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Why some Corporations Pay More Tax than Necessary

Abstract:
It has been noticed in several countries that many corporations do not claim all of their allowable tax depreciation deductions, despite incurring a higher tax cost. There are several possible explanations. First, the uniform reporting accounting system (typical of many European countries) can under certain circumstances constrain dividends. The dividend constraint can, however, be loosened by forgoing some tax depreciation. We find no support for this hypothesis. Second, we find strong evidence that corporations with bad economic performance tend to underutilize their deductions, suggesting that corporations use costly "window-dressing" on their accounting measures. Third, we find support for the hypothesis that tax compliance costs discourage the utilization of accelerated depreciation, especially by small firms. Fourth, we find weak support for the hypothesis that there is substitution between tax depreciation and private debt due to competition between the benefits of private bank monitoring and the tax savings from using tax debt, as suggested in earlier literature. Our empirical analysis is possible due to unusual access to extremely detailed individual firm tax returns forms in Norway, combined with the 1992 Norwegian tax reform that provided a natural experiment for testing some of the hypotheses. We use the time-series and cross-sectional variation across Norwegian corporations in 1988, 1991, 1992 and 1993.

Keywords: Corporate taxes, Depreciation, Reporting conventions

JEL classification: D21, H25

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1. Introduction*

Simple common sense tells us that, all else equal, a firm should prefer to claim depreciation deductions earlier rather than later: postponement increases the present value of tax payments by the interest rate times the tax rate times the difference between tax depreciation allowed and the depreciation actually claimed. However, recent empirical research, especially in the Nordic countries has discovered that many corporations do not fully utilize allowable tax depreciation[1]. Kanniainen and Södersten (1994) refer to several studies in Sweden and Finland where underutilization is found. Forsling (1996) reports underutilization of both depreciation and other tax allowances in Sweden throughout 1979-93. Askildsen and Fjærli (1989) find indirect evidence suggesting underutilization of tax depreciation by Norwegian corporations; Aarbu (1994) confirms underutilization in Norwegian firms with direct evidence. In table 1 we summarize the underutilization of tax depreciation by Norwegian corporations 1988, 1991, 1992 and 1993.[2]

Table 1. Underutilization of tax depreciation in Norwegian firms. Calculated from a sample of corporate tax returns prepared by Statistics Norway. Underutilization is calculated as total depreciation allowed minus the total depreciation claimed, divided by total depreciation claimed. Values are weighted to represent the population of firms. Calculations by authors. Sample size is approximated to nearest thousand

Year	1988	1991	1992	1993
Sample size	1700	4400	4300	2400
Mean percent underutilization	10	21	8	9
Percent of firms that do not use maximal tax depreciation	39	44	25	20

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[1] There is one obvious way in which the "common sense" may be wrong: firms may wish to delay their depreciation deductions if they expect tax rates to increase soon enough to outweigh the interest cost of delay and the cost of the uncertainty. This seems unlikely for the Nordic countries, since during this period they reformed their corporate tax systems to *lower* tax rates. Further, these reforms were among the latest in the OECD-countries (Whalley 1990). Due to the openness of the Nordic economies, there is strong pressure to keep corporate tax rates down near the levels of their trading partners, so there is no reason to think corporations expected tax rates to increase any time soon.

[2] It may seem odd that the evidence for underutilization thus far comes only from Nordic countries. We do not think this is because Nordic tax accountants are too cold to do rational tax planning. One of the hypothesis we investigate is that underutilization is induced by a "uniform reporting" accounting system, which was used throughout the Nordic countries, but is also used by many other OECD countries (Sinn 1987). However, although this hypothesis seems to find some support in the data, it is not the only explanation, and in fact Norway switched to a separate reporting system midway through our sample period. The explanation may be no more sinister than the design of the tax forms: in Norway, firms report both the allowable and the utilized depreciation on their tax return, so the researcher can directly observe discrepancies. In addition, corporate tax returns are usually not available for research.

Underutilization is quite substantial: about 10 percent of allowable depreciation is not deducted in each year, with a peak of 21 percent in the recession year of 1991. For comparison, Forsling (1996) reports about 5% average underutilization of depreciation, and 5-10% underutilization of all allowances in Sweden over 1979-93. Between 20 and 40 percent of firms do not fully utilize their allowable depreciation deductions. The significant changes after 1991 are likely the result of the Norwegian tax reform that took effect in 1992, as we discuss below. The underutilization is also quite large, measured in absolute terms. The foregone deductions in 1991 were approximately 3 billion NOK (about US$500 million in a country with only 1.7 percent as much GDP as in the US[3]), and around 1 billion in each of the other years.

One interpretation of these facts is to observe that firms in Norway are prepaying between 280 million and 1.5 billion NOK in taxes (using 1992-tax rate), foregoing one year or more of interest on that amount. Another interpretation makes the point more plainly: accelerated depreciation is a zero-interest loan from the government. When firms underutilize they are foregoing zero-interest loans. We find that about 12.5 percent of the firms in 1991 (about 5 percent in 1988 and 3 percent in other years) forgo zero-interest loans, i.e. underutilize, and at the same time increase private long-term debt. Thus, our research fits squarely in the literature on corporate financial behaviour, with the following question: why do firms forego substantial tax-free debt from the government?[4]

We consider several possible explanations for this behaviour, and then test the hypotheses on firm-level tax return data from Norway. Our findings suggest that several factors play a role:

- Corporations forego depreciation deductions to apply "window-dressing" to their accounting earnings when they have losses, low profits or other signs of economic distress.

- Tax loss carryforwards sometimes compete with depreciation deductions. Loss carryforwards expire, while depreciation can be postponed forever.

- The uniform reporting accounting system used in many OECD countries, including Norway before 1992, imposes a constraint on dividend payments that can be relaxed by underutilizing depreciation

[3] Figures from 1993.

[4] The scholarly finance community has long puzzled over whether tax policy has any effect on corporate financial policy. For example, Stewart Myers (1984) wrote in his Presidential Address to the American Finance Association, "I know of no study clearly demonstrating that a firm's tax status has predictable, material effects on its debt policy. I think the wait for such a study will be protracted". MacKie-Mason (1990) provided evidence that a firm's marginal tax rate did affect its choice between debt and equity financing. MacKie-Mason and Gordon (1997) show that tax treatment has material effects on the choice of legal form of organization. The present paper continues this line of research by asking why firms decline to fully utilize tax-subsidized, zero-interest debt.

deductions. Thus to the extent that paying dividends is valuable to the firm — as suggested by various signalling stories (and the fact that dividends is paid in countries in which they are tax disfavoured) — a firm that is constrained may forego accelerated depreciation in order to increase dividend payments[5]. Our results provide little support for the economic importance of the dividend constraint, though.

Kanniainen and Södersten (1994) suggest another hypothesis: that underutilization may lower the costs of monitoring the firm's managers. This story focuses on the financial trade-off between tax debt and private debt, and assumes that the firm may wish to forego some tax debt if private debt providers (primarily banks) provide monitoring services in exchange for the higher interest rate on private debt compared to tax debt. Although ingenious, we only find weak support for this hypothesis.

The empirical analysis is based on firm level data from 1988, 1991, 1992 and 1993. The data cover two years before the tax reform and two years after, so we can test whether the behaviour changed due to the tax reform. The tax reform changed certain important accounting rules, creating a significant natural experiment for testing our hypotheses. Further, we have extremely detailed firm-level tax return data; data of this quality have usually been unavailable to researchers.

Our data set includes both small closely held corporations and large corporations, allowing us to test whether there are significant differences in behaviour between different size corporations. One special feature of our data that permits us to directly study depreciation underutilization is that the data contain a form that gives detailed information on both depreciation declared and maximum allowable depreciation.[6]

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[5] The implication of the uniform reporting constraint on dividends was first explored by Boadway (1980) and further extended by Kanniainen and Sødersten (1994). They, and Cummins, Harris and Hasset (1995) catalogue the use of uniform reporting by OECD-countries; roughly the divide is between "Anglo-Saxon" (separate reporting) and other countries.

[6] We concentrate on the use of tax depreciation. However, some of the theory applies to other discretionary non-cash deductions as well. One such in Norway (until 1992) is the consolidation fund allocation. The consolidation fund is a way to shelter a fraction of current profit from tax, as long as the allocation was retained. We do not attempt to explain underutilization of the consolidation fund for several reasons. Most importantly, the uses of the fund are restricted to financial or real investment. If the firm have different investment opportunities compared to shareholders there will be a shadow cost to using the full allocation. We are not in position to measure this opportunity cost of imposing a restriction on the firm's retained earnings (which depends on the firm's expectations about future investment opportunities), and we expect that this omitted variable would be correlated with the measures we do have for other effects. Second, the Norwegian tax reform abolished the consolidation fund allocation, so we have two fewer years of data and cannot meet our objective of comparing behavior before and after the tax reform. Third, the consolidation fund allocation was a tax system feature peculiar to Norway, unlike accelerated depreciation which has been employed in most OECD countries.

We proceed as follows. In the next section we describe the Norwegian corporate tax system in more detail. In Section 3 we discuss the possible theoretical explanations for tax depreciation underutilization. Section 4 discusses the choice of regressors while Section 5 gives a description of the econometric method. The empirical results are given in Section 6. Section 7 concludes.

2. The Norwegian corporate tax system before and after the tax reform

2.1. Before the corporate tax reform in 1992

The corporate tax system in Norway is quite similar to those found in most OECD countries, with a few important differences. The municipal tax rate is quite high, and before 1992 it was paid on a base different from the national tax. A substantial fraction of pre-tax earnings could be allocated to various tax-deferred accounts. And, as mentioned above, before 1992 there was uniform reporting, which required reconciliation between the tax and the accounting measures. We will specify some important details of the tax calculation.

The definition of accounting profit after tax is

$$\Pi - d^B - rB - (d^T - d^B) - F - T \tag{1}$$

where Π is operating profits, d^B is book depreciation, d^T is tax depreciation (and thus (d^T - d^B) is accelerated depreciation), F is fund allocations, T is corporate tax and rB is net interest cost where r is the interest rate and B is the net debt. The amount of accelerated depreciation, (d^T - d^B), can be either positive and negative. When the corporation has positive net investments accelerated depreciation will usually be positive, when net investments are negative accelerated depreciation will usually be negative. Only declining balance is used for tax depreciation on physical assets. Book depreciation, d^B, which can be either linear or geometric, is intended to approximate economic depreciation, and may differ from tax depreciation.

The most important tax deferred fund allocation, F, was the so-called consolidation fund. Each year a corporation could allocate 23 percent of the pre-tax profit into this fund. There were no requirement to reverse these fund allocations, which meant that the corporation could defer taxes to infinity. The consolidation fund allocation can be defined as

$$F = \varphi \max(0, \Pi - d^B - rB - (d^T - d^B) - \Psi) \tag{2}$$

where φ is the consolidation fund allocation rate, 23 percent in 1991, and Ψ denotes tax loss carryforwards. We see from (2) that a corporation with a negative tax base after loss carryforwards could not allocate to the consolidation fund. For simplicity we will assume, however, that the tax base after loss carryforwards is positive.

Before 1992 corporations paid a municipal tax of 23 percent, and a national tax of 27.8 percent, for a total of 50.8 percent. The tax bases were different: dividends were deducted for the national tax. We let η be the municipal tax rate and κ be the national tax rate, to write the total tax as

(3)

$$T = \eta(\Pi - d^B - rB - (d^T - d^B) - F - \Psi) + \kappa(\Pi - d^B - rB - (d^T - d^B) - F - \Psi - \max[0, D^*])$$

where

(4) $$D^* = \min[D, \Pi - d^B - rB - (d^T - d^B) - F - \Psi]$$

where D is dividends. Dividends are deductible in the national tax base only to the extent of positive current profit after loss carryforwards.[7]

Our primary interest is to find the accounting relationship between tax depreciation, dividends, tax payments and book equity. Norwegian corporate tax law permits a corporation to pay dividends out of current profit plus free equity (accumulated retained earnings). Therefore as an accounting definition we have

(5) $$\Pi - d^B - rB - (d^T - d^B) - F - T + \Omega \equiv D + \Delta R + (\Delta\Omega + \Omega)$$

where ΔR is the allocation to the reserve fund, and Ω is the firm's free equity[8]. We require that $D \geq 0$, $\Delta R \geq 0$. The residual, $\Delta\Omega$, can be positive or negative depending on the current profit. It is the dependency between book and tax values shown in (5) that is called uniform reporting[9]. From this

[7] Firms are also allowed to pay dividends out of their accumulated retained earnings, but these are not tax deductible. Equation (3) is a simplification of the Norwegian corporate tax function. There are several other deductions, but for our analysis these can be omitted without any loss of generality.

[8] We have ignored one additional complication that does not affect the qualitative implications. For the purpose of paying dividends, a firm can add the accumulated consolidation fund net of the value of taxes deferred to its free equity.

[9] See, for example, Birch-Sørensen (1994) or Kanniainen and Södersten (1995) for a discussion of different reporting conventions. Cummins, Hasset and Harris (1995) investigate the impact of uniform reporting on firm investment.

identity we see that the firm's choice of tax depreciation, d^T, affects the maximum allowable dividend.[10]

One exogenous constraint on dividends is that under certain circumstances, some of the current profit must be allocated to the so-called reserve fund (*R*). The reserve fund is equity that must be retained to protect the creditors: it has no tax consequences but it cannot be used to finance dividends.[11]

The reserve fund allocation will probably be a restraint among new corporations, corporations that use debt as their primary financing source or corporations that do not have enough return on their investment to build up the reserve fund (these will, of course, in the long run disappear).

If we substitute for *T* and *F* in (3), remembering that we have assumed that current profit after loss carryforwards is positive[12], then solve for d^T and add the maximum allowable tax depreciation $d^{\max}$ on both sides to find the amount of underutilization we get:

(6)

$$d^{\max} - d^T \equiv d^{\max} + rB - \Pi - \frac{1}{(1-\varphi)(1-u)}[(\varphi + (1-\varphi)u)\Psi - D(1-\kappa) - (\Delta\Omega + \Omega) - \Delta R]$$

where $u = \eta + \kappa$.[13] Equation (6) summarizes the accounting constraint dependence between underutilization of tax depreciation and different sources and uses of income. For example, an increase in dividends or book equity, $\Delta\Omega$, can be achieved by higher underutilization. Likewise, high loss carryforwards (Ψ) can crowd out tax depreciation if the firm is dividend constrained.[14]

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[10] As mentioned earlier in the paper, there are some other discretionary tax choices available to firms that affect the dividend constraint. We do not model these choices in this paper, but discuss the implications of ignoring the most important, the consolidation fund, in footnote 6.

[11] The firm must allocate 10 percent of current year profit after tax to the reserve fund if the accumulated reserve fund is: i) less then 20 percent of the book share value, or; ii) the reserve fund plus revaluation fund plus book share value (we call this amount X) is less than total debt. (The revaluation fund is where the firm accumulates periodic book value adjustments due to significant changes in the market value for assets). In addition, if the corporation chooses to pay more dividends than 10 percent of X, it must also allocate the same amount to the reserve fund as the difference between dividend paid out and 10 percent of X.

[12] This assumption is for expository ease; the qualitative results does not depend on it.

[13] To calculate the amount of the dividend that is deductible from the national tax base (see equation (3)), we have assumed that the dividend itself is less than current pre-tax net income net of loss carryforwards (and thus is fully deductible, and the coefficient on *D* becomes $1[(1-\varphi)(1-u)]$. If the net income measure is negative, no dividend is deductible, and the coefficient on *D* becomes $1[(1-\varphi)(1-\eta)]$. Obviously, the qualitative relationship between underutilization of tax depreciation and the payable dividend is unaffected by which of these three cases is in effect.

[14] A rational firm *should* underutilize tax depreciation in order to use its full tax loss carryforwards if it wishes to maintain a particular level of dividends, because the loss carryforwards expire in finite time while tax depreciation can be claimed indefinitely into the future.

We can also use equation (6) as a departure point for discussing possible competition between interest costs and accelerated depreciation. See DeAngelo and Masulis (1980) and Sinn (1987) for further elaboration of this point.[15] High loss carryforwards may mean that the firm has had high interest payments in the past. Therefore, this exogenous constraint may have an impact on tax depreciation underutilization.

2.2. The corporate tax system after 1992

The 1992 tax reform changed the corporate tax system radically. The corporate tax rate (combined municipal and national) was reduced from 50.8 percent to 28 percent. This reduction was offset by an increase in the tax base. Allocations to tax exempt funds (e.g. consolidation fund) were abolished and tax depreciation rates were decreased. If a corporation had owners who worked in the corporation (active owners) and who collectively control more than 2/3 of the shares (or dividends), the corporation had to pay an additional tax, called personal tax, on corporate profits. This tax is a function of the owners income, but the corporation pays the tax. The accounting rules were also changed, to replace uniform reporting with separate reporting. The result is that the firm's choice of tax depreciation does not directly affect the dividend constraint. This change offers a natural experiment to test the importance of the dividend constraint as an explanation of the underutilization of depreciation deductions.

Before the reform the difference between tax and accounting depreciation was deducted from accounting profit, and registered as an increase in long-term debt; after the reform accounting profit is only reduced by the tax value of the difference. That is, the deferred tax due to accelerated depreciation is deducted from current profits, which cancels out the effect of tax depreciation on the dividend constraint. To see this, we can write the accounting profit after the tax reform as:

$$\Pi - d^B - rB - S + \Omega \equiv D + \Delta R + (\Delta\Omega + \Omega) \tag{7}$$

where S is the tax cost. Equation (7) tells us that current profit after tax plus free equity can be used to pay dividends, increase the reserve fund or increase the equity. The tax cost, S, is the sum of the currently payable tax, T, and the deferred (postponed) tax, P, i.e. $S = T + P$. A simplified corporate tax function for the payable tax can be written as:

$$T = \tau(\Pi - d^T - rB - \Psi) + \tau_w(\Pi - d^T - \rho K - W) \tag{8}$$

[15] As Sinn (1987) points out this competition will only exist when loss carryforwards are limited, as they are in the most OECD countries, including Norway.

where τ is the corporate tax rate and τ_w is the personal tax rate. The tax base for the personal tax is operating profits minus depreciation, an imputed capital return (ρK) and a wage deduction[16]. The imputed capital return is calculated as a fraction of the corporation's tangible assets (16 percent in 1992). Only the first term on the right hand side applies when the corporation is not obliged to pay personal tax.

The deferred tax can be written as:

$$P = \tau(d^T - d^B) \tag{9}$$

which is simplified because assets other than depreciable capital will contribute to *P*. These other deferrals have no effect on our analysis, however. If we insert for *T* and *P* in (7) we get

$$(1-\tau-\tau_w)\Pi - (1-\tau)(rB + d^B) + \tau_w(d^T + \rho K + W) + \tau\Psi + \Omega \equiv D + \Delta R + (\Delta\Omega + \Omega) \tag{10}$$

For $\tau_w = 0$, equation (10) will be reduced to:

$$(1-\tau)(\Pi - d^B - rB) + \tau\Psi + \Omega \equiv D + \Delta R + (\Delta\Omega + \Omega) \tag{11}$$

By itself, the change to separate reporting convention loosens the dividend constraint, because the firm deducts only the tax rate times the accelerated depreciation from accounting profit, rather than the full amount of the accelerated depreciation. As a result, there is a relationship between book depreciation and dividends, but an underutilization of tax depreciation has no effect on the constraint, as we see from (11).

However the overall tax reform could either loosen and tighten the constraint, depending on the firm's circumstances. If we first insert the expressions for taxes and consolidation fund in equation (5), and then take the difference between the left-hand sides in equation (5) and (11), we obtain[17]

$$(\Pi - d^B - rB)(1 - \tau - (1-\varphi)(1-u)) + (1-\varphi)(1-u)(d^T - d^B) \tag{12}$$

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[16] The "lønnsfradrag" or supplemental wage deduction is intended to account for a return to managerial human capital. It is calculated as a percentage of the difference between the firm's total wages and the wages of the active owners. The current percentage is 20 percent.

[17] To keep the presentation simple, we again assumed that the firm's dividends are sufficiently small that it is permitted to deduct the full amount from the pre-reform national tax base. We have also assumed that the corporation does not have active owners sufficiently large to incur the personal tax. These complications would change the algebraic expressions but not the conclusion that the dividend constraint could have in either direction after the reform.

If this expression is positive, the dividend constraint is less binding after the 1992-reform. However, the sign of the last term is ambiguous.

3. Towards a theory of tax overpayment

Why do firms underutilize tax allowances? We usually assume firms maximize a value function that is decreasing in the after-tax cost of capital (see for instance Auerbach (1983) or Sinn (1987) for a survey of the literature). The cost of capital is decreasing in the firm's tax depreciation rate. Therefore, the standard implication is that firms should deduct all permitted depreciation. Put simply, firms are relinquishing more to the government than necessary.

How large is the amount the corporation will loose if it chooses not to accumulate tax debt? To present the idea simply we will only look at one investment at time zero. Let *K* be the capital investment in the starting period. We assume further that the book depreciation rate is, δ, which also is equal to economic depreciation. Let the maximal tax depreciation rate be ρ. The present value of tax depreciation is:

$$u\int_0^\infty \rho K e^{-(\rho+r)t}\,dt = u\frac{\rho}{\rho+r}K \tag{13}$$

where *u* is the tax rate. The present value when the corporation chooses to use book depreciation is:

$$u\int_0^\infty \delta K e^{-(\delta+r)t}\,dt = u\frac{\delta}{\delta+r}K \tag{14}$$

The loss from underutilizing tax depreciation is the difference between the present values. This difference is

$$u\frac{r(\rho-\delta)}{(r+\rho)(r+\delta)}K \tag{15}$$

Equation (15) can be interpreted as the gain in present value when accelerated depreciation is used. This gain increases in absolute terms when *K*, the capital investment, is high or the interest rate is high. Thus, we should expect that underutilization is low when the base for depreciation or the interest rate is high.

We believe that there can be several rational causes why firms forego the gain showed in (15). In the following subsections we present several hypotheses that predict circumstances under which a firm might choose to underutilize tax depreciation. We also identify their testable implications in preparation for our empirical investigation in the following sections.

3.1. The dividend constraint

In our description of the pre-reform tax system we showed that a corporation can relax the legal constraint on dividend distribution by decreasing the use of accelerated depreciation. After the tax reform tax depreciation does not enter the constraint directly, but if the firm for other reasons claims book depreciation as a function of tax depreciation then the choice of tax depreciation will still affect the maximum permitted dividend distribution.[18]

Various signalling theories have been proposed to explain why corporations might want to pay dividends even when they are tax disfavoured. The theories predict both that there is an optional positive level of dividends, and that there is an advantage to keep dividends constant or increasing over time. These objectives may be thwarted by the legal dividend constraint, especially when a firm experiences low earnings. Earnings variation can be offset by claiming lower tax depreciation, which has the effect of raising the accounting profit used in calculating the dividend constraint. Since the signalling stories follow from information asymmetries between corporate managers and the shareholders, one testable implication is that the dividend constraint should be less important for small corporations and corporations not traded publicly.

Bhattacharya (1979) developed a model in which dividends signal expected future profits. Therefore, the share value of dividend-paying firms is more likely to increase than the price of non-dividend firms. Bernheim and Wantz (1995) find strong evidence in favour of this hypothesis.

Suppose that the managers simultaneously choose the dividend and depreciation utilization. Bernheim and Wantz (1995) manipulates Bhattacharya's (1979) model to get the following market equilibrium market value function :

$$(16) \qquad V(D) = \left(\lambda(\eta + \kappa) + (1-\lambda)\sqrt{(\eta + \kappa) + C} \right) D$$

[18] There are accounting principles in Norway, as in most countries, that limit how much book depreciation a firm can claim. However, since the reform (small) firms have been given significant latitude to equalise tax and book depreciation both because the differences in the amounts are no longer very large, and to reduce the costs of maintaining two sets of accounts.

where C is a constant and λ is a constant between 0 and 1. The cost of the dividend distribution is then the usual cost plus the additional tax cost from underutilization. From the above discussion we know that $D=f(d^T)$ and that f_d (the derivative of f with respect to d^T) is less than zero before the tax reform. After the tax reform, tax depreciation has no direct impact on dividends. The derivative of the firm's value equation (16) with respect to D is clearly positive. If we consider the period before the tax reform, a corporation that faces a binding dividend constraint may want to underutilize tax depreciation if

$$\frac{\partial V}{\partial D} > \frac{\eta}{1-\eta-\kappa} r \tag{17}$$

where the left hand side is the increase in the firm value due to a \$1 increase in dividends and the right hand side is the cost if the increase in dividends are financed by an increase in the underutilization of tax depreciation (see appendix B for a derivation). Since we are interested in the long run cost of underutilization, the tax factor $\frac{\eta}{1-\eta-\kappa}$ is multiplied by the interest rate r[19]. The tax factor is equal to 0.467, and given a 10 percent interest rate we find the long run cost of this swap to be approximately \$0.05. This cost is quite small, that is, a rather small $\frac{\partial V}{\partial D}$ can induce underutilization of tax depreciation.

3.2. Monitoring

Kanniainen and Södersten (1994) suggest that tax debt may have an implicit cost that offsets its zero interest rate.[20] They suppose that banks and other private lenders perform a monitoring function for the firm. To the extent that the share and debt holders have common interests in monitoring the managers, monitoring is a positive externality from private debt that is not available from tax debt. Depending on the importance of the monitoring benefits, there may be an internal optimal level of tax relative to private debt, reached when the marginal monitoring benefit is equal to the marginal underutilization cost. This optimum may occur at less than full utilization of available tax debt.

[19] We have not included personal taxes into this tax factor because we are only interested in the additional tax the firm will get from the swap from tax depreciation to dividends, and there are no additional personal taxes due to this change.

[20] Depreciation deductions taken today are a form of zero interest tax debt because depreciation not claimed today can be claimed in future years. Therefore, depreciation today lowers current taxes rather than future taxes, with no interest charged on this change in the timing of tax payments.

As evidence to support the monitoring cost hypothesis, Kanniainen and Södersten (1994) offer their finding that small corporations in Sweden and Finland tend to fully utilize their depreciation deductions, while larger corporations do not. They conjecture that the principal-agent problem between owners and managers is more severe in larger corporations, and thus that the monitoring advantage of private over tax debt is more valuable for the larger firms.

3.3. Other explanations

3.3.1. Tax system costs

Aarbu (1994) found that in Norway small corporations have a higher underutilization rate than large corporations. Kanniainen and Södersten (1994) found the opposite in Sweden and Finland. Both studies used approximately equivalent definitions of "small". Based on discussions with professional tax advisors in Norway, we hypothesise that an explanation may be found in tax system administrative costs. Norwegian tax law requires corporations to show the difference between tax valuation and book valuation for all assets.[21] The most important source of such differences is the use of different tax and book depreciation.[22] If there is a valuation difference, the corporation must fill in additional forms. Thus, reporting a difference between tax and book depreciation carries an administrative cost. If the tax saving from accelerated depreciation is small relative to the extra administrative cost then the corporation might underutilize accelerated tax depreciation in order to equalize it to book depreciation.

There is reason to believe that tax administration costs did not change much following the tax reform. Before the reform, the corporation had to keep track of the accumulated differences between tax and book values; after the reform it has to keep track of the same differences times the tax rate (see equations (1) and (9)). We can put this hypothesis in a little more formal terms. Let c denote the cost to auditors and accountants. We can then express c as a function of accelerated depreciation.

$$c = \begin{cases} c_1, & d^T = d^B \\ c_1 + c_2, & d^T \neq d^B \end{cases} \tag{18}$$

where c_1 is the minimum auditor/accountant cost. An increase in accelerated depreciation will increase the total cost because the auditor has to use more time and effort to keep track of the accumulated tax

[21] This is true both before and after the reform. Book and tax valuations can differ even if net income has been harmonized for uniform *reporting*, because the latter is done by an adjustment entry.

[22] It might help to clarify the distinction between "uniform reporting" such as we required in Norway before the 1992 tax reform, and equalization of tax and book depreciation. Uniform reporting requires that differences between tax and book accounts be reconciled so that net income reported in shareholder financial statements is the same as that reported to the tax authorities. This reconciliation adjusts for differences between tax and book depreciation, which are permitted.

debt. How large is the amount the corporation will lose if it chooses not to accumulate tax debt? If we have that

$$c_2 > u\frac{r(\rho-\delta)}{(r+\rho)(r+\delta)}K \tag{19}$$

the corporation may choose not to use accelerated depreciation. The probability for that C_2 is larger than the right-hand side increases when K decreases.

3.3.2. Window-dressing

Claimed tax depreciation reduces reported book income in Norway, especially before the tax reform when the accounting rules required uniform ("one book") accounting. Therefore, we are inclined to ask whether firms might want to underutilize deductions in order to improve the income statement in years earnings lower than expected. We have shown in Appendix A that on a purely financial basis and limits on loss carry forwards set a side, the firm's value will be greatest if the corporation always utilizes tax depreciation fully, regardless of reported book losses in a year. But is there some cost to reporting a loss that we have not considered?

Since Myers and Majluf (1984) it has been standard to assume that there are information asymmetries between providers of financing and borrowers. If so, a corporation in need of financing may be tempted to use some window-dressing on its net income. A full treatment of this hypothesis would require a model with adverse selection for debt financing. Such a model would have strong similarities to the Myers and Majluf (1984) model for equity issuance, and to the Stiglitz and Weiss (1981) model of credit rationing. These models suggest that equilibria can exist in which at least some firms in difficulty will incur underutilization costs in order to obtain greater access to debt. Because tax depreciation has a smaller marginal effect on book net income after the tax reform, we expect that the window-dressing effect, if one exists, will be larger before the reform.

As it happens, in Norway there is a second reason to expect some firms to use window-dressing: an accounting rule that imposes a cost on poor financial results. When a corporation has lost two thirds of its book share value some costly and restrictive actions must be taken. To avoid entering this formal state of financial distress, a firm might choose to use less tax depreciation.

4. Econometric specification

4.1. The dependent variable

The theory predicts that in general there will exist an optimal value of tax depreciation. Without loss of generality (see appendix C), we specify the dependent variable for the analysis as underutilization, equal to maximum utilization minus actual utilization, because this makes it easier to interpret the coefficients. Since reported tax depreciation is constrained above by the maximum allowed and below by zero, we have a limited dependent variable that is doubly censored for every corporation. We describe our econometric method for estimating the doubly-censored model below.

4.2. The regressors

4.2.1. The dividend constraint

Because the dividend constraint is specified as an inequality in terms of observable, we can determine whether or not the firm is constrained at the margin. If the firm underutilizes, *and* if the accounting constraint is satisfied as an equality, then the firm is constrained at the margin: in order to pay an additional dollar of dividends, it must report lower depreciation. Therefore, for years before the tax reform we construct a variable DIVC that is equal to one when equation (5) is satisfied as an equality, and zero otherwise.[23]

The dividend constraint after the tax reform is based on book, not tax depreciation. However, as we explained earlier, firms may choose to equalize their book and tax depreciation. The constraint in terms of book depreciation was given in equation (11). After the tax reform we define DIVC to be one if the constraint is binding when stated in terms of book depreciation. This constraint is exogenous; whether the firm actually chooses to equalize book and tax depreciation is endogenous, but does not affect the definition of DIVC. Since we estimate our models separately for each year, the post-reform re-definition of DIVC does not contaminate the results.

4.2.2. Monitoring costs

The essence of the Kanniainen and Södersten (1994) hypothesis is that corporations substitute between tax debt and other debt. A way to test this is to use the increase in the private long term debt (DLDEBT) as an explanatory variable. A firm that underutilize tax depreciation and at same time

[23] To avoid problems with round-off and other small arithmetic errors, we actually define DIVC=1 if the constraint equality is satisfied within 2000 NOK ($US 300). The actual point where DIVC shifts to one is based on empirical investigation for firms with dividends near the maximum allowable dividends. From graphs (available from the authors on request) we find that firms cluster below this point, while firms over this trigger point are evenly spread.

increases private debt foregoes interest free debt for costly debt. This specification is therefore a direct test of the monitoring hypothesis.

We believe, however, that firms with high accumulated tax debt have a higher likelihood not to use the interest free debt as a financing source. We control for this by including the tax debt as a fraction of total assets (TDEBT), in the start of the year as an explanatory variable. The reasoning behind this choice is the following. If tax debt is relatively high at the start of the year, then the firm might reduce monitoring costs by adding private debt rather than tax debt. Therefore, we expect to see more underutilization when the start-of-year tax debt fraction is high.

4.2.3. Accounting costs

We suggested that accounting costs may induce some firms to equalize their reported tax and book depreciation. Discretion in the accounting rules makes it possible for firms to equalize by underutilizing tax depreciation, or, at least for many firms, by fully utilizing tax depreciation but then overreporting book depreciation. Reporting different depreciation amounts has administration costs; underutilizing tax depreciation raises tax payments; overreporting book depreciation presumably has adverse consequences for business planning and access to financial capital.

We will test for the relationship between underutilization and depreciation equalization. We construct a dummy variable (INFO) that is one if the accumulated tax debt in the start of the year is zero. Corporations that have accumulated tax debt equal to zero have always equalized tax values and book values. If corporations equalize depreciation by fully utilizing tax depreciation while overreporting book depreciation, then the coefficient will be negative. If corporations use economic depreciation rates for tax depreciation (and thus underutilize), the coefficient on INFO will be positive.

4.2.4. Window-dressing

Corporations with poor results may be inclined to window-dress their after-tax net income by underutilizing tax depreciation, as explained above. We can find several indicators for the economic condition in a corporation. First, a corporation that has negative income after tax with maximal utilization, may reduce the absolute value of the negative result by lower depreciation (consolidation fund deduction is not allowed when profits are negative). This will raise the tax cost in long term (if the corporation gets positive profits in the future), but not in short term. We define a variable DIVP that is profit after tax given full utilization, calculated as the left hand side of (19).[24]

[24] We define DIVP using full utilization because actual utilization is endogenous.

Another predictor that is often used to measure economic health is Altman's (1968) ZPROB. ZPROB is a discriminant function predictor of bankruptcies. Altman correctly classified 94 percent of the corporations that went bankrupt the following year and 97 percent of those that did not. The measure is a weighted average of the following financial indicators: sales, operating result, working capital, retained earnings and market equity to book debt. Therefore, a high ZPROB generally indicates less financial distress. Market equity to book debt is not included in our measure of ZPROB because it cannot be observed for most of the firms. However, the exclusion of the market equity variable will not decrease the importance of the other financial variables. ZPROB will therefore be used as an explanatory variable. ZPROB is scaled by total assets, so it can therefore take very large positive or negative values if total assets are small. We control for this by constraining ZPROB to a maximum absolute value of 50.[25]

4.2.5. Competition between loss carryforwards and tax depreciation

The Norwegian tax rules set a 10 year limit for how long a corporation can carryforward losses, which means that a corporation will lose previous losses if it fails to deduct them from future profits within a 10 year range. The higher the loss carryforwards are the higher will the probability be for competition between these and current depreciation deductions. We will therefore include accumulated loss carryforwards, denoted LCARRY, as a explanatory variable, and we expect that underutilization is negatively correlated with LCARRY. It is likely that corporations that are on the limit to lose loss carryforwards have a different behaviour than corporations with new loss carryforwards. This suggest that we should use the oldest loss carryforwards as an explanatory variable. In addition to the accumulated loss carryforwards we have also included a weighted sum of loss carryforwards that expire within 2 years (LCARRY1)[26]. We expect that firms with old loss carryforwards will on average have a higher likelihood for underutilization.

4.2.6. Other specification issues

We use lagged variables from the balance sheet to avoid simultaneity bias. We also scale all variables in the regression equation with total sales including financial income (SIZE), except ZPROB and TDEBT that are defined as fractions in the first place[27]. However, after this normalisation, we are still

[25] About 5 to 10 observations have higher values for ZPROB each year. We could instead drop these observations from our sample, however the observations seem to be normal in all other respects so we keep them in the sample.

[26] The data for 1988 have no information about the loss carryforwards history, which forces us only to use accumulated loss carryforwards as an explanatory variable for this year.

[27] We have tried several size-measures; both total assets and different definitions of sales. The results are not sensitive to the choice of the size-measure.

able to detect large variability between corporations of different sizes. For that reason we divided the sample into four groups each year, according to SIZE.[28] Group 1 consists of corporations that have less sales than 3 million NOK. Group 2 is from 3 million NOK to 20 million, group 3 ranges from 20 million to 100 million and group 4 contains corporations with assets higher than 100 million NOK.

In Table 2 we summarize our hypotheses in terms of the explanatory variables, and indicate our prediction about the correlation.

Table 2. The expected correlation between underutilization and the regressors. A (+) indicates that the corresponding hypothesis predicts a positive correlation between the explanatory variable and the dependent variable; a (-) indicates an expected negative correlation; and a blank indicates no prediction from the theory

	Explanatory variables			
Hypothesis	DIVC	TDEBT		DLDEBT
Dividend constraint	+ (before tax reform) 0 (after tax reform)			
Monitoring costs		+		+

	Explanatory variables (continued)			
Hypothesis	DIVP	ZPROB	INFO	LCARRY/ LCARRY1
Window-dressing	-	-		
Information costs /tax system costs			+	
Competing deductions				+

4.3. Econometric Method

Tax depreciation is censored by exogenous tax rules. This implies a particular structure for the stochastic component of our model. The maximum depreciation for corporation j is $d^{\max}$, where we suppress the firm subscript j for convenience (although it is important for the estimation that each firm has its own $d^{\max}$). Then,

(20) $$0 \le d^T \le d^{\max}$$

[28] It may be other ways to care of the variability, for instance with use of dummy variables both for slope and intercept or a model with random coefficients. The division of the sample after SIZE, is however, simple and the results should be easier to interpret.

for all corporations[29]. We assume that the real unobserved (latent) variable d^* has a normal distribution with mean μ and variance σ^2. Following Greene (1990) or Maddala (1983) we get the following model specification for d^*

$$d^* = \beta x + u$$

$$d^T = \begin{cases} 0 & \text{if } d^* \le 0 \\ d^* & \text{if } 0 < d^* < d^{\max} \\ d^{\max} & \text{if } d^* \ge d^{\max} \end{cases} \tag{21}$$

where β is a vector of coefficients, x is the vector of explanatory variables given above and u is the disturbance vector. Let P denote a probability. Then the probability for observing $d^T = 0$ is equal to

$$P(d^T = 0) = P(d^* \le 0) = P(-\beta x \ge u) = P(-\frac{\beta x}{\sigma} \ge \frac{u}{\sigma}) = F(\frac{\beta x}{\sigma}) = \Phi_{L1} \tag{22}$$

where F denotes the cumulative standard normal distribution. Similarly the probability for observing $d^t = d^{max}$ is equal to

(23)

$$P(d^T = d^{\max}) = P(d^* \ge d^{\max}) = P(d^{\max} - \beta x \le u) = P(\frac{d^{\max} - \beta x}{\sigma} \le \frac{u}{\sigma}) = 1 - F(\frac{d^{\max} - \beta x}{\sigma}) = \Phi_{L2}$$

The probability for observing an uncensored observation is, with our notation, equal to Φ_{L2} - Φ_{L1}. Given these probabilities we can write our log likelihood function as

(24)

$$L(\beta, \sigma^2 \mid d^T, x, d^{\max}) = \sum_{i=0}^{N_0} \log \Phi_{L1} + \sum_{i=N_0+1}^{N_A - 1} (-\frac{1}{2}\log(2\Pi\sigma^2) - \frac{1}{2\sigma^2}(d^T - \beta x)^2) + \sum_{i=N_{\max}}^{N} \log \Phi_{L2}$$

where we have ordered the observations so that N_0 are the number of observations that are censored at zero, the last N - N_{max} are the number of observations that are censored at d^{max}, and N_{max} - N_0 are the

[29] There will always be some minor rounding errors between our calculation of maximal tax depreciation and the maximal tax depreciation given on the tax form, because the Norwegian tax authorities round off to nearest hundred or thousand (the practice can actually be dependent of the local tax authorities). Using graphical representation we find that observations is clustered below a underutilization on 200 NOK ($US 30), which indicates censoring.

number of uncensored observations. We maximize the likelihood function with respect to the unknown coefficient vector, β, and the unknown error variance, σ^2.[30]

5. Data, sample statistics and regression results

Data are taken from Statistics Norway's income and wealth surveys of Norwegian corporations. Statistics Norway is a government agency. Its surveys extract a stratified sample of about 6000 firms from the population of all firms that file tax returns. We give a brief overview of the data. A detailed description is provided in Erstad (1990) and Nygaardsseter et al. (1995).

Collected forms are:

- profit and loss account
- balance sheet with ingoing and outgoing balance
- income return statement
- tax depreciation statement for each asset group

Almost every item on each form is registered, which gives an opportunity to study the corporate behaviour in detail. In general we use data for 1988, 1991,1992 and 1993. Some corporations, like hydroelectric power plants, have different tax and depreciation rules, so we limit our sample to corporations in the industry groups for manufacturers, building and construction, merchandise, hotels and restaurants, transport and service business. We select only the corporations that have complete information required for our analysis on their tax and depreciation forms, profit and loss accounts, and balance sheets. After the selections mentioned above we have a sample of approximately 1700 observations in 1988, 4400 in 1991 and 1992 and 2300 in 1993.

5.1. Descriptive statistics

We provide summary statistics for the dependent variable, underutilization, in table 3. All figures are given in Norwegian currency (NOK).[31]

Table 3. Summary statistics for dependent variables (before scaling). Amounts in NOK

	Maximal tax depreciation minus actual tax depreciation			
Statistics	1988	1991	1992	1993
Sample size	1700	4400	4400	2400
Mean	261 000	531 000	127 000	154 000

[30] We have used the PROC LIFEREG procedure in SAS.

[31] One Norwegian krone is about 16 cents.

Std.dev	3 121 000	7 632 000	2 173 000	2 424 000
Sum	437 000 000	2 339 000 000	555 000 000	376 000 000
Max	108 650 000	374 910 000	89 038 000	71 052 000
Upper quartile	6 000	19 000	0	0
Median	0	0	0	0
Lower quartile	0	0	0	0
Minimum	0	0	0	0

The table shows that underutilization is significant in our sample, from the lowest approximately 0.5 billion in 1988 to the highest, 2.3 billion kroner in 1991. It seems evident from the table that both average underutilization and the variability in underutilization fell after the tax reform. Further investigation (not shown in the table) shows that most of the corporations that underutilize the deductions are not in tax position and do not pay any taxes, but as we show in appendix A, a corporation will achieve the lowest tax payment if it claims all the possible depreciation due to the asymmetric treatment of depreciation and loss carryforwards.

5.1.1. Regression results

For expository convenience we present results separately for each variable. Recall that firms are divided into groups according to total income (SIZE). Separate regressions are estimated for each group, for each year. The dependent variable is the amount of underutilization. The probability values are given in parentheses. The probability value denotes the probability for a true null hypothesis[32], i.e. when the probability value is equal to 0.05 we know that there is only a 5 percent chance of obtaining a coefficient estimate that large if the null hypothesis is true.

5.1.1.1. The window-dressing hypothesis

Recall that if a firm is window-dressing, we expect it to report higher income when its results are poor by claiming lower depreciation deductions. Thus, we expect negative coefficients on our measures of profitability (DIVP) and financial health (ZPROB).

Table 4. Variable: Profit measure (DIVP). Probability values in parentheses

Year/ Group	1	2	3	4
1988	-0.080	-0.027	-0.266	-0.405
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
1991	-0.384	-0.154	-0.059	-0.097
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
1992	-0.051	-0.008	-0.012	-0.047
	(0.0001)	(0.2980)	(0.0980)	(0.0006)
1993	-0.060	-0.013	-0.017	-0.014

[32] The null hypotheses for our theory are that the parameters are zero.

	(0.0001)	(0.2460)	(0.3150)	(0.3790)

We see three important results in Table 4. First, the window-dressing hypothesis is strongly confirmed in the period before the tax reform (1988-91). Second, as we predicted, the post-tax reform decrease in window-dressing is especially great for medium and large corporations. As mentioned above, this is an expected effect, due to the change from uniform to separate reporting: it is now possible to claim full tax deductions while separately dressing the financial books. Third, for small corporations we find that window-dressing is important both before and after the tax reform. This confirms our belief that reporting conventions matter less for small firms, because they tend to equalise tax and book depreciation in any case to reduce administrative costs. We also note that the estimated effects are in general larger for small firms, suggesting that small firms are more focused on book results.

Our estimates indicate that small firms on average lower their tax depreciation by 0.01 to 0.15 NOK when the book result is lowered by 1 NOK.[33] The difference between the 1988 and 1991 estimates may be due to different macroeconomic conditions. In 1988 the economy was booming which lowers the likelihood of seeing window-dressing (little monitoring, and few corporations with negative results). Norway experienced a major recession in 1991. In a recession, borrowing will probably be constrained and profits are on average low or negative, and both effects suggest more window-dressing. The time pattern in the coefficient estimates for larger firms is quite different, however. We can conjecture that the effect over the business cycle is different because large firms need to convince the market while small firms must convince their local bank. However, we have no evidence with which to test these more subtle hypotheses about time-series variation in the coefficients.

Table 5. Variable: Altman's bankruptcy indicator (ZPROB). Probability values in parentheses

Year/Group	1	2	3	4
1988	0.0001	-0.0005	-0.0006	-0.001
	(0.9530)	(0.2140)	(0.3640)	(0.1400)
1991	0.001	-0.0003	-0.0006	-0.004
	(0.3710)	(0.0870)	(0.0030)	(0.0001)
1992	-0.001	-0.0005	-0.0005	-0.0003
	(0.0410)	(0.520)	(0.0270)	(0.2200)
1993	0.002	-0.001	-0.001	-0.002
	(0.7530)	(0.0130)	(0.0490)	(0.0070)

[33] Tobit estimates are not marginal estimates, i.e., they do not directly yield the local derivative of underutilization with respect to the explanatory variables. Following Greene (1990) pp. 730, we can find a rough marginal estimate from multiplying the Tobit estimates by the proportion of uncensored observations. These proportions are given in table 13.

We expect a negative coefficient estimate on ZPROB, our measure of financial health. We find such a result among large and medium firms, usually with statistical significance. The results for smaller (group 1 and 2) firms are mixed and generally insignificant. Since a low ZPROB ratio for a small firm generally indicates a low level of cash reserves, we suspect the demand for cash (from lower current taxes) may outweigh the desire to "dress up", holding profitability constant. (Recall, the profit indicator of window-dressing was strong for small firms.)

5.1.1.2. The dividend constraint hypothesis

We predicted that before the tax reform a binding constraint on dividends (indicated by DIVC=1) would induce depreciation underutilization, to loosen the constraint.

Table 6. Variable: Dummy for an effective dividend constraint (DIVC). Probability values in parentheses

Year/Group	1	2	3	4
1988	0.007	0.009	-0.011	0.001
	(0.790)	(0.0852)	(0.2900)	(0.7915)
1991	0.012	0.010	-0.002	-0.017
	(0.7320)	(0.0990)	(0.7820)	(0.3640)
1992	0.022	0.008	0.005	-0.059
	(0.0420)	(0.4030)	(0.5300)	(0.8990)
1993	-0.003	-0.106	-0.009	-0.056
	(0.8620)	(0.9996)	(0.6230)	(0.8750)

The results gives no support to the dividend constraint hypothesis. As pointed out above we did not expect any dividend constraint after the tax reform, which is confirmed. However, it is a little more surprising that the dividend constraint seem to have no effect in the years before the reform. There may be several reasons explaining this. First, as we see from the descriptive statistics in appendix E, a very low fraction of the firms are dividend constrained using our classification. Norwegian firms usually pay a low fraction of their income as dividends (most of the income is retained)[34]. Second, 1991 was the end of a recession period that started in 1989 and the market had low expectations regarding profits and dividends. When expectations are low, as they were in 1991, it is less likely that firms will face an effective dividend constraint.

5.1.1.3. Monitoring costs hypothesis

[34] In 1988 we find that the average fraction of dividends paid out of possible dividends (for dividend paying firms) ranges from 0.11 (group 1) to around 0.33 for medium and large corporations. In 1991 the fraction is 0.1 independent of group, from 0.30 to 0.75 in 1992 and a range from 0.18 to 0.44 in 1993.

Table 7. Variable: Accumulated tax debt in the start of the year (TDEBT). Probability values in parentheses

Year/Group	1	2	3	4
1988	-0.194	0.046	0.042	0.043
	(0.4310)	(0.1820)	(0.3400)	(0.0970)
1991	-0.841	0.019	-0.065	-0.037
	(0.0082)	(0.6530)	(0.0280)	(0.3630)
1992	0.011	0.180	-0.012	0.039
	(0.9516)	(0.0750)	(0.7950)	(0.3540)
1993	0.263	-0.018	0.025	0.062
	(0.5210)	(0.8190)	(0.7510)	(0.3350)

Table 8. Variable: Increase in long term debt (DLDEBT). Probability values in parentheses

Year/Group	1	2	3	4
1988	0.007	0.003	0.032	0.016
	(0.1720)	(0.6760)	(0.0003)	(0.2900)
1991	0.030	0.012	-0.029	0.050
	(0.0290)	(0.0001)	(0.0001)	(0.0080)
1992	0.037	0.006	-0.006	0.014
	(0.0001)	(0.2770)	(0.4030)	(0.0280)
1993	0.002	-0.022	-0.0005	0.011
	(0.6550)	(0.0014)	(0.9550)	(0.4800)

Recall that Kanniainen and Södersten (1994) hypothesize that there is a substitution effect between private debt and tax debt, because private debt suppliers play a monitoring role that is valued by a firm's shareholders. They predict that firms have an internal optimum balance between tax and private debt, and thus may not fully utilize depreciation deductions. Therefore, we expect that high tax debt (TDEBT) and an increase in private long term debt (DLDEBT) entail lower tax depreciation both before and after the tax reform.[35] In fact, we find no indication of a relationship between tax depreciation and accumulated tax debt. The estimate is statistically significant only in groups 1 and 3 for 1991 (two estimated coefficients out of sixteen), and then with the wrong sign.

If we focus on the change in long-term debt, the result are more ambiguous. If the Kanniainen and Södersten story is economically important we should expect that firms underutilize tax depreciation and at the same time increase the long term debt. However, we see no clear pattern in the estimated coefficients. About half of the estimates are not significant, and they take both positive and negative signs. However, the Kanniainen and Södersten hypothesis predicts that only large corporations, where

[35] Even though some of the technicalities in the calculation of tax debt changed due to tax reform, there was no structural shift. The interpretation of the results is therefore the same both before and after the reform.

there is a long distance between shareholders and managers, need to substitute tax debt for private debt. If we focus on group 4 we find that the parameter has the correct sign in all years, and it is significant in both 1991 and 1992. Thus we find only weak support for their hypothesis.

5.1.1.4. Accounting system costs

Table 9. Variable: Dummy for firms that equalize tax and book depreciation (INFO). Probability values in parentheses

Year/Group	1	2	3	4
1988	0.056	0.027	0.016	0.052
	(0.0050)	(0.0001)	(0.1780)	(0.0001)
1991	0.043	0.026	0.016	0.023
	(0.1267)	(0.0001)	(0.0001)	(0.0020)
1992	0.024	0.014	0.00	0.002
	(0.0020)	(0.0002)	(0.0660)	(0.2900)
1993	0.035	0.005	0.004	0.009
	(0.0140)	(0.1320)	(0.1680)	(0.0083)

INFO is a dummy variable that is one for firms that have zero accumulated tax debt, and thus have been equalizing tax and book depreciation in prior years. *INFO* = 1 for a significant number of firms: 40% - 70% of group 1 firms over the sample; fewer as firm size increases (see Appendix E). Therefore, we can infer that tax administration costs are nontrivial, since there are costs to equalizing depreciation (from either underutilizing tax depreciation or overreporting book depreciation). What we can learn from the coefficient on *INFO* is this: if it is positive, then firms that equalize tax and book depreciation tend to do so by underutilizing tax depreciation, presumably because they find that less costly than overreporting book depreciation. In that case, we can conclude that the administration costs of differential depreciation reporting tend to induce greater underutilization.

Our results confirm the hypothesis that accounting administration costs induce underutilization of tax depreciation. Firms that equalize tax and book depreciation have higher underutilization than firms which do not. The effect is stronger for small firms, as expected, because the more or less fixed accounting cost of differential depreciation reporting is less important for larger firms.

5.1.1.5. Competing deductions

Table 10. Variable: Total loss carry forwards (LCARRY). Probability values in parentheses

Year/Group	1	2	3	4
1988	0.067	0.005	-0.253	0.318
	(0.0790)	(0.8780)	(0.5740)	(0.0040)

1991	-0.043	0.037	0.001	0.031
	(0.0560)	(0.0001)	(0.7370)	(0.1880)
1992	-0.041	0.001	0.003	0.005
	(0.0050)	(0.6450)	(0.4170)	(0.5690)
1993	0.002	-0.002	-0.002	0.019
	(0.3500)	(0.5850)	(0.6260)	(0.0990)

Table 11. Variable: Weighted average of loss carry forwards older than 8 years (LCARRY1). Probability values in parentheses

Year/Group	1	2	3	4
1988	na	na	na	na
1991	0.918	0.520	-0.226	0.614
	(0.0001)	(0.1010)	(0.2890)	(0.0400)
1992	0.053	0.407	-0.092	0.015
	(0.0280)	(0.3870)	(0.4780)	(0.8060)
1993	-2.380	-0.012	-0.200	0.054
	(0.9540)	(0.7820)	(0.7570)	(0.5500)

We do not obtain convincing evidence of competition between loss carryforwards and tax depreciation. The estimated coefficients have inconsistent signs and are mostly very insignificant. The predicted competition is due to a positive probability that loss carryforwards will expire before a firm can use them. This suggest that firms with old increments in loss carryforwards are more likely to reduce tax depreciation. We test for this by using a weighted average of loss carryforwards older than 8 years (LCARRY1).[36] The coefficient estimates from this test also exhibit varying signs, and are mostly highly insignificant. (The three significant estimates are large and positive, which is consistent with competition between loss carryforwards and tax depreciation. We discount these since most of the estimates are insignificant.)

5.1.1.6. Other statistics

Due to heteroskedasticity and heterogeneity we divided the sample into four different groups. In Table 12 we report the estimated standard deviation for the estimated regression line within each group.

Table 12. Estimated standard deviation *(σ)*

Year	Group 1	Group 2	Group 3	Group 4
1988	0.111	0.027	0.037	0.016
1991	0.333	0.050	0.037	0.046
1992	0.062	0.039	0.024	0.022
1993	0.047	0.019	0.031	0.026

[36] Due to less detailed data for 1988 we cannot do this test for this particular year.

The variation is greatest in 1991 and the small firms seem to be most heterogeneous than medium and large firms. The standard deviation estimates support our view that it is important to accommodate substantial heterogeneity, even after normalizing the variables with a size measure.

Table 13. Number of observations and proportion of uncensored observations. Proportion of left censored values, i.e. zero underutilization, given in parentheses . Proportion right-censored observations = 1 - noncensored observations- left censored observations

Year	Group 1	Group 2	Group 3	Group 4
1988	321	596	429	327
	0.37 (0.61)	0.32 (0.67)	0.34 (0.66)	0.34 (0.64)
1991	1177	1158	1266	808
	0.40 (0.56)	0.38 (0.60)	0.39 (0.59)	0.40 (0.57)
1992	1068	1064	1282	857
	0.20 (0.80)	0.23 (0.77)	0.25 (0.75)	0.25 (0.75)
1993	319	477	972	681
	0.16 (0.84)	0.18 (0.82)	0.18 (0.82)	0.20 (0.80)

Our estimation equations take the form of a doubly censored Tobit model. In Table 13 we provide additional information about the proportion of observations censored in each group. These proportions can be used to calculate rough marginal effects from the Tobit estimates.

6. Concluding observations

Our results provide strong evidence that corporations are in a more complex environment than most of the theoretical literature assumes. In the typical model, corporations maximize a value function which is decreasing in the firm's after tax-cost of capital (see, for instance, Auerbach (1983), Biørn (1989) or Sinn (1987) for a survey of the literature). The cost of capital is decreasing in the firm's tax depreciation rate. Therefore the standard implication is that firms should deduct all permitted depreciation. We find that this is not always true. The primary reasons for the practice of underutilizing tax deductions seem to be:

- Firms use window-dressing on their financial accounts when they have low net income.
- Keeping separate tax and book accounts imposes costs. Costs can be avoided if a firm equalizes tax and book depreciation. This type of behaviour is frequent among small firms.[37]

[37] Recall, a firm can keep separate books even if it must report its accounts on a uniform basis to the tax authorities. See footnote 21, above.

- The tax and accounting reform in 1992 had a significant impact on Norwegian corporate behaviour. The abolition of the tax system requirement for uniform reporting effectively eliminated depreciation underutilization as a window-dressing opportunity, and the evidence indicates that window-dressing (through this method) correspondingly ended.

We investigated three other major hypotheses: that tax depreciation is sometimes disfavoured relative to other possible deductions; that firms facing uniform reporting requirements may face a dividend constraint that can be loosened by depreciation underutilization; and that firms may at the margin prefer to increase higher-interest private debt rather than zero-interest tax debt to obtain benefits from bank monitoring. We tested several predictions of these hypotheses and found little evidence to support them as important determinants of the observed underutilization.

Our research strategy could be improved in several directions. First, we do not provide a direct estimate of the accounting costs. Second, it is a difficult task to measure a firm's *desired* dividend distribution and therefore the point where it is effectively constrained. Third, it is, on the basis of tax and financial microdata, difficult to directly measure monitoring costs. Further research may demonstrate that these motivations also induce otherwise puzzling underutilization of allowable tax deductions.

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Appendix A

The asymmetry between tax depreciation and loss carryforwards

It may be useful to discuss optimal strategies in the use of tax depreciation in the Norwegian tax system. If the corporate tax system consist of a constant tax rate in an infinite time horizon and the tax system is approximately symmetric i.e. losses can be carried forward, the optimal strategy is to minimize taxes every year. Even if a corporation have a negative operating result the best strategy is to minimize (negative) taxes through a maximal use of tax depreciation. The reason for this is that there is an asymmetry between tax depreciation and loss carryforwards. A loss carryforward can be increased through the use of tax depreciation, and deducted from the result in the next period. On the other hand, if a corporation do not utilize all the possible tax depreciation one year, the corporation cannot claim more tax depreciation than the maximal rate multiplied with the depreciation base. To see this clearer we can illustrate this point with some equations.

Consider a corporation tax base in two periods. We assume that the tax rate is equal in both periods and linear. Let the corporation have a profit before tax depreciation equal to Π_1 the first period, further we assume that the depreciation base is K with a depreciation on $\rho_m K$ the first period if the corporation uses the maximum rate. If the corporation uses a lower rate the depreciation is just ρK. The tax base after the tax deprecation in these two cases are

(a1)
$$N_{1m} = \Pi_1 - \rho_m K < 0$$
$$N_1 = \Pi_1 - \rho K = 0$$

Where N_{1m} is the tax base when full tax depreciation is used and N_1 is the tax base with a lower depreciation. We have assumed, in making the example interesting, that use of full tax depreciation and the lower rate ρ both gives zero tax in period 1. In period 2 we assume that the tax base before tax depreciation is sufficiently large to cover maximal tax depreciation. The corporation can carryforward loss to the second period. Thus, the tax base in period 2 given full tax depreciation in period 1 becomes

(a2) $$N_{2m} = \Pi_2 - N_{1m} - \rho_m^2 K$$

The tax base in period 2 given that the corporation used a lower depreciation rate in period 1 generally becomes

(a3) $$N_2 = \Pi_2 - N_1 - \rho_m (1-\rho) K$$

We notice that there is no difference in the tax payment in period 1. The difference between the tax bases in period 2 are

(a4) $$N_2 - N_{2m} = K(\rho_m - \rho)(1-\rho_m) > 0$$

which is clearly positive. This means that the tax payment in period 2 is higher if the corporation uses a tax depreciation rate lower than ρ_m in the first period, even if the tax payment in the first period is the same (zero in our example). This effect is due to the asymmetric treatment of tax depreciation and loss carryforwards. Our example will exaggerate the difference between the to strategies compared to the Norwegian tax system, because we have implicitly assumed that the corporation can carry the losses forward with interest. This is not true in the Norwegian tax system, but as we see from equation a4, a discount rate cannot change our result.

Appendix B

Calculation of the tax cost when dividends are substituted for tax depreciation

In this appendix we explain the derivation of equation (17) in the text. The left hand side ($\frac{\partial V}{\partial D}$) is the increase in firm value due to a \$1 increase in dividends. To find the tax cost of reducing depreciation deductions enough to permit a \$1 increase in dividends we must ask two questions.

1. How much must the firm reduce tax depreciation to increase dividends by \$1?
2. By how much will the tax increase due to the swap from tax depreciation to dividends?

These questions can be tricky due to the pre-reform Norwegian tax system, where dividends and tax must be determined simultaneous by two equations. From equation (3) we have the following simplified tax function

(b1) $$T = \eta(\Pi - A) + \kappa(\Pi - A - D)$$

We have omitted interest costs, consolidation fund and loss carryforwards and further assumed that all dividends are paid out of current profit. These simplifications will not change the qualitative results. Under these assumptions we get the following uniform reporting constraint

(b2) $$D = \Pi - A - T$$

where we have assumed that the firm is constrained i.e. we have an equality in (b2). We are interested in the tax increase due to a increase in dividends by \$1, financed by lower tax depreciation, i.e. a decrease in *A*. The solution is found by a total differentiation of (f2) and (f3) assuming that $d\Pi = 0$. This gives us

(b3) $$dT = -\eta dA - \kappa dA - \eta dD$$

and

(b4) $$dD = -dA - dT$$

An increase in dividends by \$1 means that $dD = 1$. This gives us

(b5) $$dT = -\eta dA - \kappa dA - \eta$$

and

(b6) $$1 = -dA - dT$$

If we substitute for *dA* in (b5) using (b6) we get an increase in the tax equal to

(b7) $$dT = \frac{\eta}{1-\eta-\kappa}$$

The right hand side in (b7) is the tax factor in equation (13).

Appendix C

The irrelevancy between underutilization and actual utilization as the choice variable for the firm

We claimed above that the value of the firm is a function of depreciation. In this appendix we will show that our specification of the dependent variable, as a difference between maximum utilization and actual utilization, is equivalent with a specification where the dependent variable is the actual utilization. To make it easy we specify that the value of the firm is a function of the depreciation, denoted *V(A)*. The general problem for the firm is to maximize the value given the constraint on *A*. We can formulate the problem as follows

$$\begin{aligned} & Max \quad V(A) \\ & s.t. \quad 0 \le A \le A_m \end{aligned} \tag{c1}$$

An equivalent formulation is

$$\begin{aligned} & Min \quad V(A_m - A) \\ & s.t. \quad 0 \le A_m - A \le A_m \end{aligned} \tag{c2}$$

Sketch proof

Assume that A_m is predetermined. Then the following must hold

$$Min \quad V(A_m - A) = Min(V(A)_m) - Max(V(A)) = V_m - Max(V(A)) \tag{c3}$$

where V_m is the value of the corporation when $A = A_m$. In both formulations the maximal value of the corporation is found. The crucial assumption is that A_m is given, which determines the value of the corporation, V_m . Given that fact it is clear that when the corporation chooses the optimal *A* it also chooses the optimal A_m - *A*. The reader can easily verify that the constraints in equation c1 are equivalent to the constraints in equation c2.

Appendix D

Construction of data

a) Calculation of underutilization

The underutilization of tax depreciation allowances is calculated as maximum depreciation minus actually claimed depreciation. Every corporation has to fill in a tax depreciation form for every asset it owns. Every type of asset has a certain maximum percentage of depreciation that allows us to find the maximal depreciation for every single corporation within each year. The actually claimed depreciation is given on the form. It is then quite easy to calculate the difference between maximum and actual depreciation. In 1991 there were twelve different types of asset groups with different maximum allowed depreciation rates. In two of the asset groups there is not a unique maximum depreciation rate. Some of the assets in these groups have in general a maximum depreciation rate of ρ, while other have a maximum depreciation rate of $\rho/2$. This makes it difficult to know the maximum rate for these assets. We have controlled for this in using the low rate if the corporation has used the low rate, and using the high rate if the corporation has used a rate higher rate than the low rate. This solution is not perfect, but is the best we can achieve given the data, and it implies that we do not exaggerate the underutilization.

Some corporations can both have negative and positive depreciation bases within one asset group. Unfortunately the asset forms are aggregated within every asset group, and the depreciation base we observe is therefore not necessarily the correct base, in fact we can in many cases observe negative bases and positive depreciation. We have, however, been able to control for this because we have the sum of the negative bases within every asset group for every corporation, but the uncertainty is greater in these cases.

The maximum and actual depreciation are calculated precisely as follows:

Maximum depreciation = (observed base-sum of negative bases)*max. depr. rate
Actual depreciation = observed depreciation

Appendix E

Descriptive statistics

This appendix gives descriptive statistics for the regressors and in addition we discuss some characteristics about the corporations in each group. All regressors are divided by total sales except TDEBT , ZPROB (that are divided by total assets) and dummy variables (that are 0,1).

1993: ***Group 1. N = 319***

Statistics/regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	0.004	0.317	2.63	-2.65
Dividend constraint (DIVC)	0.05	0.231	1	0
Accumulated tax debt (TDEBT)	0.005	0.014	1	0
Change in long term debt (DLDEBT)	0.036	0.577	7.73	-2.79
Dummy for firms that equalise tax and book depr. (INFO)	0.705	0.45	1	0
Altman's ZPROB	3.15	3.88	50	-15.86
Total loss carry forwards (LCARRY)	0.31	1.45	18.28	0
Weighted average of old loss carry forwards (LCARRY1)	0.001	0.005	0.07	0

About 53 percent of the firms in this group have loss carry forwards, while only 1.5 percent have loss carry forwards older than 8 years.

Group 2. N = 477

Statistics/regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	0.014	0.136	0.79	-1.65
Dividend constraint (DIVC)	0.014	0.120	1	0
Accumulated tax debt (TDEBT)	0.008	0.020	1	0
Change in long term debt (DLDEBT)	-0.009	0.195	2.03	-2.67
Dummy for firms that equalise tax and book depr. (INFO)	0.601	0.490	1	0
Altman's ZPROB	3.689	2.714	19.75	-3.369
Total loss carry forwards (LCARRY)	0.118	0.534	7.57	0
Weighted average of old loss carry forwards (LCARRY1)	0.002	0.028	0.54	0

About 41 percent of the firms in this group have loss carry forwards, while only 3.5 percent have loss carry forwards older than 8 years.

Group 3. N = 972

Statistics/regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	0.018	0.093	0.65	-1.54
Dividend constraint (DIVC)	0.008	0.090	1	0
Accumulated tax debt (TDEBT)	0.012	0.021	1	0
Change in long term debt (DLDEBT)	0.006	0.183	3.55	-1.12
Dummy for firms that equalise tax and book depr. (INFO)	0.454	0.490	1	0
Altman's ZPROB	3.477	2.639	30.15	-17.37
Total loss carry forwards (LCARRY)	0.057	0.257	4.35	0
Weighted average of old loss carry forwards (LCARRY1)	0.000	0.03	0.07	0

About 38 percent of the firms in this group have loss carry forwards, while only 1.5 percent have loss carry forwards older than 8 years.

Group 4. N = 681

Statistics/regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	0.028	0.080	0.93	-0.47
Dividend constraint (DIVC)	0.002	0.054	1	0
Accumulated tax debt (TDEBT)	0.018	0.026	1	0
Change in long term debt (DLDEBT)	-0.002	0.075	0.89	-0.51
Dummy for firms that equalise tax and book depr. (INFO)	0.361	0.48	1	0
Altman's ZPROB	3.417	2.403	28.24	0.04
Total loss carry forwards (LCARRY)	0.033	0.113	1.35	0
Weighted average of old loss carry forwards (LCARRY1)	0.000	0.013	0.262	0

About 34 percent of the firms in this group have loss carry forwards, while only 1.3 percent have loss carry forwards older than 8 years.

1992: ***Group 1. N = 1071***

Statistics/regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure (DIVP)	-0.019	0.252	3.06	-2.21
Dividend constraint (DIVC)	0.057	0.233	1	0
Accumulated tax debt (TDEBT)	0.06	0.017	1	0
Change in long term debt (DLDEBT)	0.006	0.256	2.61	-1.43
Dummy for firms that equalise tax and book depr. (INFO)	0.724	0.446	1	0
Altman's ZPROB	3.49	5.37	50	-14.36
Total loss carry forwards (LCARRY)	0.211	0.805	17.03	0
Weighted average of old loss carry forwards (LCARRY1)	0.004	0.086	2.56	0

About 59.1 percent of the firms in this group have loss carry forwards, while only 1 percent have loss carry forwards older than 8 years.

Group 2. N = 1164

Statistics/regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	0.0003	0.189	0.75	-3.88
Dividend constraint (DIVC)	0.024	0.233	1	0
Accumulated tax debt (TDEBT)	0.009	0.017	1	0
Change in long term debt (DLDEBT)	0.005	0.212	4.59	-1.27
Dummy for firms that equalise tax and book depr. (INFO)	0.544	0.498	1	0
Altman's ZPROB	5.443	16.304	342.45	-46.57
Total loss carry forwards (LCARRY)	0.084	0.462	11.24	0
Weighted average of old loss carry forwards (LCARRY1)	0.000	0.002	0.06	0

About 46 percent of the firms in this group have loss carry forwards, while only 0.9 percent have loss carry forwards older than 8 years.

Group 3. N = 1282

Statistics/regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	0.008	0.111	0.75	-1.80
Dividend constraint (DIVC)	0.010	0.100	1	0
Accumulated tax debt (TDEBT)	0.018	0.129	1	0
Change in long term debt (DLDEBT)	-0.008	0.115	1.61	-1.70
Dummy for firms that equalise tax and book depr. (INFO)	0.204	0.490	1	0
Altman's ZPROB	3.919	3.81	50	-6.31
Total loss carry forwards (LCARRY)	0.050	0.202	3.84	0
Weighted average of old loss carry forwards (LCARRY1)	0.000	0.010	0.27	0

About 44 percent of the firms in this group have loss carry forwards, while only 1 percent have loss carry forwards older than 8 years.

Group 4. N = 847

Statistics/Regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	0.017	0.080	0.787	-0.680
Dividend constraint (DIVC)	0.001	0.034	1	0
Accumulated tax debt (TDEBT)	0.023	0.027	1	0
Change in long term debt (DLDEBT)	0.004	0.122	1.89	-0.43
Dummy for firms that equalise tax and book depr. (INFO)	0.285	0.452	1	0
Altman's ZPROB	3.47	3.95	50	-3.14
Total loss carry forwards (LCARRY)	0.032	0.107	1.26	0
Weighted average of old loss carry forwards (LCARRY1)	0.001	0.015	0.357	0

About 42 percent of the firms in this group have loss carry forwards, while only 1.4 percent have loss carry forwards older than 8 years.

1991: ***Group 1. N = 1177***

Statistics/regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	-0.129	0.728	2.480	-15.64
Dividend constraint (DIVC)	0.125	0.331	1	0
Accumulated tax debt (TDEBT)	0.026	0.049	0.64	0
Change in long term debt (DLDEBT)	0.100	1.00	24.09	-2.56
Dummy for firms that equalise tax and book depr. (INFO)	0.484	0.499	1	0
Altman's ZPROB	3.69	7.33	50	-34.72
Total loss carry forwards (LCARRY)	0.215	1.640	53.30	0
Weighted average of old loss carry forwards (LCARRY1)	0.001	0.044	1.52	0

About 50 percent of the firms in this group have loss carry forwards, while only 0.7 percent have loss carry forwards older than 8 years.

Group 2. N = 1158

Statistics/Regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	-0.006	0.135	0.913	-1.607
Dividend constraint (DIVC)	0.079	0.270	1	0
Accumulated tax debt (TDEBT)	0.037	0.048	0.53	-0.009
Change in long term debt (DLDEBT)	0.072	1.021	28.89	-2.05
Dummy for firms that equalise tax and book depr. (INFO)	0.266	0.442	1	0
Altman's ZPROB	3.95	5.84	50	-50
Total loss carry forwards (LCARRY)	0.067	0.278	5.109	0
Weighted average of old loss carry forwards (LCARRY1)	0.000	0.009	0.30	0

About 43 percent of the firms in this group have loss carry forwards, while only 0.8 percent have loss carry forwards older than 8 years.

Group 3. N = 1266

Statistics/regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	-0.001	0.187	0.490	-5.30
Dividend constraint (DIVC)	0.025	0.157	1	0
Accumulated tax debt (TDEBT)	0.046	0.049	0.43	0
Change in long term debt (DLDEBT)	0.006	0.227	7.09	-0.88
Dummy for firms that equalise tax and book depr. (INFO)	0.141	0.348	1	0
Altman's ZPROB	3.95	5.84	50	-50
Total loss carry forwards (LCARRY)	0.054	0.235	4.14	0
Weighted average of old loss carry forwards (LCARRY1)	0.000	0.008	0.25	0

About 41 percent of the firms in this group have loss carry forwards, while only 0.7 percent have loss carry forwards older than 8 years.

Group 4. N = 808

Statistics/regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	0.008	0.121	-2.185	0.314
Dividend constraint (DIVC)	0.012	0.111	0	1.000
Accumulated tax debt (TDEBT)	0.061	0.054	0	0.291
Change in long term debt (DLDEBT)	0.001	0.106	-0.791	1.488
Dummy for firms that equalise tax and book depr. (INFO)	0.082	0.274	0	1.000
Altman's ZPROB	3.317	3.240	-1.300	50.000
Total loss carry forwards (LCARRY)	0.023	0.084	0	1.058
Weighted average of old loss carry forwards (LCARRY1)	0	0.006	0	0.123

About 43 percent of the firms in this group have loss carry forwards, while only 0.8 percent have loss carry forwards older than 8 years.

1988: ***Group 1. N = 321***

Statistics/Regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	-0.09	0.54	0.70	-8.01
Dividend constraint (DIVC)	0.08	0.27	1	0
Accumulated tax debt (TDEBT)	0.03	0.04	0.35	0
Change in long term debt (DLDEBT)	0.08	1.28	-9.13	12.78
Dummy for firms that equalise tax and book depr. (INFO)	0.42	0.49	1	0
Altman's ZPROB	1.93	3.53	23.90	-22.01
Total loss carry forwards (LCARRY)	0.06	0.18	1.60	0

About 35 percent of the firms in this group have loss carry forwards.

Group 2. N = 596

Statistics/regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	0.017	0.160	0.94	-2.89
Dividend constraint (DIVC)	0.068	0.253	1	0
Accumulated tax debt (TDEBT)	0.058	0.046	0.30	-0.009
Change in long term debt (DLDEBT)	0.024	0.178	1.91	-0.56
Dummy for firms that equalise tax and book depr. (INFO)	0.125	0.331	1	0
Altman's ZPROB	3.10	3.47	47.69	-6.17
Total loss carry forwards (LCARRY)	0.006	0.03	0.45	0

About 11 percent of the firms in this group have loss carry forwards.

Group 3. N = 429

Statistics/Regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	0.051	0.220	0.490	-5.30
Dividend constraint (DIVC)	0.051	0.220	1	0
Accumulated tax debt (TDEBT)	0.074	0.052	0.22	0
Change in long term debt (DLDEBT)	0.028	0.2124	2.60	-0.81
Dummy for firms that equalise tax and book depr. (INFO)	0.037	0.189	1	0
Altman's ZPROB	3.11	3.32	47.18	-0.16
Total loss carry forwards (LCARRY)	0.003	0.052	1.08	0

About 5 percent of the corporations have loss carry forwards.

Group 4. N = 327

Statistics/Regressors	Mean	Standard deviation	Maximum	Minimum
Profit measure(DIVP)	0.009	0.003	0.152	-0.163
Dividend constraint (DIVC)	0.042	0.202	1	0
Accumulated tax debt (TDEBT)	0.077	0.046	0.24	0
Change in long term debt (DLDEBT)	0.011	0.071	0.50	-0.44
Dummy for firms that equalise tax and book depr. (INFO)	0.015	0.122	1	0
Altman's ZPROB	2.92	3.15	50.00	-0.61
Total loss carry forwards (LCARRY)	0.0009	0.009	0.158	0

About 5 percent of the corporations have loss carry forwards.