imputed labor income is negative, the loss does not offset other income, but may be carried forward to be deducted against future imputed labor income. Both self-employed individuals and corporations where active[11] owners possess two-thirds of the shares or more are taxed under the split model.

By exaggerating the capital assets of the firm, the self-employed individual achieves a reduction in the imputed labor income, and reduces his tax payments. This may be done in several ways, for instance by shifting from leased to owned[12] premises and machinery, by increasing stocks at the end of the year, by increasing and extending customers' trade receivables at the end of the year, and by financing private durable goods in the firm. Acquired good-will is very hard for the tax authorities to value, and overstating this and other parts of firm capital reduces the imputed labor income. Also, by letting the firm invest in durable private consumption goods such as boats, cars, cottages, etc. the owner increases his consumption and reduces tax payments. Even if the increased wealth tax due on the value of capital assets is taken into account this strategy is lucrative for the self-employed[13].

[8] These assets include physical business capital, acquired good-will and other intangible assets, business inventories, and credit extended to customers net of debt to the firm's supplyers.

[9] This rate of return on capital is set anually by the Parliament on the basis of the average rate of return on government bonds (5% in 2000) pluss a risk premium (5% in 2000).

[10] If the firm has employees in addition to the owner(s), a salary deduction of 12% of the wage bill from taxable wage payments applies before the return to the owner's labor effort is imputed.

[11] An owner is characterised as active if he works more than 300 hours annually in the firm. Close family members of active owners are not recognized as passive owners by the tax authorities.

[12] There is an offsetting shift of ownership regarding former owners of leased assets. Presumably there will be a clientele effect where assets are owned by self-employed and companies subject to the split model.

[13] Assume that the self-employed individual increases his investments by NOK 100. At the going rate his imputed return to capital increases with NOK 10, which means that the imputed return to

It can even be profitable to borrow in the financial market to invest in business capital. Such debts are private and entitles to tax allowances.

But the largest loophole in the split system is probably at the margin, of whether a firm is subject to the split model at all. By incorporating and selling more than one-third of the shares to investors not active in the firm, firms can avoid being taxed according to the split system. The corporation is then free to pay its active owners as little wage and as much dividends as it likes. This technique is especially attractive for individuals in "liberal" professions, such as lawyers, medical doctors and dentists. These are typically professions with little capital required to run a business, and the imputed labor income is accordingly high. As a corporation they may take out all the compensation for their own labor effort as dividends.

3 The model.

For simplicity, the following analysis abstracts from many of the details discussed above. Consider an utility maximizing entrepreneurial individual who lives for two periods and who is about to start a business. He needs to decide how much to invest in the firm, and which organizational form to choose. As an entrepreneur, he is taxed under the split model. A corporation offers the possibility to reduce tax payments by reducing his wage and increasing dividends, since he no longer is taxed according to the split model. Different entrepreneurs have different preferences, and some have clear preferences for which organizational form they prefer. Here consider the marginal entrepreneur who initially has no intrinsic value of either of the two organizational forms.

The individual has a given time endowment in both periods, which he spends working in his firm and enjoying leisure. In order to study the individual's investment decision and the choice of organizational form separately from his labor supply decision, assume that total time spent working in his firm is given. The remaining

labor income is reduced by the same amount. Assuming that he is in the top wage income bracket, this increased investment reduces his personal taxes by NOK 5.2. The increased return to capital is subject to taxation on firm level at 28 per cent. In addition he is subject to a wealth tax of 1.1 per cent on total wealth. His taxes on firm level hence increases with NOK 3.9. Even when the increased wealth tax is taken into consideration, it still pays off to engage in this kind of income shifting.

leisure time is hence also given. A change of organizational form in order to reduce tax payments is only a re-labelling of the existing nature of the self-employed's activity, and he puts in the same amount of labor in the two cases. But the change of organizational form could nevertheless change the return to working, since it affects the net return to entrepreneurial activity in the presence of taxes.

Utility and separability. Let the individual's utility function be represented by

$$U = u(C_1, C_2), \tag{1}$$

which has positive and non-increasing marginal utilities of both first and second period consumption. The individual chooses the investment portfolio and organizational form that maximize his lifetime utility. The Fisher separability property of this model ensures that the investment decision is independent of the utility function, as is the choice of organizational form. He chooses the alternatives that generate the highest net present value of income. No intrinsic values of the different organizational forms are present, and the individual maximizes the net present value of his income such as to maximize his consumption. Hence the utility maximization problem reduces to an income maximization problem.

Investments and income. In the first period he has a given income $\overline{Y}$, which he allocates to investing in real capital K in his new firm, and saving B in the financial market, in order to maximize his lifetime income. Investments in the financial market yield the exogenously given real rate of return, r. Savings may be negative, and then the individual borrows in the financial market. Loans are repaid in full in the second period.

Investments in firm real capital yield the return $R(K)$, which is the return to the individual's entrepreneurial investment and depends positively on the sales value of firm production and negatively on the depreciation rate, δ, of firm real capital.

The exact expression for $R(K)$ varies according to the chosen organizational form and will hence be specified separately in the two following sections along with the different expressions for the individual's lifetime budget constraint.

The individual's first period income, Y_1, is given by:

$$Y_1 = \overline{Y} - K - B. \tag{2}$$

Second period income, Y_2, is given by:

$$Y_2 = R(K) + K + [1 + r] \cdot B - T, \tag{3}$$

where T is total tax payments, which depends on the chosen organizational form. The net of depreciation real capital is liquidized in the second period to finance his consumption.

Production. Our individual is the only person employed by the firm, and thus labor as a production factor in the firm is fixed. The firm produces one type of product, which is sold in the second period at a given price[14] set to unity, $p = 1$ The production level X varies according to the amount of capital, K, invested in the firm, and it is given by the production function

$$X = F(K), \tag{4}$$

which has a positive and decreasing marginal product of capital.

Taxes. Let t_w be the proportional tax rate on labor income and t_k the proportional tax rate on capital income. We simplify by assuming that the tax on labor income is proportional, when it in fact is progressive in most countries, including the countries with a dual income tax. But one might think of this tax as the top marginal tax rate on labor income. The progressive labor income tax schedule is then in fact "flat on the top". Assume that the tax rate on labor income is higher than that on capital income, $t_w > t_k$.

An additional pay-roll tax, t_p, applies on all wage payments made by the corporation[15], and this tax is paid on firm level. Hence the shareholders carry this cost according to the amount of shares they hold.

Let α be the share of actual depreciation which is tax deductible[16]. If $\alpha > 1$, then the tax code allows for generous deductions for real capital depreciation, and if $\alpha < 1$, less than the actual depreciation is tax deductible. In the first parts of the following analysis, let $\alpha = 1$.

No wealth tax is present in the model.

[14]The market demand for this good is nevertheless not given.

[15]In 2001, the ordinary pay-roll tax was 14,1% on all wage payments made to employees. It is pure revenue generating and does not entitle the individual to additional benefits.

[16]This follows the modelling approach of Sandmo (1989).

Risk. The more the individual invests in firm real capital, the less diversified is his investment portfolio, and the higher is his potential loss in case of bankruptcy. Bonds are risk free, and yield a safe annual return.

Under the split model of dual income taxation there is an implicit compensation for the riskiness of investing in the own firm, which will be discussed thoroughly in the next section. Besides this tax allowance for risk under the split model, risk does not exist as a motive for changing organizational form, since the present paper analyzes the tax induced change of organizational form. Both the self-employed and the incorporated entrepreneurs are risk neutral. The self-employed entrepreneur carries all risk of the operation himself, while the incorporated entrepreneur shares the risk with his fellow shareholders.

4 The self-employed entrepreneur.

Let the subscript "s" denote the previously described variables when the entrepreneur is self-employed. The self-employed individual owns the firm and has full disposal over total sales income, $F(K_s)$. The real capital depreciation, δ, is a cost of production. Then the return to entrepreneurial investment, $R(K)$, can be expressed as

$$R(K_s) = F(K_s) - \delta \cdot K_s. \tag{5}$$

The imputation rate and risk valuation. A self-employed entrepreneur has full disposal over firm income, and would, if he could and ceterus paribus, have all income taxed as capital income. The tax authorities assign a part of the income as a return to the capital invested, and the residual as a return to labor, which is taxed as labor income. When assigning the part of the income to be taxed at the capital income tax rate, a return to real capital in the firm is imputed at a fixed rate r_i of the total value of the firm real capital at the beginning of the period[17]. The subscript "i" refers to "imputed".

[17] When the split model was first introduced, the self-employed individual could choose whether the value at the beginning or at the end of the period should be used in the imputation of the return to firm capital. Later this changed, and at the present, the average of the values of firm capital at the beginning and at the end of the period should be used to impute the return to firm capital. The first specification is chosen for this paper.

The imputation rate is set by the parliament, and it is the sum of the average return to government bonds, r, and a risk compensation factor. This risk compensation factor acknowledges the fact that the entrepreneur takes a risk by investing in real capital in the firm and hence looses the possibility to risk diversification in the financial market. The individual has his own assessment of this risk and the additional risk premium he requires to be willing to invest in risky firm real capital. Let μ be the difference between the risk premium offered by the tax authorities and the risk premium demanded by the entrepreneur. The imputation rate is defined as

$$r_i = r + \mu. \tag{6}$$

The government's risk compensation is the same for all type of firms and all types of real capital. Hence less risky projects or sectors tend to have an over-compensation of the actual risk, $\mu > 0$, as more risky projects or sectors are under-compensated for their actual risk, $\mu < 0$. The investment distortions created by this will be thoroughly discussed in the following sections.

Tax payments and the individual's budget constraint Total taxes due for the self-employed are given by

$$T_s = t_k \cdot r_i \cdot K_s + t_w \cdot \{F(K_s) - [\delta + r_i] \cdot K_s\} + t_k \cdot r \cdot B_s. \tag{7}$$

Capital income tax is paid on the imputed return to invested capital, $r_i \cdot K_s$. Labor income tax is paid on the imputed return to labor, which is the value of the production net of production costs (which here is the tax recognized real capital depreciation[18]) and the imputed return to invested capital[19], $\{F(K_s) - [\delta + r_i] \cdot K_s\}$. In addition, capital income tax is paid on interest income from the investments in bonds. Combining the equations (3), (5) and (7), the self-employed individual's private net disposable second period income, $Y_{2,s}$:

$$\begin{aligned} Y_{2,s} &= [1 - t_w] \cdot [F(K_s) - \delta \cdot K_s] + \{1 + [t_w - t_k] \cdot r_i\} \cdot K_s \\ &\quad + [1 + (1 - t_k) \cdot r] \cdot B_s \end{aligned} \tag{8}$$

[18] Here $\alpha = 1$.

[19] If the imputed labor income exceeds a given threshold, which in 1993 was NOK 1,25 Million, the remainder is taxed as capital income. Assume in this analysis that the imputed labor income always is below this threshold.

The first part of the right hand side of (8) represents the individual's net of taxes income from his firm if all income were taxed as labor income. But a part $r_i \cdot K_s$ of the income is actually taxed as capital income, which increases his net income by a fraction $[t_w - t_k]$ of total imputed return to firm real capital. The larger the difference between the marginal tax rates on labor income and capital income, the higher is the individual's net disposable income.

The net present value of the individual's lifetime income as a self-employed entrepreneur, Y_s, is found by combining the equations (8) and (2):

$$Y_s = Y_1 + \frac{[1 - t_w] \cdot [F(K_s) - \delta \cdot K_s] + \{[t_w - t_k] \cdot r_i - (1 - t_k) \cdot r\} \cdot K_s}{1 + (1 - t_k) \cdot r} \tag{9}$$

The individual chooses the investment level that maximizes his lifetime income.

4.1 The self-employed's investments in the absence of taxes.

In optimum, the value of the marginal product of capital, F_{K_s}, equals the user cost of capital:

$$F_{K_s} = \delta + r. \tag{10}$$

The individual invests capital in the firm until the value of the production from this additional investment equals the cost of the investment, namely the sum of real capital depreciation and the return to the financial investments, the real interest rate. Since the marginal product of capital is decreasing in the amount of capital, if either or both of the depreciation rate and the real interest rate increases, the amount of real capital invested in the firm decreases because of the increased costs.

4.2 The self-employed's investments under the split model.

Under the split model of dual income taxation, where $r_i = r + \mu$, the self-employed individual's optimal investment condition reduces to

$$F_{K_s} = r + \delta - \frac{t_w - t_k}{1 - t_w} \cdot \mu \tag{11}$$

Observe that the optimal investment condition reduces to the Fisher-condition (10) if taxes are comprehensive, $t_w = t_k$. The return to all investment alternatives are taxed at the same rate, and this eliminates the incentive to shift income from labor income to capital income as a re-labelling effort to reduce tax payments. Any tax

induced distortion to the individual's investment decision is hence eliminated. So, *a comprehensive and proportional income tax is a neutral tax on the return to capital, and it introduces no distortions in the investment decision of the self-employed entrepreneur.*

We have in this paper, though, assumed that $t_w > t_k$, which means that the last fraction of (11) depends critically on the net risk compensation rate μ.

When $\mu > 0$, the entrepreneur is over-compensated for the risk of investing in real capital in his firm, and the presence of taxes introduce distortions in the investment market. This over-compensation represents an additional return to real capital investments compared with bonds, and the individual invests in real capital at a lower marginal return than he would have done in the absence of taxes. *Hence the split model induces the individual to over-invest in real capital.*

The entrepreneur is on the other hand under-compensated for the risk of investing in real capital in the firm when $\mu < 0$. *Hence the split model induces the entrepreneur in a risky sector to under-invest in real capital in the firm.*

How large these tax-induced distortions are depend on the sizes of the tax rates and the difference between them, as well as on the size of the imputation rate to labor effort.

If the tax authorities' risk compensation rate equals the demanded risk compensation by the entrepreneur, $\mu = 0$, the split model creates no distortions in the investment portfolio of the entrepreneur.

The effect of tax changes on the investment behavior. How is the individual's investment decision affected by tax on capital income and on labor income? Comparative static analysis of the optimal investment condition (11) reveals the following:

i) **Labor income tax:**

$$\frac{\partial K_s}{\partial t_w} = -\frac{\mu \cdot [1 - t_k]}{F_{K_s,K_s} \cdot [1 - t_w]^2}. \tag{12}$$

The change in the marginal product of capital by increased investments in real capital in the firm, F_{K_s,K_s}, is negative. Thus the effect of an increased labor income

tax rate on the self-employed entrepreneur's investment behavior depends critically on his valuation of the riskiness of the firm.

If he estimates the risk to be moderate, $\mu > 0$, then the higher the tax rate on labor income is, the more the self-employed individual invests in firm real capital. This is the tax arbitrage effect. Real capital is a more attractive income shifting device the larger the difference between the two tax rates is. And the more real capital invested in the firm, the higher is the imputed return to firm real capital, and the lower is the imputed return to labor effort, which is to be taxed at the higher labor income tax rate[20].

If the firm is highly exposed to risk, $\mu < 0$, an increase in the tax rate on labor income induces the self-employed individual to invest less in firm real capital and more in risk free bonds. The increased tax on labor income reduces the individual's total return to entrepreneurial activity, but he does not want to invest more in real capital in his firm, since he is under-compensated for the risk he is exposed to.

ii) **Capital income tax:**

$$\frac{\partial K_s}{\partial t_k} = \frac{\mu}{F_{K_s,K_s} \cdot [1 - t_w]} \tag{13}$$

Increased tax on capital income reduces the tax arbitrage gain of shifting income from labor income to capital income through increased investments in moderately risky firm real capital, $\mu > 0$. Hence the self-employed's investment in firm real capital is reduced as the tax on capital income is increased. On the other hand, the above result states formally that the lower the tax rate on capital income is, the more the individual invests in firm real capital and the less he invests in bonds. This is due to the increased return to income shifting when tax rate on capital is reduced.

But if the risk of the operation is higher than the government compensates for, $\mu < 0$, the value of this under-compensation, $[t_w - t_k] \cdot r_i \cdot K_s$, decreases, and the individual invests more in firm real capital as the capital income tax rate increases.

[20] But the total effect depends on other factors as well. The higher the capital income tax rate, the smaller the difference between the two tax rates, and the smaller the reduction in tax payments stemming from this tax arbitrage activity. Also, the more convex the production technology, the less is the production increase from an increase in firm capital, and the less does the individual invests in additional firm capital.

All real capital is owned by the firm in this model, and in order to benefit from the possibility to reduce tax payments trough increased investments, the entrepreneur must increase the total level of real capital in the firm. On the other hand, if parts of the real capital were leased, the entrepreneur could purchase this real capital and still have the same level of expenses, just switching from having to pay lease to pay interest on a loan. This manoeuvre would leave the level of firm real capital unchanged, and it would reduce the entrepreneurs tax payments. Either way the split model contains great incentives for the self-employed entrepreneur to change his investment behavior.

A digression on the wealth tax. A wealth tax would reduce the incentives to overstate the value of firm real capital. No wealth tax is present in this model, and in this framework the presence of a wealth tax would not alter the split-model's distortions to the investment portfolio of the entrepreneur. Increased investments in real capital means reduced investments in financial capital and does not increase the wealth tax liability.

The indirect income function. Let $\widetilde{K_s}$ be the investment level in firm real capital that maximizes the individual's net lifetime income. By choosing this investment level the entrepreneur maximizes the present value of his lifetime after tax income and receives the income $\widetilde{Y_s}$, which is the highest achievable income level for the individual if he organizes as a self-employed at the given tax rates. This maximum value function is the indirect income function, and it is found by applying the investment level $\widetilde{K_s}$ in the individual's lifetime income function, the right hand side of equation (9). Rearranging this, the indirect income function is given by:

$$\widetilde{Y_s} = \overline{Y} + \frac{[1-t_w]\cdot F(\widetilde{K_s}) + \{[t_w - t_k]\cdot \mu - [1-t_w]\cdot[r+\delta]\}\cdot \widetilde{K_s}}{1+(1-t_k)\cdot r} \qquad (14)$$

The indirect income function will come in handy in the later analysis of the organizational choice.

5 The incorporated entrepreneur.

In the following, use the same variables as previously described in the paper, with the subscript "l" denoting a corporation with limited liability. The production tech-

nology is independent of organizational form, and the same production function as in the self-employed case applies.

If he incorporates, the individual receives some revenue from selling shares in his firm to external investors. Model this as a reduction in the amount of real capital investment required by the individual. The entrepreneurial individual invests a share $\beta \geq 1$ of total capital, and passive[21] owners invest a share $[1-\beta]$. The present paper concentrates on analyzing an entrepreneur's choice of organizational form, given that he undertakes the same activity. The choice of whether to be an entrepreneur or a worker employed by others is not considered, and hence it is assumed that the individual always wishes to have some ownership in his firm, that $0 < \beta$.

The individual's first period budget constraint (2) thus changes in the corporate case:

$$Y_{1,l} = \overline{Y} - \beta \cdot K_l - B_l. \tag{15}$$

At the same level of real capital in the firm under the two organizational forms, the individual may invest more in the financial market if he organizes as a corporation and has passive shareholders, that is if $\beta < 1$. The incorporated entrepreneur hence has a greater possibility to diversify his investments at a given level of real capital in the firm.

Dividends and wage payments. Shareholders receive dividend payments as a return to their invested capital in the firm. The owners of the corporation, represented by the shareholder majority, decide the wage level of the active owner. All firm profits are paid as dividends to the shareholders in the second period. Usually capital costs and labor costs are deducted from sales income to find firm profits available for dividend payments. This is a special case, though. The only reason for the entrepreneurial individual to incorporate is to be able to pay the return to his entrepreneurial activity as any given combination of wages and dividends. Hence only real capital depreciation is deducted before the remainder of the sales income is either paid as wages to the active owner or distributed as dividends to all owners.

Dividends are paid as a proportional return rate $\Omega \leq r_d \leq 1$ of corporate sales income, $F(K_l)$, of which the individual receives the share β. The lower boundary Ω is defined later in this section. Wage payments are the remaining of the profits,

[21] In this model all share holders are passive, except for the entrepreneur.

and are given as $[1 - r_d] \cdot F(K_l)$. The real capital depreciation is also carried by the shareholders, and the entrepreneurial individual carries his share β of the depreciation $\delta \cdot K_l$. Passive owners invest $[1 - \beta] \cdot K_l$ and receive $[1 - \beta] \cdot [r_d \cdot F(K_l) - \delta \cdot K_l]$. The individual's return to his entrepreneurial investment is thus

$$R(K_l) = [1 - r_d] \cdot F(K_l) + \beta \cdot r_d \cdot F(K_l) - \beta \cdot \delta \cdot K_l. \tag{16}$$

Tax payments and the individual's budget constraint. If the individual chooses to organize as a corporation, the size of his ownership determines which regime the corporation is taxed under. If the active owner holds more than two thirds of the shares, $\beta > 2/3$, the corporation is taxed under the split model, and then $r_d = r_i$. If the active owner holds less than two thirds of the shares, $\beta < 2/3$, with the rest of the shares held by passive owners, the corporation is taxed according to corporate tax rules.

Private disposable income of the entrepreneur is given by net wage receipts, net return to financial investments and his share of dividend payments, net of depreciation. Since the individual only invests a share of total firm capital, he may invest more in the financial market. Total tax payments for the individual when he organizes as a corporation are given by T_l:

$$T_l = [t_w + \beta \cdot t_p] \cdot [1 - r_d] \cdot F(K_l) + t_k \cdot r \cdot B_l + t_k \cdot \beta \cdot [r_d \cdot F(K_l) - \delta \cdot K_l] \tag{17}$$

Labor income tax is paid on total wage receipts by the individual, $[1 - r_d] \cdot F(K_l)$. The pay-roll tax is levied on firm level on all wage payments, and the individual indirectly carries a part β of this tax, since firm profits are reduced by this tax and thus also what is available for dividend payments. The remainder is carried by the passive shareholders. Capital income tax is paid on total interest income from investments in the financial market, $r \cdot B_l$. In addition, the firm pays corporate income tax on total firm profit, which is sales income net of labor costs and depreciation. Here corporate taxes are paid on dividend payments net of real capital depreciation, $[r_d \cdot F(K_l) - \delta \cdot K_l]$, since all profits are paid as dividends. Corporate taxes are paid on firm level, and the individual carries a share β of these costs, since his dividend receipts are reduced by the same amount. In principle, dividends are subject to capital income taxation. But the individual receives a tax credit for taxes paid at corporate level. The corporate income tax rate and the capital income tax rate on individual level are identical, and hence his tax payments due on dividend receipts

and his tax credit from taxes paid on corporate level cancel out. The incorporated net present value of total lifetime income, Y_l, is given by.

$$Y_l = \overline{Y} + \frac{\left\{ \begin{array}{c} [1 - t_w - \beta \cdot t_p] \cdot [1 - r_d] \cdot F(K_l) \\ + [1 - t_k] \cdot \beta \cdot \{r_d \cdot F(K_l) - [\delta + r] \cdot K_l\} \end{array} \right\}}{1 + [1 - t_k] \cdot r} \tag{18}$$

If $\beta = 1$, the active owner is the sole share holder of the corporation, and (18) reduces to the the budget constraint of the self-employed.

The individual maximizes his lifetime income (18), and the optimal investment condition is found from the first order condition with respect to real capital. Below it is discussed how the presence of taxes affects the corporation's investment decision and dividend payments, as well as the individual's optimal ownership share.

5.1 Corporation in the absence of taxes.

It can be shown[22] that in absence of taxes, $\beta = 1$ is the only possible solution, and hence the entrepreneur holds all the shares. As long as the entrepreneur is the sole owner and the only person working in the firm, it does not matter whether he pays the firm profits as wages to himself or as dividends, and all values of the dividend rate r_d maximize his income. The optimal investment condition reduces to

$$F_{K_l} = r + \delta, \tag{19}$$

which is identical to the Fisher condition (10) developed in the self-employed case. *The individual's investment portfolio is in the absence of taxes unaffected by the choice of organizational form.*

5.2 Corporation in the presence of taxes.

The optimal investment condition in the presence of taxes reduces to:

$$F_{K_l} = \beta \cdot \frac{[1 - t_k] \cdot [\delta + r]}{[1 - t_w - \beta \cdot t_p] \cdot [1 - r_d] + [1 - t_k] \cdot \beta \cdot r_d} \tag{20}$$

This depends crucially on the dividend payment rate and the entrepreneur's ownership rate in the firm, so let us now study these in detail.

[22] The deduction of this result is shown in the appendix, which is available from the author upon request.

The income function is linear in β and r_d, and the maximum values of these variables hence are at the boundaries, as in the case without taxes. Now $0 < \beta \leq 2/3$, and thus $\beta = 2/3$ is the optimal value of the entrepreneur's ownership in the corporation, which means that the firm is not taxed according to the split model.

How much wages to pay the employee and what to pay in dividends is decided by the majority of the shareholders, which in this case means the entrepreneur himself. He chooses the combination of dividend payments and wage payments such as to maximize his own disposable after-tax income, given that the passive shareholders receive at least the same net return on their invested capital as in the financial market. This lower boundary of r_d is given by Ω_t. Since all wage payments are subject to the pay-roll tax on firm level, this cost reduces the total amount to be distributed as wages and dividends, and the passive shareholders are to be compensated for this as well. In this case Ω_t is given by[23]:

$$\Omega_t = \frac{r \cdot [1 - t_k] \cdot \frac{K_l}{F(K_l)} + t_p}{1 - t_k + t_p} \tag{21}$$

The value of this lower boundary on the dividend payment rate depends negatively on the tax rate on capital income, since this reduces the net return to the alternative investment as well, and positively on the pay-roll tax rate, since this reduces the profit of the firm. A low productive firm needs to pay a higher share of their profits as dividends to keep their shareholders satisfied than a highly productive firm. Productivity is here measured as sales income per unit of firm real capital. $\Omega_t = 1$ if $\frac{F(K_l)}{K_l} = r$, and $\Omega_t < 1$ if $\frac{F(K_l)}{K_l} > r$.

If the active owner in the corporation reduces his net wage receipts by one unit, how much can he then increase his dividend receipts by? By reducing the active owner's net wage receipts by one unit, wage payments made by the firm is reduced by $\frac{1}{1-t_w}$. The corporation pays pay-roll tax on all wage payments to the active owner, and hence total labor costs for the firm is reduced by $\frac{1+t_p}{1-t_w}$. Firm profit increases by this amount and is taxed at the corporate tax rate, which is the same as the tax rate on capital income on private level. The firm pays all additional net profits as dividends to the shareholders, of which the active owner receives 2/3. This kind of income shifting then yields the increased income I_l per unit reduced net wage

[23] See mathematical appendix for the development of the equation.

receipts by the active owner:

$$I_l = \frac{2}{3} \cdot \frac{[1 - t_k] \cdot [1 + t_p]}{1 - t_w} - 1. \tag{22}$$

This income shifting is more profitable for the individual the more of the corporation he owns and the higher the pay-roll tax and the tax rate on labor income are. A high tax rate on capital / corporate income reduces the incentives to participate in this kind of income shifting[24].

The only reason for the entrepreneur to incorporate is to escape the split model and increase is private after-tax income, and he does so through reducing the part of income taxed as labor income and increasing the part of income taxed as capital income. This is only desirable if the tax rate on labor income is higher than the tax rate on capital income, $t_w > t_k$, and if the gain in saved tax payments at least compensates for the dividend payments to be made to the external investors, $I_l > 0$. The last condition puts specific restrictions for under which tax rates it is profitable to engage in this kind of income shifting, namely only if

$$t_w > \frac{1}{3} + \frac{2}{3} \cdot [t_k - (1 - t_k) \cdot t_p]. \tag{23}$$

As the income function is linear in the dividend rate, r_d, as well as in the ownership share, two possibilities for a maxima exist: 1) : $\beta = 2/3$ and $r_d = \Omega_t$, and 2) : $\beta = 2/3$ and $r_d = 1$. As long as the tax schedule satisfies condition (23) the entrepreneur increases his private disposable income if he reduces his wages by one unit and instead pays it as dividends. This he will continue doing until no wages are paid and he receives the full compensation for his labor effort as dividend payments, $r_d = 1$. If condition (23) does not hold, all incentives to incorporate and escape the split model disappears. The model has only one optimal combination of the individuals ownership share and dividend rate, namely alternative 2), where $\beta = 2/3$ and $r_d = 1$. Applying these values reduces the optimal investment condition to

$$F_{K_l} = r + \delta. \tag{24}$$

The tax system does not impose any distortions in the corporation's investment decision. The tax rate on the return to real capital in the firm is the same as the tax

[24] At the present tax rates, $t_w = 0.55$, $t_k = 0.28$, and $t_p = 0.141$, the individual's gain from income shifting is at the maximum 21.7%, given that he holds two thirds of the shares in the corporation. This kind of income shifting is hence very profitable for the individual. By reducing his net wage payments by one unit, he receives an additional 1.217 units of dividends.

rate on the return to financial investments, and the corporation acquires the same amount of real capital as in the absence of taxes.

Labor income taxation has no direct effect on the level of real capital in the corporation, since no wages are paid to the employee. But it does nevertheless affect the private gain from income shifting, I_l, and it also affects at which rates for the capital income tax and the pay-roll tax it is profitable to engage in such an income shifting

The indirect income function. The indirect income function (25) is found by inserting the optimal investment level $\widetilde{K_l}$ along with the optimal values $\beta = 2/3$ and $r_d = 1$ from the individual's income maximization problem into the income function. Then $\widetilde{Y_l}$ states the individual's highest achievable income level when he organizes as a corporation not subject to the split model:

$$\widetilde{Y_l} = \overline{Y} + \frac{2}{3} \cdot [1 - t_k] \cdot \frac{F(\widetilde{K_l}) - [\delta + r] \cdot \widetilde{K_l}}{1 + [1 - t_k] \cdot r} \tag{25}$$

This will be used in the later analysis.

6 When to shift organizational form?

The direct costs of organizing as a corporation are moderate, and the process is also not that complicated. But it is important to bear in mind that corporations are subject to stricter regulations than self-employed. For instance, they are obliged to have an accountant. Let all the costs of shifting organizational form by assumption be represented by the parameter $\theta > 0$, regardless of size. The individual incorporates if the highest achievable net personal income is higher as a corporation than as self-employed, and the difference at least covers the costs of incorporating. This condition reduces to:

$$\text{Incorporate if} \quad \widetilde{Y_l} - \widetilde{Y_s} > \theta, \tag{26}$$

and organize as a self-employed firm taxed according to the split model otherwise. The larger this difference is, the higher are the incentives for the self-employed entrepreneur to incorporate in order to reduce total tax payments. Now let us study how the tax rates on labor income and capital income affects the incentives to

incorporated. The difference in income potential between the two organizational forms is given by

$$\widetilde{Y}_l - \widetilde{Y}_s = \frac{\left\{ \begin{array}{c} \frac{2}{3} \cdot [1-t_k] \cdot \left\{ F(\widetilde{K_l}) - [r+\delta] \cdot \widetilde{K_l} \right\} \\ - [1-t_w] \cdot \left\{ F(\widetilde{K_s}) - [r+\delta] \cdot \widetilde{K_s} \right\} \\ - [t_w - t_k] \cdot \mu \cdot \widetilde{K_s} \end{array} \right\}}{1 + [1-t_k] \cdot r}. \tag{27}$$

In the following, by applying the envelope theorem, consider how the different tax rates affects the profitability of incorporating in order to maximize private disposable income for the entrepreneur.

Capital income tax. First, consider an increase in the tax rate on capital income. The effect on the incentives to incorporate is given by the expression:

$$\frac{\partial \left(\widetilde{Y}_l - \widetilde{Y}_s \right)}{\partial t_k} = \frac{\left\{ \begin{array}{c} -\frac{2}{3} \cdot \left\{ F(\widetilde{K_l}) - [r+\delta] \cdot \widetilde{K_l} \right\} \\ - [1-t_w] \cdot r \cdot \left\{ F(\widetilde{K_s}) - [\mu + r + \delta] \cdot \widetilde{K_s} \right\} \\ + \mu \cdot \widetilde{K_s} \end{array} \right\}}{[1 + [1-t_k] \cdot r]^2} \tag{28}$$

Inspection[25] shows that as long as

$$\left[\widetilde{Y}_l - Y_1 \right] + [1-t_k] \cdot r \cdot \left[\widetilde{Y}_s - Y_1 \right] > [1-t_k] \cdot \mu \cdot \widetilde{K_s},$$

then

$$\frac{\partial \left(\widetilde{Y}_l - \widetilde{Y}_s \right)}{\partial t_k} < 0.$$

$\left[\widetilde{Y}_s - Y_1 \right]$ is the maximum value of the net present value of the return to the individuals labor effort and investments as a self-employed under the split model, as $\left[\widetilde{Y}_l - Y_1 \right]$ is as a corporation under corporate tax rules. That is, as long as the individual is a high income individual and generates so high income through his entrepreneurial activity as to at least exceed the net benefit from the risk compensation rate under the split model, then the effect of an increased tax rate on capital income on his incentives to incorporated is negative. The higher the tax rate on capital income, the smaller the gain from shifting income from labor income to capital income, and the smaller the tax incentive to incorporate.

[25] See appendix for discussion.

Labor income tax. Now consider an increase in the tax rate on labor income. The effect of an increased tax rate on the incentives to incorporate is given by:

$$\frac{\partial\left(\widetilde{Y_l}-\widetilde{Y_s}\right)}{\partial t_w}=\frac{F(\widetilde{K_s})-[\mu+r+\delta]\cdot\widetilde{K_s}}{1+[1-t_k]\cdot r} \tag{29}$$

If the imputed return to the entrepreneur's labor effort is negative, as it often is in the start-up phase of a firm, then he would want to stay under the split model in order to forward this return to deduct against future positive imputed return to labor. Increased tax rate on labor income would only strengthen this incentive, since the value of the future deductions is higher.

Only two periods exist in this model. We then know that in order for there to exist any incentive for the individual to incorporate, then the imputed return to labor must be positive: $F(\widetilde{K_s})-\widetilde{K_s}\cdot[\mu+r+\delta]>0$. If this condition is met, increased tax on labor income raises the gap between the marginal tax rates on labor and capital, and this increases the incentives for the entrepreneur to incorporate in order to reduce his tax payments, $\frac{\partial\left(\widetilde{Y_l}-\widetilde{Y_s}\right)}{\partial t_w}>0$. The greater the imputed labor income, the greater the incentives to incorporate.

The increased tax rate on labor income induces the individual to incorporate. The result is that more corporations and less self-employed individuals exist in the economy, even though the activity of these firms is unchanged. The incorporation is a pure re-labelling of existing production activity, but more individuals engage in tax avoidance activities.

The risk compensation. The effect of the risk compensation rate, μ, on the incentives to incorporate is given by:

$$\frac{\partial\left(\widetilde{Y_l}-\widetilde{Y_s}\right)}{\partial\mu}=-\frac{[t_w-t_k]\cdot\widetilde{K_s}}{1+[1-t_k]\cdot r}<0. \tag{30}$$

An increased difference between the split model's risk compensation and the entrepreneur's own valuation of the riskiness of investing in firm real capital and thus limiting his possibility to investment portfolio diversification actually decreases the incentives to incorporated. The higher μ is, the higher is the imputed return to capital, and the more of his total income is taxed as capital income. Hence he does not need to incorporate in order to shift more of his income from labor income to capital income.

7 The tax recognition of real capital depreciation.

Until now it has been assumed that the government knows the exact true real capital deprecation rate and allows for a tax deduction of this size, $\alpha = 1$. This is rarely so, and now consider how the pervious results are affected when $\alpha \neq 1$.

Effect on the investment level of the self-employed entrepreneur. With inaccurate tax deduction allowances for real capital depreciation the self-employed entrepreneur's investment condition extends to

$$F_{K_s} = r + \frac{[1 - \alpha \cdot t_w]}{1 - t_w} \cdot \delta - \frac{t_w - t_k}{1 - t_w} \cdot \mu. \tag{31}$$

From the above equation we see that if tax deductions for real capital depreciation differ from the actual real capital depreciation, $\alpha \neq 1$, then a comprehensive proportional income tax still introduces distortions in the investment market. A restrictive tax recognition of real capital depreciation, $\alpha < 1$, discourages real capital investments and induces the individual to acquire less real capital than he would have done in the absence of taxes. A generous tax recognition of depreciation, $\alpha > 1$, has the opposite effect.

The effect on the investment behavior of changes in the tax rates is less straightforward. A generous tax deduction for depreciation, $\alpha > 1$, strengthens the over- and under-investment incentives inherent in the split-model, and the higher the tax rate on labor income, the larger the tax induced distortions in the investment portfolio of the individual. A restrictive tax recognition of the depreciation reduces the distortions.

Effect on the investment level of the incorporated entrepreneur. In the presence of inaccurate tax allowances for real capital depreciation the incorporated entrepreneur's optimal investment condition changes to

$$F_{K_l} = r + \frac{1 - \alpha \cdot t_k}{1 - t_k} \cdot \delta. \tag{32}$$

The previous neutrality of the corporate taxation brakes down when the real capital depreciation tax allowances differ from the actual deprecation. If $\alpha > 1$, the tax system induces the corporation to over-invest in real capital. On the contrary, if $\alpha < 1$, the tax system discriminates against real capital investments. These distortions are stronger the higher the tax rate on capital income is.

Effect on the choice of organizational form. There exists an asymmetry in the tax treatment of real capital deprecation under the two tax regimes. Under the split model, the tax recognized real capital depreciation rate, $\alpha \cdot \delta$, entitles to a tax allowance against the tax rate on labor income, t_w, while it under the corporate tax regime only entitles to an allowance against the tax rate on capital income, t_k, as is seen from equations (7) and (17). So if the firm had the same amount of real capital depreciation under the two organizational forms, it would be allowed a higher tax deduction in the size of $(t_w - t_k)$ under the split model. For this reason the rate α of true depreciation recognized for tax deduction still distorts the incentives to incorporated, even though this factor is the same under both tax regimes:

$$\frac{\partial\left(\widetilde{Y_l} - \widetilde{Y_s}\right)}{\partial\alpha} = \frac{-\delta \cdot \left[t_w \cdot \widetilde{K_s} - \frac{2}{3} \cdot t_k \cdot \widetilde{K_l}\right]}{1 + [1 - t_k] \cdot r} < 0 \tag{33}$$

A higher tax recognition of firm real capital reduces total tax payments more under the split model than under the corporate tax model, and hence it reduces the incentives to incorporate.

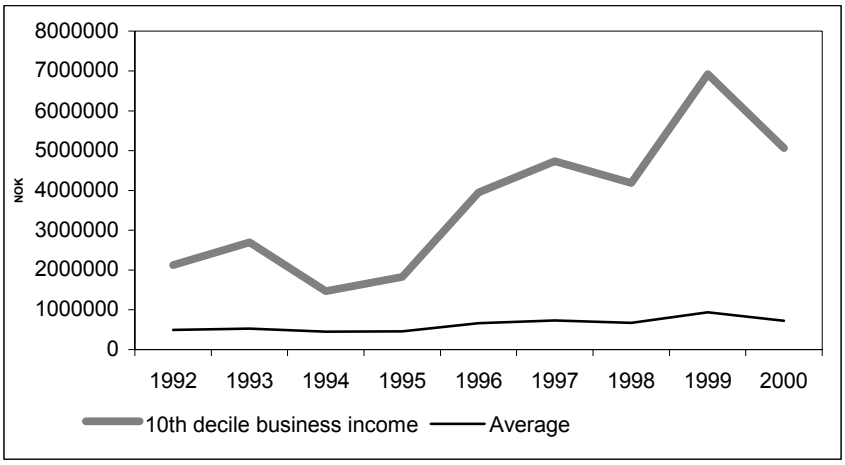
8 Summary of results.

i) Less risky real capital objects are used as an income shifting device by the self-employed entrepreneur in order to have a larger part of his income taxed as capital income and hence reduce total tax payments. The larger the difference between the marginal tax rates on labor and capital income, the higher is the over-investment in real capital induced by the split model. This effect is initiated by the fact that the return to all kinds of real capital is imputed at the same rate, independent of the perceived riskiness of the project by the entrepreneur.

ii) The optimal organizational form will change over the life cycle of a firm. In the start-up phase, an entrepreneurial firm is likely to have a negative imputed return to labor. Then it will be optimally for the owner to register as self-employed. When the firm is more mature and generates a steady stream of income, the individual would want to shift organizational form to a corporation with passive shareholders. He then avoids the split model of dual income taxation, and gets larger parts of his profits taxed at the lower corporate tax rate.

iii) An entrepreneur who incorporates in order to avoid the split model will keep as many of the shares himself and only invite the minimum required amount

Figure 1: Value of firm real capital of self-employed entrepreneurs, 1998-prices.



of passive shareholders to invest in the firm.

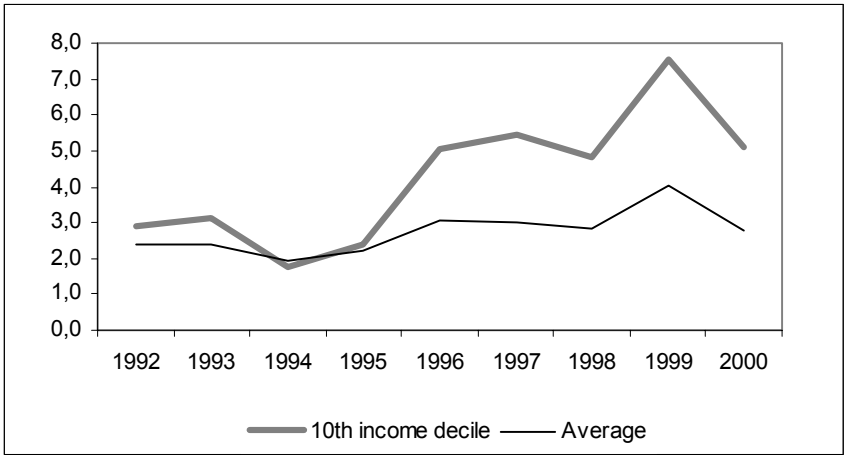
iv) The incorporated tax minimizing entrepreneur will pay no wages to himself and instead pay all profits as dividends.

8.1 Empirical observations support the model predictions.

High-income self-employed entrepreneurs are the ones subject to the top marginal tax rate on the imputed return to labor, and these are expected to take advantage of the income shifting possibilities through increased real capital stock. The self-employed in the top decile of the income distribution more than doubled the value of their real capital from 1992 to 2000[26], as figure 1 shows. These are aggregate data, and it is not possible to see whether there has been a shift in the type or real capital investments. Unfortunately there are no available data prior to the 1992-tax reform. Still, it ought to take the firm some time to adjust its investment decision to the new tax rules. As new self-employed entrepreneurs reach the top marginal tax bracket on labor income, they would also adapt to the rules. Hence one would expect a development towards more real capital in this group over time, rather than a shift to a new investment level directly after the tax reform.

[26] Calculations made on combined survey and register data from Statistics Norway. Annual sample of ca. 4000, but weighted for representability. The primary sector is heavily regulated and subsidized, self-employed in this sector are excluded from the sample.

Figure 2: Units of firm real capital per unit of firm business income of self-employed entrepreneurs.



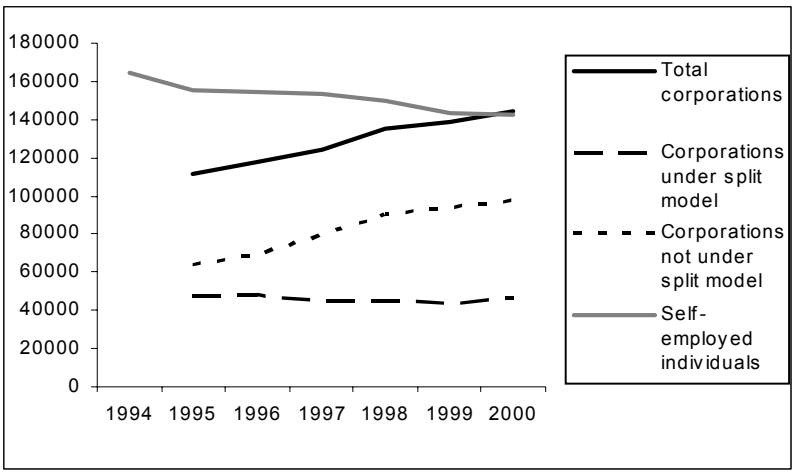
1992 marked the end of an economic depression and was followed by a period of strong economic expansion, this would lead to increased investments independent of the tax regime. But then the rate of real capital per unit of firm business income ought to be more or less constant. As seen in figure 2, this is not the case. The high-income entrepreneurs still increased their share of real capital per unit of business income more than the average of all self-employed individuals in non-primary sectors. This indicates that income shifting through over-investment in real capital has taken place.

The number of self-employed individuals decreased during the 1990ies, while the total number of corporations increased by more than the same amount, as is seen in figure[27] 3. Even if part of the decline of self-employed is due to a reduction of the primary sector, mostly farming, there was also a reduction of the number of self-employed in other businesses. At the same time, there was a reduction in the number of corporations under the split model, and a rapid increase of corporations avoiding the split model. A strong selection also took place. The corporations that remain under the split model mostly have negative imputed return to labor, and their active owners hence do not pay labor income taxes. In 1992, 65% of the corporations under the split model had negative imputed return to labor, while this share had increased

[27]Source: Statistics Norway.

Data are unfortunatelly not available for the whole time period in question.

Figure 3: Number of self-employed individuals and corporations.



to 80% in 2000. In the year 2000, only 3.5 % of all corporations under the split model had positive imputed return to labor. In 1995, 28% of all one-man corporations were taxed according to the split model, and already in 1997 this share had fallen to 20%.

This can be interpreted as an indication of a tax induced shift in organizational form and choice of tax regime. Self-employed individuals choose to incorporate in order to escape the split model, and corporations have passive shareholders such as to escape the split model. Only corporations who have low profits and thus also low or negative imputed return to labor stay under the split model.

8.2 Conclusions.

The above analysis concludes that the split model of dual income taxation provides the individual with large incentives for participating in tax minimizing income shifting. It actually induces the self-employed individual to over-invest in less risky firm real capital. Real capital investment becomes a device to shift income from labor income to capital income and to enjoy the lower capital income tax rate on a larger share of total income.

In addition, the corporate organizational form serves as a tax shelter for high income entrepreneurs. The higher his income, and the larger the difference between the tax rates on labor income and capital income, the larger the incentives to incorporate (with less than two thirds of the shares held by the active owner) to escape

the split model and reduce total tax payments. These entrepreneurs would keep close to the maximum allowed of shares under the split model. Only low-income entrepreneurs have incentives to stay under the split model in order to enjoy the forwarding of negative imputed return to labor, in order to deduct this against future positive imputed return to labor. Again, it seems like this prediction is supported by actually observed behavior over the last ten years.

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10 Mathematical appendix.

At which real capital stock should the return to capital be imputed, at the beginning or at the end of the period? When the split model was first introduced, the self-employed individual could choose whether the value at the beginning or at the end of the period should be used in the imputation of the return to firm capital. Later this changed, and at the present, the average of the values of firm capital at the beginning and at the end of the period should be used to impute the return to firm capital, which in our context would be $(1 - \frac{\alpha \cdot \delta}{2}) \cdot K_s$. Applying this assessment of firm capital would change the tax equation (7) to $T_s = t_k \cdot r_i \cdot (1 - \frac{\alpha \cdot \delta}{2}) \cdot K_s + t_w \cdot \{F(K_s) - \alpha \cdot \delta \cdot K_s - r_i \cdot (1 - \frac{\alpha \cdot \delta}{2}) \cdot K_s\} + t_k \cdot r \cdot B$. This would entitle the individual to a tax deduction for the depreciation of $\alpha \cdot \delta \cdot K_s \cdot (t_w - \frac{1}{2} \cdot r_i \cdot (t_w - t_k))$. This is smaller than the tax deduction which applies in the present specification of the model, $\alpha \cdot \delta \cdot K_s \cdot t_w$, but for the benefit of simplicity, this is not considered in the analysis, and equation (7) is the specification of the tax equation to be used in this paper. This simplifying assumption does not change the fact that there is an asymmetrical tax treatment of real capital deprecitation under the two tax regimes, it only reduces the amplitude of the effect.

The second period income of the self-employed entrepreneur.

$$
\begin{aligned}
Y_{2,s} &= F(K_s) + [1 - \delta] \cdot K_s + [1 + r] \cdot B_s - T_s. \\
&\Downarrow \\
Y^n_{2,s} &= F(K_s) + [1 - \delta] \cdot K_s + [1 + r] \cdot B_s - t_k \cdot [r_i \cdot K_s] - \alpha \cdot \delta \cdot K_s + \alpha \cdot \delta \cdot K_s \\
&\quad - t_w \cdot [F(K_s) - \alpha \cdot \delta \cdot K_s - r_i \cdot K_s] - t_k \cdot r \cdot B_s \\
&\Downarrow \\
Y^n_{2,s} &= [1 - t_w] \cdot [F(K_s) - \alpha \cdot \delta \cdot K_s] + \{1 + [t_w - t_k] \cdot r_i\} \cdot K_s \\
&\quad - (1 - \alpha) \cdot \delta \cdot K_s + [1 + (1 - t_k) \cdot r] \cdot B_s
\end{aligned}
$$

Eq. (8): $\alpha = 1$:

$$Y^n_{2,s} = [1 - t_w] \cdot [F(K_s) - \delta \cdot K_s] + \{1 + [t_w - t_k] \cdot r_i\} \cdot K_s + [1 + (1 - t_k) \cdot r] \cdot B_s$$

Utility maximization in the presence of taxes, the self-employed case: Eq. (31):

$$\max_{K_s} Y_s$$

$$\begin{aligned}
\frac{\partial Y_s}{\partial K_s} &= \frac{\left\{ \begin{array}{c} [1-t_w]\cdot[F_{K_s}-\alpha\cdot\delta]+[t_w-t_k]\cdot r_i \\ -(1-\alpha)\cdot\delta-(1-t_k)\cdot r \end{array} \right\}}{1+(1-t_k)\cdot r} = 0 \\
&\Downarrow \\
F_{K_s} &= \alpha\cdot\delta+\frac{(1-\alpha)\cdot\delta+(1-t_k)\cdot r-[t_w-t_k]\cdot r_i}{1-t_w} \\
&\Downarrow \quad r_i = r+\mu \\
F_{K_s} &= \alpha\cdot\delta+\frac{r+(1-\alpha)\cdot\delta-t_k\cdot r-t_w\cdot[r+\mu]+t_k\cdot[r+\mu]}{1-t_w} \\
&\Downarrow \\
F_{K_s} &= \left[\alpha+\frac{1-\alpha}{1-t_w}\right]\cdot\delta+\frac{[1-t_w]\cdot r+[t_k-t_w]\cdot\mu}{1-t_w} \\
&\Downarrow \\
F_{K_s} &= r+\frac{1-\alpha\cdot t_w}{1-t_w}\cdot\delta-\frac{t_w-t_k}{1-t_w}\cdot\mu
\end{aligned}$$

Eq. (10), in the absence of taxes:

$$F_{K_s} = r+\delta$$

Eq. (11), in the presence of taxes: $\alpha = 1$:

$$F_{K_s} = r+\delta-\frac{t_w-t_k}{1-t_w}\cdot\mu$$

Effect on the self-employed entrepreneur's investements of increased tax on labor income:

$$\begin{aligned}
F_{K_s} &= r+\frac{[1-\alpha\cdot t_w]\cdot\delta+[t_k-t_w]\cdot\mu}{1-t_w} \\
&\Downarrow \\
F_{K_s^t,K_s}\cdot\frac{\partial K_s}{\partial t_w} &= \frac{[-\alpha\cdot\delta-\mu]\cdot[1-t_w]+[1-\alpha\cdot t_w]\cdot\delta+[t_k-t_w]\cdot\mu}{[1-t_w]^2} \\
&\Downarrow \\
\frac{\partial K_s}{\partial t_w} &= \frac{[1-\alpha]\cdot\delta-[1-t_k]\cdot\mu}{F_{K_s,K_s}\cdot[1-t_w]^2}
\end{aligned}$$

Eq. (12) $\alpha = 1$**:**

$$\frac{\partial K_s}{\partial t_w} = -\frac{[1-t_k]\cdot\mu}{F_{K_s,K_s}\cdot[1-t_w]^2}$$

Eq. (13):

$$\begin{aligned} F_{K_s,K_s}\cdot\frac{\partial K_s}{\partial t_k} &= \frac{\mu}{1-t_w} \\ &\Downarrow \\ \frac{\partial K_s}{\partial t_k} &= \frac{\mu}{F_{K_s,K_s}\cdot[1-t_w]} < 0 \end{aligned}$$

Let $\widetilde{K_s}$ be the investment level in firm real capital that maximizes the individual's net lifetime income, the right hand side of lifetime budget constraint. The indirect income function $\widetilde{Y_s}$ is then given by:

$$\begin{aligned} \widetilde{Y_s} &= \overline{Y} + \frac{1}{1+(1-t_k)\cdot r}\cdot\left\{\begin{array}{c} [1-t_w]\cdot F(\widetilde{K_s}) - [1-t_w]\cdot\alpha\cdot\delta\cdot\widetilde{K_s} \\ +[t_w-t_k]\cdot[r+\mu]\cdot\widetilde{K_s} \\ -[(1-\alpha)\cdot\delta+(1-t_k)\cdot r]\cdot\widetilde{K_s} \end{array}\right\} \\ &\Downarrow \\ \widetilde{Y_s} &= \overline{Y} + \frac{1}{1+(1-t_k)\cdot r}\cdot\left\{\begin{array}{c} [1-t_w]\cdot F(\widetilde{K_s}) \\ +\left\{\begin{array}{c} -\alpha\cdot\delta + t_w\cdot\alpha\cdot\delta + t_w\cdot r + t_w\cdot\mu \\ -t_k\cdot r - t_k\cdot\mu - \delta + \alpha\cdot\delta - r + t_k\cdot r \end{array}\right\}\cdot\widetilde{K_s} \end{array}\right\} \\ &\Downarrow \\ \widetilde{Y_s} &= \overline{Y} + \frac{[1-t_w]\cdot F(\widetilde{K_s}) + \{[t_w-t_k]\cdot\mu - [1-t_w]\cdot r - [1-t_w\cdot\alpha]\cdot\delta\}\cdot\widetilde{K_s}}{1+(1-t_k)\cdot r} \end{aligned}$$

Eq. (14), $\alpha = 1$**:**

$$\widetilde{Y_s} = \overline{Y} + \frac{[1-t_w]\cdot F(\widetilde{K_s}) + \{[t_w-t_k]\cdot\mu - [1-t_w]\cdot[r+\delta]\}\cdot\widetilde{K_s}}{1+(1-t_k)\cdot r}$$

The entrepreneur's budget constraint in the presence of taxes, the corporate case:

$$\begin{aligned} C_{1,l} + \frac{C_{2,l}}{1+[1-t_k]\cdot r} &= Y_1 - \beta\cdot K_l - B_l + \frac{\left\{\begin{array}{c} [1-r_d]\cdot F(K_l) + \beta\cdot r_d\cdot F(K_l) \\ +\beta\cdot[1-\delta]\cdot K_l + [1+r]\cdot B_l \\ -[t_w+\beta\cdot t_p]\cdot[1-r_d]\cdot F(K_l) \\ -t_k\cdot r\cdot B_l - t_k\cdot\beta\cdot r_d\cdot F(K_l) \\ +\beta\cdot t_k\cdot\alpha\cdot\delta\cdot K_l \end{array}\right\}}{1+[1-t_k]\cdot r} \\ &\Downarrow \\ Y_l &= \overline{Y} + \frac{\left\{\begin{array}{c} [1-t_w-\beta\cdot t_p]\cdot[1-r_d]\cdot F(K_l) \\ +[1-t_k]\cdot\beta\cdot r_d\cdot F(K_l) \\ -\beta\cdot([1-\alpha\cdot t_k]\cdot\delta+[1-t_k]\cdot r)\cdot K_l \end{array}\right\}}{1+[1-t_k]\cdot r} \end{aligned}$$

The optimal investment condition, the corporate case:

$$\max_{K_l} Y_l$$

$$\begin{aligned} \frac{\partial Y_l}{\partial K_l} &= \frac{\left\{\begin{array}{c} [1-t_w-\beta\cdot t_p]\cdot[1-r_d]\cdot F_{K_l} \\ +[1-t_k]\cdot\beta\cdot r_d\cdot F_{K_l} \\ -\beta\cdot([1-\alpha\cdot t_k]\cdot\delta+[1-t_k]\cdot r) \end{array}\right\}}{1+[1-t_k]\cdot r} = 0 \\ &\Downarrow \\ F_{K_l} &= \beta\cdot\frac{[1-\alpha\cdot t_k]\cdot\delta+[1-t_k]\cdot r}{[1-t_w-\beta\cdot t_p]\cdot[1-r_d]+[1-t_k]\cdot\beta\cdot r_d} \end{aligned}$$

Corporation in the absence of taxes. In the absence of taxes, the optimal investment condition is:

$$F_{K_l} = [\delta + r]\cdot\frac{\beta}{1-[1-\beta]\cdot r_d} \tag{34}$$

In addition to the interest rate and the depreciation rate, the user cost of capital now depends on how much of the corporation the active owner owns, and how much of firm income are paid as dividends and wages. If $\beta = 1$, the entrepreneur holds all shares and (34) reduces to the optimal investment condition in the self-employed case, equation (10). This is not the case if $\beta < 1$. But since the income function

(18) is linear in β, there are no internal optimal values of β, and the only possible maximum value is at the boundary. Thus $\beta = 1$ is the only possible solution, where the entrepreneur holds all the shares.

As the income function is also linear in the dividend rate, the only possible optimal values for the dividend rate are at the boundaries, and thus $r_d = \Omega$ or $r_d = 1$. Now take a closer look at the lower boundary Ω. The shareholders demand a return on their invested capital at least as high as the return in to the alternative investment, bonds. The return to investing their capital in bonds is given by $[1-\beta] \cdot K_l \cdot r$. The same amount invested in the firm yields the net of capital depreciation return $[1-\beta] \cdot [r_d \cdot F(K_l) - \delta \cdot K_l]$. The lower boundary for the dividend payments is thus given by

$$\begin{aligned} [1-\beta] \cdot r_d \cdot F(K_l) - [1-\beta] \cdot \delta \cdot K_l &\geq [1-\beta] \cdot K_l \cdot r \\ &\Downarrow \\ r_d &\geq \frac{[r+\delta] \cdot K_l}{F(K_l)} \\ &\Downarrow \\ \Omega &= \frac{[r+\delta] \cdot K_l}{F(K_l)} \end{aligned}$$

The higher the cost of capital is relative to the value of the firm's production, the higher is Ω. That is, the lower boundary on the rate of dividend payments depends negatively on the firm's productivity. The more efficient production, the lower share of the profits need to be paid as dividends to give the shareholders the same return on their invested capital as in the financial market.

Two possible combinations of ownership share of the entrepreneur and dividend payment rate exist:

$$\begin{aligned} 1) &: \beta = 1 \text{ and } r_d = \Omega, \\ 2) &: \beta = 1 \text{ and } r_d = 1. \end{aligned}$$

As long as the entrepreneur is the sole owner and the only person working in the firm, in the absence of taxes it does not matter whether he pays the firm profits as wages to himself or as dividends. Both $r_d = 1$ and $r_d = \Omega$ maximize his income, and alternative 1) and 2) both represent optimal solutions. Applying these values in the analysis and inserting them into the optimal investment condition (34), we see that the dividend payments do not matter for the optimal investment level. Both

alternative 1) and 2) reduce the optimal investment condition to equation (19):

$$F_{K_l} = r + \delta,$$

which is identical to the Fisher condition (10) developed in the self-employed case. Also, by applying the optimal values of alternative 1) and 2), the individual's budget restriction reduces to that of the self-employed entrepreneur in the absence of taxes.

The individual's investment portfolio and income level are in the absence of taxes both unaffected by the choice of organizational form.

Eq. (21): By investing his capital in bonds, the passive shareholder would receive the net return

$$[1 - t_k] \cdot r \cdot [1 - \beta] \cdot K_l.$$

Shares in the corporation yield the net return

$$[1 - \beta] \cdot \{[1 - t_k] \cdot r_d \cdot F(K_l) - [1 - t_k] \cdot [1 - \alpha] \cdot \delta \cdot K_l - t_p \cdot [1 - r_d] \cdot F(K_l)\},$$

the passive shareholders net of capital income tax dividend receipt, his share of the non-tax deductible real capital depreciation, and his share of the pay-roll tax due on the firm's hand. For the external investor to be willing to invest in the firm, the net return on investments in firm real capital must be at least as high as the net return to investments in the financial market. Hence

$$\begin{aligned}
[1 - \beta] \cdot \left\{ \begin{array}{c} [1 - t_k] \cdot r_d \cdot F(K_l) \\ -[1 - t_k] \cdot [1 - \alpha] \cdot \delta \cdot K_l \\ -t_p \cdot [1 - r_d] \cdot F(K_l) \end{array} \right\} &\geq [1 - t_k] \cdot r \cdot [1 - \beta] \cdot K_l \\
&\Downarrow \quad \cdot \frac{1}{F(K_l) \cdot [1 - \beta]} \\
[1 - t_k + t_p] \cdot r_d - [1 - t_k] \cdot [1 - \alpha] \cdot \delta \cdot \frac{K_l}{F(K_l)} - t_p &\geq [1 - t_k] \cdot r \cdot \frac{K_l}{F(K_l)} \\
&\Downarrow \quad \cdot \frac{1}{1 - t_k + t_p}
\end{aligned}$$

$$
\begin{aligned}
r_d &\geq \frac{[1-t_k]\cdot r + [1-t_k]\cdot[1-\alpha]\cdot\delta}{1-t_k+t_p}\cdot\frac{K_l}{F(K_l)} + \frac{t_p}{1-t_k+t_p} \\
&\Downarrow \\
\Omega_t &= \frac{[1-t_k]\cdot r + [1-t_k]\cdot[1-\alpha]\cdot\delta}{1-t_k+t_p}\cdot\frac{K_l}{F(K_l)} + \frac{t_p}{1-t_k+t_p} \\
&\Downarrow \quad \alpha = 1 \\
\Omega_t &= \frac{[1-t_k]\cdot r\cdot\frac{K_l}{F(K_l)} + t_p}{1-t_k+t_p}
\end{aligned}
$$

Eq. (23):

$$
\begin{aligned}
I_l &> 0 \\
&\Downarrow \\
\frac{2}{3}\cdot\frac{[1-t_k]\cdot[1+t_p]}{1-t_w} - 1 &> 0 \\
&\Downarrow \\
\frac{2}{3}\cdot[1-t_k]\cdot[1+t_p] &> 1-t_w \\
&\Downarrow \\
t_w &> \frac{1}{3} + \frac{2}{3}\cdot[t_k - (1-t_k)\cdot t_p]
\end{aligned}
$$

The optimal investment condition (32):

$$
\begin{aligned}
\beta &= \frac{2}{3}, \quad r_d = 1 \\
&\Downarrow \\
F_{K_l} &= \frac{2}{3}\cdot\frac{[1-\alpha\cdot t_k]\cdot\delta + [1-t_k]\cdot r}{[1-t_k]\cdot\frac{2}{3}} \\
&\Downarrow \\
F_{K_l} &= r + \frac{1-\alpha\cdot t_k}{1-t_k}\cdot\delta
\end{aligned}
$$

Eq. (24), $\alpha = 1$:

$$F_{K_l} = r + \delta$$

The difference between the maximum achievable lifetime income under the two organizational forms:

$$\begin{aligned}
\widetilde{Y}_l - \widetilde{Y}_s &= \overline{Y} + \frac{\left\{ \begin{array}{c} \frac{2}{3} \cdot [1-t_k] \cdot F(\widetilde{K_l}) \\ -\frac{2}{3} \cdot ([1-\alpha \cdot t_k] \cdot \delta + [1-t_k] \cdot r) \cdot \widetilde{K_l} \end{array} \right\}}{1 + [1-t_k] \cdot r} \\
&\quad -\overline{Y} - \frac{\left\{ [1-t_w] \cdot F(\widetilde{K_s}) + \left\{ \begin{array}{c} [t_w - t_k] \cdot \mu \\ -[1-t_w] \cdot r - [1-t_w \cdot \alpha] \cdot \delta \end{array} \right\} \cdot \widetilde{K_s} \right\}}{1 + (1-t_k) \cdot r}
\end{aligned}$$

$$\Downarrow$$

$$\widetilde{Y}_l - \widetilde{Y}_s = \frac{\left\{ \begin{array}{c} \frac{2}{3} \cdot [1-t_k] \cdot F(\widetilde{K_l}) - [1-t_w] \cdot F(\widetilde{K_s}) \\ -\frac{2}{3} \cdot ([1-\alpha \cdot t_k] \cdot \delta + [1-t_k] \cdot r) \cdot \widetilde{K_l} \\ -\{[t_w - t_k] \cdot \mu - [1-t_w] \cdot r - [1-t_w \cdot \alpha] \cdot \delta\} \cdot \widetilde{K_s} \end{array} \right\}}{1 + [1-t_k] \cdot r}$$

Eq. (27), $\alpha = 1$**:**

$$\widetilde{Y}_l - \widetilde{Y}_s = \frac{\left\{ \begin{array}{c} \frac{2}{3} \cdot [1-t_k] \cdot \left\{ F(\widetilde{K_l}) - [r+\delta] \cdot \widetilde{K_l} \right\} \\ -[1-t_w] \cdot \left\{ F(\widetilde{K_s}) - [r+\delta] \cdot \widetilde{K_s} \right\} \\ -[t_w - t_k] \cdot \mu \cdot \widetilde{K_s} \end{array} \right\}}{1 + [1-t_k] \cdot r}$$

Effects on the organizational choice of increased tax on capital income:

$$\begin{aligned}
\frac{\partial \left(\widetilde{Y_l^n} - \widetilde{Y_s^n} \right)}{\partial t_k} &= \frac{Z}{[1 + [1-t_k] \cdot r]^2}, \text{ where} \\
Z &= \left\{ -\frac{2}{3} \cdot F(\widetilde{K_l}) - \frac{2}{3} \cdot [-\alpha \cdot \delta - r] \cdot \widetilde{K_l} + \mu \cdot \widetilde{K_s} \right\} \cdot \{1 + [1-t_k] \cdot r\} \\
&\quad + r \cdot \left\{ \begin{array}{c} \frac{2}{3} \cdot [1-t_k] \cdot F(\widetilde{K_l}) - [1-t_w] \cdot F(\widetilde{K_s}) \\ -\frac{2}{3} \cdot ([1-\alpha \cdot t_k] \cdot \delta + [1-t_k] \cdot r) \cdot \widetilde{K_l} \\ -\{[t_w - t_k] \cdot \mu - [1-t_w] \cdot r - [1-t_w \cdot \alpha] \cdot \delta\} \cdot \widetilde{K_s} \end{array} \right\}
\end{aligned}$$

$$
\begin{aligned}
Z &= \frac{2}{3}\cdot\{-1-r+r\cdot t_k\}\cdot F(\widetilde{K_l}) \\
&\quad +\frac{2}{3}\cdot\left\{\alpha\cdot\delta+\alpha\cdot\delta\cdot r-\alpha\cdot\delta\cdot r\cdot t_k+r+r^2+r^2\cdot t_k\right\}\cdot\widetilde{K_l} \\
&\quad +\{\mu+\mu\cdot r-t_k\cdot\mu\cdot r\}\cdot\widetilde{K_s}+\frac{2}{3}\cdot[r-t_k\cdot r]\cdot F(\widetilde{K_l})-[r-t_w\cdot r]\cdot F(\widetilde{K_s}) \\
&\quad -\frac{2}{3}\cdot\left(r\cdot\delta-\alpha\cdot t_k\cdot r\cdot\delta+r^2-t_k\cdot r^2\right)\cdot\widetilde{K_l} \\
&\quad -\left\{t_w\cdot\mu\cdot r-t_k\cdot\mu\cdot r-r^2+t_w\cdot r^2-r\cdot\delta+t_w\cdot\alpha\cdot r\cdot\delta\right\}\cdot\widetilde{K_s}
\end{aligned}
$$

$$
\begin{aligned}
Z &= \frac{2}{3}\cdot\{-1-r+r\cdot t_k+r-t_k\cdot r\}\cdot F(\widetilde{K_l})-[r-t_w\cdot r]\cdot F(\widetilde{K_s}) \\
&\quad +\frac{2}{3}\cdot\left\{\begin{array}{c}\alpha\cdot\delta+\alpha\cdot\delta\cdot r-\alpha\cdot\delta\cdot r\cdot t_k+r+r^2\\ +r^2\cdot t_k-r\cdot\delta+\alpha\cdot t_k\cdot r\cdot\delta-r^2+t_k\cdot r^2\end{array}\right\}\cdot\widetilde{K_l} \\
&\quad +\left\{\begin{array}{c}\mu+\mu\cdot r-t_k\cdot\mu\cdot r-t_w\cdot\mu\cdot r+t_k\cdot\mu\cdot r\\ +r^2-t_w\cdot r^2+r\cdot\delta-t_w\cdot\alpha\cdot r\cdot\delta\end{array}\right\}\cdot\widetilde{K_s}
\end{aligned}
$$

$$
\begin{aligned}
Z &= -\frac{2}{3}\cdot F(\widetilde{K_l})-[1-t_w]\cdot r\cdot F(\widetilde{K_s}) \\
&\quad +\frac{2}{3}\cdot\{(1+r)\cdot\alpha\cdot\delta+(1-\delta)\cdot r\}\cdot\widetilde{K_l} \\
&\quad +\left\{\left[\frac{1}{r}+(1-t_w)\right]\cdot\mu+[1-t_w]\cdot r+[1-t_w\cdot\alpha]\cdot\delta\right\}\cdot r\cdot\widetilde{K_s}
\end{aligned}
$$

$$
\begin{aligned}
Z &= -\frac{2}{3}\cdot\left[F(\widetilde{K_l})-r\cdot\widetilde{K_l}\right]+\frac{2}{3}\cdot\{(1+r)\cdot\alpha\cdot\delta-\delta\cdot r\}\cdot\widetilde{K_l} \\
&\quad -r\cdot\left\{[1-t_w]\cdot F(\widetilde{K_s})-\{[1-t_w]\cdot r+[1-t_w\cdot\alpha]\cdot\delta\}\cdot\widetilde{K_s}\right\} \\
&\quad +\{1+[1-t_w]\cdot r\}\cdot\mu\cdot\widetilde{K_s}
\end{aligned}
$$

From the equations (14) and (25) the maximum value of the present value of total net individual income under the two organizational forms are given by

$$
\begin{aligned}
\widetilde{Y_s^n} &= Y_1+\frac{[1-t_w]\cdot F(\widetilde{K_s})+\{[t_w-t_k]\cdot\mu-[1-t_w]\cdot r-[1-t_w\cdot\alpha]\cdot\delta\}\cdot\widetilde{K_s}}{1+(1-t_k)\cdot r} \\
&\Downarrow
\end{aligned}
$$

$$[1-t_w]\cdot F(\widetilde{K_s}) - \{[1-t_w]\cdot r + [1-t_w\cdot\alpha]\cdot\delta\}\cdot\widetilde{K_s}$$

$$= \left[\widetilde{Y_s^n} - Y_1\right]\cdot[1+(1-t_k)\cdot r] - [t_w - t_k]\cdot\mu\cdot\widetilde{K_s}$$

and

$$\widetilde{Y_l^n} = Y_1 + \frac{\frac{2}{3}\cdot[1-t_k]\cdot F(\widetilde{K_l}) - \frac{2}{3}\cdot([1-\alpha\cdot t_k]\cdot\delta + [1-t_k]\cdot r)\cdot\widetilde{K_l}}{1+[1-t_k]\cdot r}$$

$$\Downarrow$$

$$\frac{2}{3}\cdot\left[F(\widetilde{K_l}) - r\cdot\widetilde{K_l}\right] = \left[\widetilde{Y_l^n} - Y_1\right]\cdot\frac{1+(1-t_k)\cdot r}{1-t_k} + \frac{2}{3}\cdot\left[\frac{1-\alpha\cdot t_k}{1-t_k}\right]\cdot\delta\cdot\widetilde{K_l}$$

Applying this in the expression for Z yields :

$$\begin{aligned} Z = & -\left[\widetilde{Y_l^n} - Y_1\right]\cdot\frac{1+(1-t_k)\cdot r}{1-t_k} - \frac{2}{3}\cdot\left[\frac{1-\alpha\cdot t_k}{1-t_k}\right]\cdot\delta\cdot\widetilde{K_l} \\ & + \frac{2}{3}\cdot\{(1+r)\cdot\alpha\cdot\delta - \delta\cdot r\}\cdot\widetilde{K_l} \\ & - r\cdot\left\{\left[\widetilde{Y_s^n} - Y_1\right]\cdot[1+(1-t_k)\cdot r] - [t_w - t_k]\cdot\mu\cdot\widetilde{K_s}\right\} \\ & + \{1+[1-t_w]\cdot r\}\cdot\mu\cdot\widetilde{K_s} \end{aligned}$$

$$\begin{aligned} Z = & -\left[\widetilde{Y_l^n} - Y_1\right]\cdot\frac{1+(1-t_k)\cdot r}{1-t_k} \\ & + \frac{2}{3}\cdot\left[-\frac{1-\alpha\cdot t_k}{1-t_k} + \alpha + (\alpha-1)\cdot r\right]\cdot\delta\cdot\widetilde{K_l} \\ & - r\cdot\left[\widetilde{Y_s^n} - Y_1\right]\cdot[1+(1-t_k)\cdot r] \\ & + \{1+[1-t_w+t_w-t_k]\cdot r\}\cdot\mu\cdot\widetilde{K_s} \end{aligned}$$

$$\begin{aligned} Z = & -\left[\widetilde{Y_l^n} - Y_1\right]\cdot\frac{1+(1-t_k)\cdot r}{1-t_k} \\ & + \frac{2}{3}\cdot\left[\frac{-1+\alpha\cdot t_k+\alpha-\alpha\cdot t_k+(\alpha-1)\cdot r\cdot(1-t_k)}{1-t_k}\right]\cdot\delta\cdot\widetilde{K_l} \\ & - r\cdot\left[\widetilde{Y_s^n} - Y_1 - \frac{\mu}{r}\cdot\widetilde{K_s}\right]\cdot[1+(1-t_k)\cdot r] \end{aligned}$$

$$
\begin{aligned}
Z &= \frac{2}{3}\cdot\left[\frac{1}{1-t_k}+r\right]\cdot[\alpha-1]\cdot\delta\cdot\widetilde{K_l} \\
&\quad +\left[\mu\cdot\widetilde{K_s}-r\cdot\left[\widetilde{Y_s^n}-Y_1\right]-\left[\widetilde{Y_l^n}-Y_1\right]\cdot\frac{1}{1-t_k}\right]\cdot[1+(1-t_k)\cdot r]
\end{aligned}
$$

$$
Z < 0 \Rightarrow \frac{\partial\left(\widetilde{Y_l^n}-\widetilde{Y_s^n}\right)}{\partial t_k} > 0
$$

$Z < 0$ if

$$
\begin{aligned}
&\frac{2}{3}\cdot\frac{\left[\frac{1}{1-t_k}+r\right]\cdot[\alpha-1]\cdot\delta}{1+(1-t_k)\cdot r}\cdot\widetilde{K_l}+\mu\cdot\widetilde{K_s} \\
<\ & r\cdot\left[\widetilde{Y_s^n}-Y_1\right]+\left[\widetilde{Y_l^n}-Y_1\right]\cdot\frac{1}{1-t_k}
\end{aligned}
$$

$$
\begin{aligned}
&\frac{2}{3}\cdot\frac{[1+(1-t_k)\cdot r]\cdot[\alpha-1]\cdot\delta}{1+(1-t_k)\cdot r}\cdot\widetilde{K_l}+(1-t_k)\cdot\mu\cdot\widetilde{K_s} \\
<\ & (1-t_k)\cdot r\cdot\left[\widetilde{Y_s^n}-Y_1\right]+\left[\widetilde{Y_l^n}-Y_1\right]
\end{aligned}
$$

$$
\begin{aligned}
&\frac{2}{3}\cdot[\alpha-1]\cdot\delta\cdot\widetilde{K_l}+(1-t_k)\cdot\mu\cdot\widetilde{K_s} \\
<\ & (1-t_k)\cdot r\cdot\left[\widetilde{Y_s^n}-Y_1\right]+\left[\widetilde{Y_l^n}-Y_1\right]
\end{aligned}
$$

$$
(1-t_k)\cdot r\cdot\left[\widetilde{Y_s^n}-Y_1\right]+\left[\widetilde{Y_l^n}-Y_1\right]-\frac{2}{3}\cdot[\alpha-1]\cdot\delta\cdot\widetilde{K_l}-(1-t_k)\cdot\mu\cdot\widetilde{K_s} > 0
$$

$$
\left\{\left[\widetilde{Y_l^n}-Y_1\right]-\frac{2}{3}\cdot[\alpha-1]\cdot\delta\cdot\widetilde{K_l}\right\}+(1-t_k)\cdot\left\{r\cdot\left[\widetilde{Y_s^n}-Y_1\right]-\mu\cdot\widetilde{K_s}\right\} > 0
$$

where $\left[\widetilde{Y_s}-Y_1\right]$ is the maximum value of the net present value of the return to the individuals labor effort and investments as a self-employed under the split model, as $\left[\widetilde{Y_l}-Y_1\right]$ is as a corporation under corporate tax rules.