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THE DEPRECIATION-POLICY DECISIONS OF INDUSTRIAL FIRMS: TAX BENEFITS VERSUS NON-TAX COSTS

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Abstract

Empirical research has indicated that when firm's management makes accounting-policy decisions, it may have to trade-off the tax benefits relating with a particular decision against the non-tax costs ensuing from it. The applicability of this argument is examined within the context of the Greek business sector, with special reference to the depreciation-policy decisions of industrial firms operating in Greece. In particular, this paper investigates whether the firms' ownership/control status, and their leverage characteristics, influences the balance of the non-tax costs and the tax benefits. Furthermore, the influence of the size of the firm on its accounting-policy decisions is investigated. In addition, it has been examined whether the firms' depreciation-policy decisions constitute a part of a tax-reducing strategy aiming at reducing firm's long time taxable income by substituting alternative tax shields over time. For the investigation of these issues, the financial statements of a sample of industrial firms operating in Greece have been analysed. The findings of this analysis suggest that firms' leverage characteristics and their size can explain certain aspects of firms' depreciation-policy decisions (JEL Classification: M41).

1. Introduction

The legislation regulating the accounting for depreciation in Greece for the period 1993-1995, provided quite considerable discretion to firms to influence the level of depreciation charges. The legislation offered firms the discretion to avoid depreciating part or all of their depreciable tangible assets, a decision that had an increasing effect on firms' accounting income. On the other hand the legislation stipulated that under certain conditions firms had the right to charge additional depreciation. In that case the firm's accounting income was adversely affected. The purpose of this paper is to examine whether the balance between the non-tax costs and the tax benefits influences the deprecia-

tion-policy decisions of the industrial firms in Greece. Given that in Greece tax accounting and financial accounting coincide, it is expected that tax considerations will have a bearing on management's financial-accounting policy decisions, through the impact they may have on the firm's cash flows. The aspects of the depreciation policy, which are examined in this study, are: (i) whether firms used the option to charge additional depreciation; and (ii) whether firms used the option not to depreciate part or all of their depreciable tangible assets.

In addition, this study investigates whether the specific depreciation-policy decisions constitute part of a tax-reducing strategy aiming to reduce firm's taxable income by substituting alternative tax shields over time. It has been argued that when a firm benefits from tax shields, such as high interest expenses and losses carried-forward, will be less inclined to use investment-related tax shields for sheltering its taxable income (Johnson and Dhaliwal, 1988; Dhaliwal *et al.*, 1992).

In the next section the factors that can give rise to significant non-tax costs are briefly discussed. The third section deals with the data and methodology adopted for the present study. The fourth section presents the empirical findings. The final section contains the main conclusions of the study.

2. Factors giving rise to significant non-tax costs

The economic consequences of alternative accounting methods can explain the firms' preferences with regard to these methods (Dhaliwal *et al.*, 1982; Watts and Zimmerman, 1986). A firm's choice of reporting methods have economic consequences when changes in accounting methods "...alter the distribution of firm's cash flows, or the wealth of parties who use those numbers for contracting or decision making." (Holthausen and Leftwich, 1983 : 77).

In addition to their use in the contracting agreements between the various parties of a firm, reported accounting figures affect the firm's cash flows through their impact on the level of a company's tax liabilities (Cloyd *et al.*, 1996; Klassen, 1997). This is the case provided that the accounting treatment for financial reporting and tax purposes coincide (Niehaus, 1989). Tax planning can result in an increase in the firm's tax saving, and consequently it can have a positive effect on a firm's cash flows. As a consequence, assuming rationality and efficient capital markets, an accounting method that minimises taxable income should, *ceteris paribous,* be preferred (Biddle and Lindhal, 1982; Niehaus, 1989). However, given that the reduction of firm's tax liability is usu-

ally accompanied by a corresponding decrease in a firm's reported income, tax planning, under certain circumstances, can have serious implications for the various parties involved in a firm (Scholes, Wilson and Wolfson, 1990; Scholes and Wolfson, 1992; Wolfson, 1993). The adverse picture of the firm's financial position that may emerge as a result of a decrease in the level of reported income, can have serious consequences with regard to a firm's ability to meet its contractual and regulatory obligations, while shareholders' and managers' personal wealth may also be affected adversely (Scholes, Wilson and Wolfson, 1990; Matsounaga *et al.*, 1992; Cloyd *et al.*, 1996). These implications have been designated as the "non-tax" costs of a tax reducing policy. Each party in a firm is supposed to trade-off the tax benefits of an accounting decision, against the non-tax costs ensuing from it. The outcome of this trade-off is supposed to influence firm's accounting policy decisions.

The significance of non-tax costs is related to certain characteristics of the firm. A firm's ownership structure has been hypothesised to be associated with the magnitude of the non-tax costs that can be generated from a tax-minimising strategy. The management of firms characterised by a diffused ownership and a separation between management and ownership might face significant non-tax costs (Wolfson, 1993). The extensive use of accounting-based contracts in these firms, and managers' perceptions regarding the impact that accounting figures may have on the evaluation of managers' abilities by the external users of accounts, can induce managers to assign a great deal of importance to the level of reported income (Cloyd *et al.*, 1996; Klassen, 1997). On the other hand, for those firms in which ownership is concentrated in the hands of a relatively small numbers of shareholders who actively control the firm's management, the necessity for using a bonus scheme is reduced, while managers can communicate any information directly to shareholders without having to use published financial statements (Dhaliwal *et al.*, 1982; Klassen, 1997). Thus, the previously mentioned non-tax costs may be of lesser importance. Consequently, the closely-held firms are expected to pursue a more aggressive tax-reducing policy, which can include the choice of income-decreasing accounting methods. The findings of empirical research seem to support the argument that in comparison to the widely-held firms, the closely-held ones are less concerned about the non-tax consequences of their accounting choices, and they are more inclined to implement a tax-reducing strategy (Smith, 1976; Dhaliwal *et al.*, 1982; Hunt, 1986; Peno and Simon, 1986; Niehaus, 1989; Scholes and Wolfson, 1992; Wolfson, 1993; Cloyd *et al.*, 1996; Klassen, 1997).

The ownership-structure of the majority of the Greek industrial firms is characterised by a high level of concentration. In most cases, the owners occupy important posts within the organisational structure of their firms, and they are actively involved in their companies' administration (Bourantas *et al.*, 1990; OECD, 1995; Makridakis *et al.*, 1997). Under these circumstances, the non-tax costs related to the ownership-structure of a firm are not likely to arise. Given that firms' owners can directly, and effectively, monitor and motivate their subordinate managers the need to employ incentive schemes, to motivate hired managers, is less urgent. Further, managers in such firms can communicate information regarding their performance directly to their superior owner-managers, without using financial statements. For these reasons, it can be hypothesised that the ownership-structure of most Greek industrial corporations contributes to the adoption of an aggressive tax-reducing strategy. To examine, nevertheless the association between the firm's ownership/control status and its depreciation policy decisions the following hypotheses are proposed

- There is an association between a firm's ownership/control status and its decision to charge additional depreciation.

- There is an association between a firm's ownership/control status and its decision to not depreciate its fixed tangible assets.

It has been argued that an association may exist between a firm's accounting policy decisions and its size. The size of a firm is supposed to influence, to a considerable extent, the political cost of a firm, since the larger the firm the more likely is that it will "attract" the attention of politicians as a potential target for a wealth transfer (Watts and Zimmerman, 1978). Firms with greater political visibility are thought to be the subject of greater political scrutiny and are therefore more likely targets for wealth transfers. Taxation of profits is supposed to be the most direct way of wealth transfer. It might have been expected, therefore, that the larger firms, compared with the smaller ones, would face higher tax rates (Zimmerman, 1983). By reporting lower profits larger firms aim to reduce their political visibility, and as a consequence the possibility of high wealth transfers. Within this context, it has been hypothesised that larger firms are more likely to adopt income-decreasing accounting methods.

Yet the level of effective tax rates for the larger firms may not be that high. Larger firms seem to be better "equipped" to pursue a tax-planning strategy in comparison to their smaller counterparts. Due to their extended resources, larger firms can devote time and capital in order to develop an effective

tax-reducing plan and organise their activities and operations in a way that contributes to a reduction of the long term tax burden (see, Siegfried, 1972; Scholes *et al.*, 1992; Holland, 1998). For instance, larger firms can afford to employ tax specialists, who will design a tax-reducing strategy. On the other hand, it has been argued that although larger firms may have higher political costs, they may achieve greater political benefits as well: for example profitable government contracts, import restrictions, easier access to financial markets etc. More importantly, larger firms, due to "...their greater resources would improve their ability to influence the formation of tax legislation in their favour..." (Siegfried, 1972, as cited in Holland, 1998, p. 267; see also Scholes *et al*, 1992). In other words, due to their size, the larger firms may be politically stronger and consequently enjoy higher political benefits.

One of the distinctive characteristics of the development of the Greek industry has been the strong links between the state-apparatus and the large industrial concerns (Halikias, 1978; Mouzelis, 1978; Tsoris, 1984). Thus, it can be assumed that it is not particularly likely that the large Greek industrial companies will face significant political costs. Instead, they may enjoy significant political benefits. These political benefits may refer to the introduction of accounting standards that can contribute to a reduction in the level of firm's tax liability. In fact, whether a firm has the right to charge additional depreciation and the level of these charges, are partially conditioned by the firm's size. Additional depreciation charges clearly contribute to a reduction in effective tax rates. Therefore the larger firms are more likely to be eligible to charge additional depreciation. Thus, larger firms, by accordingly adjusting their depreciation policy, can reduce effective tax rates. Therefore, larger Greek industrial firms, being relieved by significant political costs, will pursue an aggressive tax-reducing policy; such a policy may include the choice of income-reducing accounting options.

The following hypotheses have been formulated for investigating the research hypothesis that the firm's size affects the firm's depreciation policy decisions

- The firms that decide to charge additional depreciation are larger than the firms that decide to not charge additional depreciation.

-The firms that decide to make use of the option not to depreciate part or all of their fixed tangible assets are smaller than the firms that decide to not use this option.

The use of financial accounting figures in a firm's negotiations with the providers of credit capital, and the inclusion of accounting numbers-based terms in the debt agreements, suggest that a particular accounting choice can generate important non-tax costs (Wolfson, 1993; Cloyd *et al.*, 1996). Lower reported profit figures may adversely influence the banks' credit decisions, and thus raise the cost of capital for the firm (Deakin, 1979). Furthermore, the violation of the terms of loan agreements, places a firm in technical default, a situation which can have particularly adverse consequences for a firm (Frost and Bernard, 1989; Beneish and Press, 1993; Gopalakrishan and Parkash, 1995). Firms are more likely to prefer accounting methods that reduce the likelihood that these events will occur, and thus they are most likely to choose the income-increasing methods. However, such a decision is most likely to be associated with important tax costs, since the resulting increase in the reported income is likely to be followed by an increase in taxable income. Thus, when a firm is close to violate the accounting-based conditions in their debt covenants, and needs debt capital, important non-tax costs can be ensued by the implementation of a tax-reducing policy (Johnson and Dhaliwal, 1988; Matsunaga, Shevlin and Shores, 1992; Maydew, 1997). The financial leverage of a firm is used as a proxy for the firm's required debt capital, and its proximity to violating debt covenants (Christie, 1990). Consequently, the more leveraged firms are expected to face higher non-tax costs, and thus they are more likely to select the income increasing choice. Findings of empirical research suggest that the more leveraged firms do trade off tax benefits against non-tax costs, while firms' financial decisions seem to be associated with the tax and non-tax costs/benefits resulting from these decisions (Johnson and Dhaliwal, 1988; Scholes and Wolfson, 1990; Sweeney, 1992; Matsunaga, Shevlin and Shores, 1993; Smith, 1993; Maydew, 1997).

The Greek banks constitute one of the main source of funds for the Greek industry, and have developed a long-lasting close relationship with many manufacturing concerns, while in certain cases banks own part of the firm's share capital. Thus, banks in many instances may directly obtain any relevant financial information, by-passing any reliance on publicly disclosed data. Furthermore, the large state-controlled banks are supposed to have a tendency not to always base their credit decisions on entirely objective financial criteria (Halikias, 1978; Mouzelis, 1978; Tsoris, 1984; OECD 1986, 1993, and 1995). Consequently, the importance of public accounting information may further diminish. As a consequence, a tax-reducing strategy is not likely to give rise to important non-tax costs, since financial accounting information may not constitute a particularly important informational input for the providers of debt capi-

tal. Moreover, the close relationship between banks and companies may mean, that a violation of a debt covenant may not have so dramatic repercussions for a firm; again the non-tax costs of a tax reducing strategy may not be so significant. In addition, the fact that Greek firms do not issue public debt very often may further diminish the importance of the non-tax consequences of an aggressive tax-reducing policy. The cost of renegotiating the covenants of private debt is not particularly high. Thus, a firm in order to avoid technical violation can renegotiate the debt covenants, without having to resort in managing reported figures through a selective choice of appropriate reporting methods (Holthausen, 1981). In other words, when a firm's debt capital is private, the non-tax costs related with an accounting-policy choice, may not be that significant for the particular firm.

Yet, the possibility that some significant non-tax costs can arise should not be immediately disregarded. Regardless of the factors that may influence banks' credit decisions, most companies will be required to meet some official criteria based on accounting numbers while making a loan application. If the applying firm has a long-standing close link with a particular bank, one can not rule out the possibility that the bank's official will tolerate some "adjusting" of accounting figures, so that the firm will be able to comply with the relevant terms. Thus, a tendency of a firm to influence accounting figures through the choice of an appropriate depreciation method may actually be reinforced. As a consequence, financial-accounting considerations can still influence a firm's accounting-policy decisions.

The following hypotheses have been formulated for investigating the research hypothesis that the level of the firm's debt to equity ratio, as a proxy for firms' dependency on bank financing and its closeness in violating debt covenants, affects the firms' depreciation policy decisions

- The debt/equity ratio of the firms that decide to charge additional depreciation is lower than the debt/equity ratio of the firms that decide to not charge additional depreciation.

- The debt/equity ratio of the firms that decide to make use of the option to not depreciate part or all of their fixed tangible assets is higher than the debt/equity ratio of firms that decide to not use this option.

An inverse association may exist between the investment-related and the debt-related tax shields. When a firm has high tax-deductible interest-expenses, it has less need to use its investment-related tax-shields, such as

the depreciation charges, in order to reduce its tax burden (Dhaliwal *et al.*, 1992). Thus a firm with high interest expenses will be less motivated to charge additional depreciation. Furthermore, if interest-expenses are so high that they completely cover the operating income, there is no need to charge depreciation and thus a decision to charge depreciation would have led to a waste of the investment-related tax-shields. In Greece, however, during the period under examination the depreciation of assets was optional. Thus, a firm in order to avoid wasting its depreciation-related tax shields could have refrain from depreciating its assets.

If the level of interest-expenses is a function of the firm's leverage, then the latter is a surrogate of the former (Bradley *et al.*, 1984). In that case, the hypotheses presented earlier, despite the fact that have been derived from a different framework, i.e. tax benefits vs. non-tax costs, are also applicable within a context of a tax-minimisation strategy. That is, the higher leveraged a firm is, the lower the need to charge additional depreciation; the higher leveraged a firm is, the lower the need to charge depreciation. However, Dhaliwal *et al.* (1992) have indicated that the leverage ratio is not an appropriate measure for the debt-related tax-shields. The ratio of interest expenses as a proportion of operating earnings, is a more suitable measure. The hypotheses which have been formulated for investigating the research hypothesis that the level of the firm's interest expenses/operating income ratio affects the firm's depreciation policy decisions are

- The interest expenses/operating income ratio of the firms that decide to charge additional depreciation is lower than the interest expenses/operating income ratio of the firms that decide to not charge additional depreciation.

- The interest expenses/operating income ratio of the firms that decide to make use of the option not to depreciate their fixed tangible assets is higher than the interest expenses/operating income ratio of the firms that decide not to make use of the relevant option.

These hypotheses hold providing that the operational earnings of a firm are not high enough, to accommodate the simultaneous use of both tax shields. Thus, the lower the operational income, more likely it is the firm will attempt to substitute alternative tax shields. The hypotheses concerning the association between the two variables of interest are

- Firms with operating losses are less likely to charge additional depreciation.

- Firms with operating losses are more likely to make use of the option of not depreciating its fixed tangible assets

The substitution between the investment-related and the debt-related tax-shields will take place provided that: "...a firm is unable to use net operating loss carryovers in the carryback and carryforward periods." (Dhaliwal *et al.*, 1992, p. 4). If losses can be carried forward, the tax shields are not wasted, since they can be used to offset taxable income in the future. For tax purposes, in Greece, losses of prior periods can be carried forward for a maximum period of five years. When the expected duration of the loss is so long that it cannot be covered within the next five years, the firm wastes these tax shields, by charging its (negative) income with depreciation and the interest expenses. Thus, the relevant tax shields can not be carried forward to offset future taxable income.

Furthermore, for the firms with large loss-carryforward, the value of the tax shields may decline, if the operating income can not "absorb" all the available tax shields (Auerbach and Poterba, 1987, as cited in Feldestein ed., 1987). Although a firm could not carry forward losses for unlimited period of time, by not depreciating its assets, it could have carried forward depreciation-related tax shields. Under these circumstances, the tendency for substitution between investment and debt-related tax shields is likely to intensify.

When a firm faces huge prior years losses - or operating losses - and avoids to depreciate its fixed tangible assets, not only does not waste its tax shields, but also increases the total tax savings. When a firm does not depreciate its assets, its operating income rises and can be charged with the losses carried forward from prior years. In that way the company writes off the prior periods' losses and effectively reduces its tax liability. Since the reported profits are charged with losses carried forward, there will be no taxable income for the years that such a policy is implemented. After that period, the firm can charge its profits with the depreciation that has not been charged in the previous years. As a result the level of reporting profits and of taxable income will be reduced. Thus a firm by refraining from charging depreciation avoids the waste of tax shields, since it defers the relevant tax shields in the future, when they can be used for reducing the future taxable income. A similar argument has been developed by Bowen *et al.* (1981), with regard to the accounting treatment of the interest costs related with capital expenditures - i.e. capitalisation vs. expense. He argued that, since the expense of the interest would result in a reduction of tax liability, it would have been the obvious choice from a tax per-

spective. However, a "...firm with a tax loss carry forward or with a current operating loss and insufficient taxable income in the previous three years to carry back the operating loss may prefer to capitalise interest. Under these circumstances, delaying recognition of the interest expense prolongs the period over which the expense can be used to reduce taxable income." (p. 155). Hence, it has been considered as necessary to formulate hypotheses that link the existence of prior years' losses with depreciation policy decisions. Such an investigation can facilitate the identification of the motive behind the choice of depreciation policy, by clarifying whether the choice is driven by financial reporting considerations or tax related ones. The hypotheses concerning the association between the two variables of interest are

- Firms with prior periods' losses are less likely to charge additional depreciation.

- Firms with prior periods' losses are more likely to make use the option of not depreciating their fixed tangible assets

According to the hypotheses presented above, a firm's depreciation policy decisions are dictated by the requirements of a tax-reducing strategy aiming to substitute tax shields over time. Such an interpretation can be perceived as distinct from a tax benefits vs. non-tax costs analysis. However, both interpretations are based on economic consequences, and they are not necessarily incompatible or competing. For heavily indebted firms, which benefit from the tax shields mentioned above, the decision to choose the income increasing option may be justified not only on the ground of reducing the tax liability, but also of avoiding further deterioration of its financial condition. However, the tax costs of such a decision are not severe, since the firm's financial condition has generated other tax shields (Johnson and Dhaliwal, 1988), while such a decision can actually contribute in the long term to a reduction in a firm's tax liability (Bowen *et al.*, 1981). Thus, the particular firm not only achieves a long-term reduction of its tax liability but also at the same time increases the possibility of raising debt capital in favourable terms and avoids violation of its debt covenants.

3. Data and methodology

The sample for this study consists of industrial firms listed on the Athens Stock Exchange. Only for listed firms was feasible to determine whether or not a firm was eligible for charging additional depreciation. The selected firms were eligible to charge additional depreciation. The financial statements have been collected for the financial periods 1993, 1994, and 1995.

The firm's ownership/control status is defined on the basis of the percentage of the ownership of a firm's stock capital. In particular, firms in which no party owned more than 4 per cent of firm's share capital has been identified as a "widely-held" firm. According to the Athens Stock Exchange Guide (1994) a firm is identified as widely held when no party controls more than 4 per cent of the share capital; the same threshold has been used in this study. Most studies have classified a firm as closely held one, when one party controlled more than 10 per cent or 20 per cent of the firm's capital. A firm has been identified as a "closely-held" when one party controlled more than 10 per cent of its stock capital. Following the example of Smith (1976), the representation of major owners on the board of directors has been considered as an indication of owners' involvement in firm's management. Given that the board of directors is legally responsible to manage firm's affairs, major shareholders membership in it constitutes strong evidence of their direction in decision-making.

The proposed hypotheses have been tested using univariate and multivariate statistical analysis. For the univariate analyses the following tests have been employed: the Mann-Whitney U-test; and the chi-square statistic. The multivariate analysis has aimed at indicating the incremental effect of each variable and the significance of the variables as a whole. For the multivariate analysis logistic regression analysis has been employed.

4. Empirical results

4.1 Univariate analysis

Table 1 (see Appendix) presents the results of the statistics testing the association between firms' ownership structure and their depreciation policy decisions, while Table 2 presents the results of the statistics testing the association between their corporate governance characteristics and their depreciation policy decisions. No association appears to exist between the variables under investigation. Consequently, the respective null hypotheses cannot be rejected,

Table 3 presents the tests investigating the association between firms' size and their depreciation policy decisions. The larger firms appear to be more likely to charge additional. The difference is statistically significant in the years 1993 ($0.041 < 0.05$), and 1994 ($0.0123 < 0.05$). Therefore, for these years the null hypotheses can be rejected. The observed relationship is consistent with the size-hypothesis that the larger firms are more likely to choose the income-decreasing option in order to reduce their political exposure.

In this particular case, however, such a conclusion should be received with some caution. As mentioned earlier large firms operating in Greece are more likely to enjoy political benefits, such as investment tax credits and other investment allowances which contribute to a reduction in effective tax rates. Thus, the tendency of the larger firms to charge additional depreciation may not indicate a determination of the larger firms to avoid political exposure, but may rather illustrate their success in the political process; when they charge additional depreciation, larger firms actually reap the benefits which result from their effective participation in the political process. No difference exists between the size of firms that make use of the option of not depreciating their assets, and the size of the firms that decide to make use of the relevant option.

It appears that the firms, which charge additional depreciation, are less leveraged, compared to the firms that do not (Table 4). This difference is statistically significant, in the year 1995 ($0.0207 < 0.05$). The observed relationship is consistent with the hypothesis that the higher the firm's debt/equity ratio, the less likely it is that the firm will charge additional depreciation.

The question can arise as to whether more leveraged firms are less likely to charge additional depreciation because they face significant non-tax costs, or because they have alternative tax-shields. The results that are reported in Table 4 are supportive of the second interpretation. For all three periods, the firms, which charge additional depreciation, appear to have the lower interest expenses/operating income ratio. In order to overcome the problem of discontinuity of the IOP, which appears as the operating profits go from positive to negative, the interest expenses/operating income ratio has been transformed so that the statistical analysis will be facilitated. In the years 1994 and 1995 the difference becomes a significant one ($0.0176 < 0.05$, and $0.0119 < 0.05$). The observed effect is consistent with the hypothesis that the higher a firm's tax-deductible interest-expense the less likely the firm needs to use the depreciation-related tax-shields in order to reduce its tax burden. Thus, a firm with high interest expenses is less motivated to charge additional depreciation.

Likewise, the existence of prior years' losses carryforward, and/or operating losses, can reduce the relative importance of depreciation charges as tax shields. However, the results reported in Table 4 do not provide any evidence in support of the argument that firms, which report prior years' losses, are less likely to charge additional depreciation.

The results indicate that the firm's leverage significantly affects its decision to not depreciate its assets. The firms, which make use of the relevant option, have

higher debt/equity ratio compared to those that do not. The difference between the leverage characteristics of the groups of firms is statistically significant for the years 1993 and 1995 at the levels of 0.05 (see Table 5). Although the relationship is not statistically significant in the year 1994, the firms that avoid from depreciating their assets are the more leveraged ones. The observed relationship is consistent with the hypothesis that the more leveraged firms face higher non-tax costs and thus they choose the income-increasing accounting option.

Yet, the observed finding may be explained by the higher debt-related tax-shields held by the more leveraged firms. The relationship between the firm's interest expenses/operating ratio and its decision to abstain from depreciating its assets provides some evidence that is supportive of such an argument. Firms, which make use of the option of not depreciating their assets, have higher interest/operating incomes ratio, compared with the remaining firms. This difference appears to be a statistically significant in each individual year (see Table 5). The observed effect is consistent with the hypothesised one

Additional evidence in support of the argument that the particular depreciation policy decision can be part of a tax-reducing strategy, is provided by the observed association between the firm's decision not to depreciate its assets and whether the firm reports prior periods losses carryforward. The relevant option is more likely to be used by firms that report prior years' losses than by firms that do not. In all years the significance level is considerably lower than the cut-off level of 0.05 (see Table 5).

An association exists between the firm's decision not to depreciate its assets, and whether it reports operating losses (Table 5). When a firm is confronted with operating losses, it is more likely to make use of the option. The association is statistically significant only for the year 1994 ($0.00002 < 0.05$). In years 1993 and 1995, although the association is not statistically significant, it is in the expected direction. Again, when the firm reports operating losses the importance of depreciation charges as tax-shields diminishes and the firm avoids depreciating its assets.

4.2 Multivariate analysis

The logistic regression analysis proceeded in two stages. During the first stage, each independent variable was separately examined for its contribution in explaining the dependent one. During the second stage, on the basis of the findings of the previous stage a model was created, indicating the accumulating explanatory power of the identified variables.

4.2.1 Firms' decision to charge additional depreciation

The results of the tests aiming at assessing the individual contribution of each variable in explaining the variation in the dependant one for each individual year, are presented in Table 6. For two of the three years, the size variable (SIZE) significantly contributes to explaining the variance of the dependent variable. The results indicate that this variable generates the greatest and the most significant reduction of the log-likelihood ratio *(-2LL).* In the year 1993, the particular variable (SIZE 93) reduces the value of the log-likelihood ratio to 92.388 from 98.446, while the level of significance is 0.0138 < 0.05. In the years 1994 and 1995, the corresponding *model chi-square* (G_M) are 9.875 and 3.194, respectively, while the levels of significance are 0.0017 < 0.05 and 0.0739 > 0.005, respectively. Despite the fact that in the year 1995, the improvement is not statistically significant, the size variable continues to contribute most in the prediction of the dependent one.

From the sign of the coefficient *(b)* of the size variable, it can be inferred that the firms, which charge additional depreciation, are larger than the firms that do not. Given that the decision to charge additional depreciation has a decreasing effect on the level of reported income, the present result is consistent with the size hypothesis. Larger firms, due to the higher political costs that they are supposed to facing, are more likely to adopt income decreasing accounting methods. Yet, as mentioned within the context of the univariate analysis an alternative explanation may apply.

The ownership/control characteristics of the firms do not significantly improve the prediction of the variance of the dependent variable. Whether a firm is characterised by a concentrated ownership, or whether it is a widely-held firm, does not seem to significantly contribute to explaining the firm's decision to charge additional depreciation. Similarly, the owners' participation in the board of directors appears to contribute very marginally indeed, in predicting the value of the dependant variable. These results are in line with those reported in previous sections regarding the association between the firm's ownership/control status and its depreciation policy decisions. The firms, which charge additional depreciation, do not appear to differ from those, which do not, with respect to their ownership structure.

Likewise, a firm's leverage and profitability characteristics do not significantly improve the prediction of the dependent variable. Neither the debt/equity (DOQ) and interest expenses/operating income (IOP) ratio, nor the existence of operating (OPLS) and/or prior years losses (LOC), appear to cause a

significant reduction in the level of the log-likelihood ratio *(-2LL).* Despite the fact that the data reported in Table 6 do not denote statistically significant results, the firms, which charge additional depreciation, have on average lower leverage, and interest expenses/operating income. The sign of the coefficient *(b)* for the debt/equity DOQ variable, in all years except 1993, is negative. With regard to the interest expenses/operating income ratio, the sign of coefficient in all years is positive. It should be noted, that in the year 1994, the contribution of the interest expenses/operating income ratio (IOP) variable in the prediction of the dependant one, is nearly significant, i.e. 0.0528 > 0.05. That result indicates that firms that charge additional depreciation may benefit from lower debt-related tax shields. Given that only the size variable significantly improved the prediction of the dependant variable, it has not been considered expedient to construct a model indicating the accumulative explanatory power of the identified variables.

4.2.2 Firms' decisions to make use of the option of not depreciating part or all of their dereciable tangible assets

Table 7 presents the results of the investigation about the individual contribution of each variable, in predicting whether a firm makes use of the option of not depreciating its assets or not. The size variable does not significantly contribute in explaining the dependant variable. In all years, the particular variable generates a very marginal, and statistically insignificant, reduction in the log-likelihood ratio *(-2LL).* Similarly, the firm's ownership/control status does not seem to significantly improve the prediction as to whether a firm will make use of the relevant depreciation policy option.

These results are in line with those reported in previous sections regarding the association between the firm's ownership/control status and its depreciation policy decisions. The firms that make use of the option of not depreciating part of their tangible assets do not appear to differ from those that do not, with respect to their ownership structure.

On the other hand, the variables indicating the firm's leverage and profitability characteristics contribute to significant reductions in the value of the log-likelihood ratio *(-2LL).* In particular, for the year 1993, the IOP 93 and LOC 93 variables significantly contribute to the prediction of the dependent variable; the corresponding model chi-square (G_M) are 10.637, and 7.373 respectively, while the levels of significance are 0.0011 < 0.05, and 0.0066 < 0.05 respectively. In the year 1994, the variables LOC 94, OPLS 94, and IOP 94 resulted in a quite considerable model chi-square (G_M), 17.757, 17.757, and

13.819 respectively; the observed significance levels are, 0.0000 < 0.05, 0.0000 < 0.05, and 0.0002 < 0.05, respectively. In 1995, the variables LOC 95, DEQ 95, and IOP 95 generated significant reductions in the log-likelihood ratio *(-2LL);* the corresponding model chi-square (G_M) are 7.740, 6.780 and 6.302 respectively, while the observed significance levels were, 0.0054 < 0.05, 0.0092 < 0.05, and 0.0121 < 0.05 respectively. It can be seen that for all three years, the existence of prior years losses carryforward (LOC), and the interest expenses/operating income ratio (IOP), are among the factors that significantly contribute to predicting the variance in the dependant variable, i.e. the refrain from charging depreciation. The signs of the coefficients *(b)* allow to determine the direction of the contribution of the relevant factors. In comparison with firms that decide to depreciate all their assets, the firms which decide not to depreciate all their assets, have higher debt-related shields and they are more likely to report prior periods' losses carryforward. In addition, in the year 1994 the firms which face operating losses are more likely to make the relevant depreciation policy choice, while for the year 1995 the firms which employed the specific option appear to be more leveraged. Even in the years in which the variables DOQ and OPLS do not generate significant model chi-square (G_M), their coefficients continue to be in the expected direction. These results are supportive of the hypotheses presented earlier, according to which, leverage and profitability characteristics can contribute to explaining depreciation policy decisions by influencing the balance between tax benefits and non-tax costs, and the choice among alternative tax shields.

Furthermore, in comparison with the indicator of the level of the firm's dependency on bank financing (DOQ), the indicators of the profitability (LOC, and OPLS), and of the debt-related tax shields (IOP), have - almost constantly - contributed more significantly to the prediction of the variance in the dependant variable. Thus, it can be maintained that an indication has been provided that the observed depreciation-policy decisions are more likely to be a result of a tax-reducing strategy, rather than of a trade-off between tax benefits and non-tax costs. The logistic regression models that were constructed on the basis of the individual contribution of each variable suggest that for each year, only the first variable which is incorporated results in significant changes in the likelihood ratio (Table 8).

It should be mentioned, however, that there can be a positive correlation between the level of the firm's dependency on bank financing, and (i) the level of the firm's interest expenses (IOP), (ii) the existence of prior years losses carryforward (LOC), and (iii) the reporting of operating losses (OPLS).

Higher leverage can result in higher interest payments, which in turn can lead to an accumulation of operating losses. Indeed, the relevant variables appear to be highly correlated with each other (Table 9). It should be pointed out that due to the transformation of the data regarding the IOP ratio the negative sign of the coefficient in fact indicates that there is a positive correlation between the relevant variables. Higher leverage firms are more likely to have higher interest expenses/operating income ratios and they are more likely to experience operating losses, and to report prior year losses carryforward. Similarly, the **IOP,** LOC and OPLS appear to be significantly correlated with each other.

5. Conclusions

The findings of this investigation have indicated that a firm's depreciation-policy decisions are not significantly related to their ownership structure. On the other hand, the size variable seems to be significantly associated with the firm's decision to charge additional depreciation; the firms that charge additional depreciation appear to be larger compared to those that do not.

The firms' leverage and profitability characteristics have appeared to be significantly associated with the firm's depreciation-method choices. Regarding the firm's decision to charge additional depreciation, the results did not indicate that there is a constantly significant relationship between the variables of interest. On the other hand, in the case of the firm's decision to not depreciate its assets, the results have indicated an almost constantly significant relationship between the variables of interest. The firms which make use of the option of not depreciating their assets are more leveraged, and have the benefit of significant tax-shields in the form of higher interest expenses and operating losses and losses carryforward.

According to one interpretation, the more leveraged firms adopt the income-increasing accounting options, in order to (i) improve their prospects of raising debt capital in reasonable terms, and (ii) to avoid breaching their accounting-based debt covenants. Such a decision can result in a significant rise of the firm's tax liability. Yet the firm's management assigns greater importance to non-tax costs than to tax benefits and decides to sacrifice the latter. The above reported results are consistent with the findings of previous studies, which have indicated that more leveraged firms are more likely to adopt the accounting methods that contribute to a reduction of their non-tax costs, despite the fact that important tax benefits which may be foregone.

An alternative interpretation proposes that the firm's depreciation-policy decisions may be dictated by the requirements of a strategy aiming at reducing a firm's taxable income. The more leveraged firms are more likely to have higher interest expenses and as a result are less dependent on the depreciation charges for reducing their taxable income. Additional evidence is provided by the indication that the decision to avoid depreciation is significantly related to the presence of losses carryforward and operating losses.

It could have been concluded, therefore, that firms' determination to reduce their taxable income is very likely to explain their depreciation-policy decisions. However, the fact that a significant positive correlation exists between the values of the debt/equity ratio and the values of the indicators of the other tax shields, may mitigate the robustness of such a conclusion. It can be argued that all variables are surrogates of each other. Therefore, an interpretation of firms' depreciation-policy decisions that is based on a substitution between alternative tax shields could be accepted somewhat cautiously.

Nevertheless, the proposed alternative explanations for the firms' depreciation policy decisions are not necessarily incompatible or competing. From a certain viewpoint, a specific decision can be perceived as purely based on financial accounting considerations. An alternate approach may suggest that tax considerations can equally explain the same decision. A heavily leveraged firm by abstaining from depreciating its assets and by avoiding charging additional depreciation, not only effectively reduces its overtime tax liability - since it defers the use of potential tax shields in the future - but in addition improves its prospects of raising debt capital in comparatively favourable terms. At the same time, the possibility that the firm will be placed in technical default due to a violation of debt-covenants is reduced.

Both interpretations explain firms' depreciation policy decisions on the basis of economic consequences ensuing from those choices. In addition, they both seem to be plausible, while the findings of the statistical analysis provide evidence that is supportive of both explanations. It cannot be argued with absolute confidence which consideration is the dominant one. The possibility that both considerations, simultaneously and in conjunction, influence the firm's management decision regarding the level of depreciation charges, cannot be completely disregarded. A further research may be required in order to shed some light upon this issue.

Appendix -Tables

TABLE 1

Association between firms' ownership structure and their depreciation policy decisions

I. Firm charges additional depreciation	**Concentrated ownership**	**Widely held**
YEAR 1993		
NO **YES**	**60** **29**	**3**
Likelihood ratio: 2.31820	*DF:* 1	*p-value:* 0.1278
YEAR 1994		
NO **YES**	**64** **33**	**3**
Likelihood ratio: 2.44833	*DF:* 1	*p-value:* 0.1176
YEAR 1995		
NO **YES**	**59** **33**	**2** **1**
Likelihood ratio: 0.0082	*DF:* 1	*p-value:* 0.9277
II. Firm avoids depreciating its assets	**Concentrated ownership**	**Widely held**
YEAR 1993		
NO **YES**	**75** **13**	**2** **1**
Likelihood ratio: 0.61833	*DF:* 1	*p-value:* 0.4316
YEAR 1994		
NO **YES**	**73** **22**	**2** **1**
Likelihood ratio: 0.15295	*DF:* 1	*p-value:* 0.6938
YEAR 1995		
NO **YES**	**71** **21**	**2** **1**
Likelihood ratio: 0.16596	*DF:* 1	*p-value:* 0.6837

TABLE 2

Owners' involvement in management and depreciation policy decisions

I. Firm charges additional depreciation	**Owners members of the BD (Board of Directors)**	**Owners are not members of the BD**
YEAR 1993		
NO **YES**	**52** **24**	**11** **5**
Pearson: 0.00066	*DF:* 1	*p-value:* 0.97946
YEAR 1994		
NO **YES**	**54** **27**	**13** **6**
Pearson: 0.02142	*DF:* 1	*p-value:* 0.88363
YEAR 1995		
NO **YES**	**48** **28**	**13** **6**
Pearson: 0.18322	*DF:* 1	*p-value:* 0.66862
II. Firm avoids depreciating its assets		
YEAR 1993		
NO **YES**	**63** **12**	**14** **2**
Likelihood ratio: 0.12966	*DF:* 1	*p-value:* 0.7187
YEAR 1994		
NO **YES**	**61** **19**	**14** **4**
Likelihood ratio: 0.1298	*DF:* 1	*p-value:* 0.8895
YEAR 1995		
NO **YES**	**58** **18**	**15** **4**
Likelihood ratio: 0.06015	*DF:* 1	*p-value:* 0.8062

TABLE 3

Univariate statistics on their size

Firm charges additional depreciation		**Mean rank size**	**U-statistic**	**Z-score**	**2-tailed P**
1993	YES	50.20	520.0	-2.0348	0.0419
	NO	38.47			
1994	YES	60.85	764.0	-2.5034	0.0123
	NO	45.40			
1995	YES	44.58	860.0	-1.1408	0.2540
	NO	51.21			
Firm avoids depreciating its assets					
1993	YES	47.14	411.0	-0.8756	0.3813
	NO	40.96			
1994	YES	47.61	819.0	-0.3646	0.7154
	NO	50.08			
1995	YES	40.50	638.0	-1.2928	0.1961
	NO	49.01			

TABLE 4

Univariate tests for firms charging additional depreciation

Debt/equity ratio		**mean rank**	**U-statistic**	**Z-score**	**2-tailed P**
1993	YES	41.52	713.0	-0.1193	0.9501
	NO	42.21			
1994	YES	47.91	1020.0	-0.6283	0.5298
	NO	51.78			
1995	YES	38.90	727.5	-2.3130	0.0207
	NO	52.38			
Interest expenses /operating income ratio					
1993	YES	43.58	622.0	-0.6413	0.5213
	NO	39.91			
1994	YES	58.05	718.5	-2.3747	0.0176
	NO	43.73			
1995	YES	54.19	618.0	-2.5140	0.0119
	NO	39.84			
		Prior years' losses carryforward			
Additional depreciation (1993)		**NO**		YES	
	NO	50		8	
	YES	22		5	
Pearson: 0.31755		*DF:* 1		*p-value:* 0.57308	
(1994)	**NO**	57		10	
	YES	27		**6**	
Pearson: 0.17445		*DF:* 1		*p-value:* 0.67618	
(1995)	**NO**	47		12	
	YES	30		**4**	
Pearson: 1.11326		*DF:* 1		*p-value:* 0.29137	
		Operating losses>			
Additional depreciation (1993)		**NO**		YES	
	NO	50		**8**	
	YES	23		**2**	
Likelihood ratio: 0.59227		*DF:* 1		*p-value:* 0.44154	
(1994)	**NO**	55		12	
	YES	29		**4**	
Pearson: 0.55136		*DF:* 1		*p-value:* 0.45776	
(1995)	**NO**	48		**9**	
	YES	29		**3**	
Likelihood ratio: 0.75871		*DF:* 1		*p-value:* 0.38373	

TABLE 5

Univariate tests for firms abstaining from depreciation

Debt/equity ratio		**Mean rank**	**U-statistic**	**Z-score**	**2-tailed P**
1993	YES	56.46	280.5	-2.4658	0.0137
	NO	39.07			
1994	YES	57.96	668.0.0	-1.6341	0.1022
	NO	46.91			
1995	YES	59.36	531.0	-2.3422	0.0192
	NO	43.88			
Interest expenses /operating income ratio					
1993	YES	20.71	185.0	-3.5478	0.0004
	NO	45.24			
1994	YES	31.63	451.5	-3.2106	0.0013
	NO	52.64			
1995	YES	31.38	428.0	-2.7640	0.00578
	NO	49.21			
		Prior years' losses carryforward			
Additional depreciation (1993)		**NO**		YES	
	NO	64		7	
	YES	**8**		6	
Pearson: 9.82889		*DF:* 1		*p-value:* 0.00172	
(1994)	**NO**	70		5	
	YES	12		11	
Pearson: 21.82830		*DF:* 1		*p-value:* 0.00000	
(1995)	**NO**	64		**7**	
	YES	13		**9**	
Pearson: 11.36775		*DF:* 1		*p-value:* 0.00075	
		Operating losses			
Additional depreciation (1993)		**NO**		YES	
	NO	63		6	
	YES	10		4	
Likelihood ratio: 3.54660		*DF:* 1		*p-value:* 0.05967	
(1994)	**NO**	70		5	
	YES	12		11	
Likelihood ratio: 18.64805		*DF:* 1		*P-value:* 0.00002	
(1995)	**NO**	61		**7**	
	YES	16		**5**	
Likelihood ratio: 2.25706		*DF:* 1		*p-value:* 0.13301	

TABLE 6

Multivariate tests for firms' choice to charge additional depreciation.

The abbreviations denote: *BOARD-major* shareholders participation in the board of directors; DOQ-debt/equity ratio; IOP-interest expenses/operating income ratio; LOC-existence of prior years losses carryforward; OPLS-reporting of operating losses; *OWNER-owner* structure; *SIZE-size.* Numbers indicate specific years.

I. Year 1993

variable	b	s.e.	2-log. likelihood	Model chi-square	df.	D.
Constant	-	-	98.446	-	-	
SIZE 93	1.0186	0.4441	92.388	6.058		0.0138*
OWNER	-3.1954	10.5827	96.294	2.152		0.1424
DOQ 93	0.3457	0.3022	97.117	1.329		0.2489
LOC93	0.2387	0.3155	97.889	0.557		0.4554
IOP 93	0.8045	1.1058	94.892	0.555		0.4564
OPLS 93	-0.2927	0.4156	97.904	0.542		0.4616
BOARD	0.1695	0.3101	98.514	0.292		0.5887

II. Year 1994

variable	b	s.e.	2-log. likelihood	model chi-square	df.	P.
Constant	_	-	122.21072	-	-	
SIZE 94	1.3767	0.4710	112.336	9.875		0.0017*
IOP 94	1.8067	0.9950	118.462	3.749		0.0528
OWNER	-3.2783	10.5825	119.734	2.476		0.1156
OPLS 94	-0.2398	0.3116	121.586	0.625		0.4294
LOC 94	0.1100	0.2844	122.063	0.148		0.7007
DOQ 94	-0.0650	0.3405	122.173	0.037		0.8466
BOARD	-7,2E-17	0.2774	122.211	0.000		1.0000

III. Year 1995

variable	b	s.e.	2-log. likelihood	model chi-square	df.	p.
Constant	_	-	116.26233	-	-	
SIZE 95	0.8218	0.4724	113.069	3.194		0.0739
IOP 95	1.4663	0.9717	113.676	2.586		0.1078
LOC 95	-0.4735	0.3440	114.111	2.151		0.1424
DOQ 95	-0.3996	0.3818	114.849	1.413		0.2345
OPLS 95	-0.2974	0.3535	115.504	0.759		0.3837
OWNER	-0.599	0.6226	116.253	0.009		0.9229
BOARD	-0.0178	0.2819	116.258	0.004		0.9496

* statistically significant improvement.

TABLE 7

Multivariate tests for the firms' choice to refrain from charging depreciation

I. Year 1993

variable	b	s.e.	2-log. likelihood	model chi-square	df.	p.
Constant	-	-	74.578347	-	-	-
IOP93	-3.8017	1.2272	63.941	10.637		0.0011*
LOC 93	0.9304	0.3359	67.205	7.373		0.0066*
OPLS 93	0.7014	0.3651	71.182	3.396		0.0654
SIZE 93	0.4380	0.4610	73.690	0.888		0.3460
OWNER	0.4581	0.6309	74.107	0.472		0.4922
DOQ 93	0.1813	0.3349	74.308	0.271		0.6028
BOARD	-0.1344	0.4137	74.468	• 0.111		0.7394

II. Year 1994

variable	b	s.e.	2-log. likelihood	model chi-square	df.	p.
Constant	-	-	104.60614	-	-	-
LOC 94	1.2466	0.3120	86.849	17.757		0.0000*
OPLS 94	1.2466	0.3120	86.849	17.757		0.0000*
IOP 94	-3.4235	0.9771	90.787	13.819		0.0002*
DOQ 94	0.5853	0.3620	101.581	3.025		0.0820
SIZE 94	-0.3885	0.4894	103.966	0.640		0.4237
OWNER	0.2250	0.6245	104.483	0.123		0.7256
BOARD	-0.0313	0.3150	104.596	0.010		0.9692

III. Year 1995

variable	b	s.e.	2-log. likelihood	model chi-square	df.	p.
Constant	-	-	97.2542	-	-	-
LOC95	0.8397	0.3005	89.514	7.740		0.0054*
DOQ 95	0.8106	0.3746	90.474	6.780		0.0092*
IOP 95	-2.213	0.8870	90.952	6.302		0.0121*
SIZE 95	-0.7994	0.5223	94.811	2.443		0.1181
OPLS 95	0.5009	0.3247	94.997	2.257		0.1330
OWNER	0.2504	0.6255	97.103	0.151		0.6974
BOARD	-0.0023	0.3178	97.254	0.000		0.9943

The abbreviations defined in Table 7, continue to apply
* statistically significant improvement.

TABLE 8

Results of the logistic regression analysis, for firms' decision to abstain from depreciating its assets (model)

I. 1993

variables	**2-log. likelihood**	**df.**	**Improvement**	df.	P.
Constant	74.5783	80			
IOP 93	63.941	79	10.637	1	0.0011
LOC93	63.618	78	0.323	1	0.5696

II. 1994

variables	**2-log. likelihood**	**df.**	**Improvement**	df.	P.
Constant	104.60614	93	-	-	
OPLS 94	86.849	92	17.757	1	0.0002
LOC94	85.309	91	1.540	1	0.2146
IOP94	85.293	90	0.017	1	0.8979

III. 1995

variables	**2-log. likelihood**	**df.**	**Improvement**	df.	P.
Constant	97.254	88	-	-	-
LOC95	89.514	87	7.740	1	0.0054
DEQ 95	89.428	86	2.086	1	0.1086
IOP95	87.373	85	0.055	1	0.8141

TABLE 9

Descriptive statistics and correlation

I. 1993

Variables	Mean	std. dev.	DOQ93	OPLS 93	IOP 93	LOC93
DOQ 93	0.5020	0.7640				
OPLS 93	0.1205	0.3275	0.3358 ρ = 0,000			
IOP 93	0.7676	0.2358	-0.5481 ρ = 0.000	-0.7885 ρ = 0.000		
LOC 93	0.1494	0.3586	0.2923 ρ = 0.000	0.6552 ρ = 0.000	-0.6716 ρ= 0.0000	

II. 1994

Variables	Mean	std. dev.	DOQ 94	OPLS 94	IOP 94	LOC 94
DOQ 94	0.4041	0.6557				
OPLS 94	0.1600	0.3685	0.4707 ρ = 0,000			
IOP 94	0.7551	0.2558	-0.6000 ρ = 0.000	-0.8373 ρ = 0.000		
LOC 94	0.1600	0.3685	0.4119 ρ = 0.000	0.8512 ρ = 0.000	-0.7041 ρ= 0.0000	

III. 1995

Variables	Mean	std. dev.	DOQ 95	OPLS 95	IOP 95	LOC95
DOQ 95	0.4578	0.7718				
OPLS 95	0.1444	0.3535	0.5454 ρ = 0,000			
IOP 95	0.7781	0.2701	-0.6129 ρ = 0.000	-0.8877 ρ = 0.000		
LOC 95	0.1809	0.3870	0.4675 ρ = 0.000	0.8010 ρ = 0.000	-0.8180 ρ= 0.0000	

The previously mentioned abbreviations continue to apply.

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