Capital Structure and Imperfect Competition in Product Markets

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CAPITAL STRUCTURE AND IMPERFECT COMPETITION IN PRODUCT MARKETS

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Abstract

In this paper a theory of capital structure based on imperfections in firms' product markets is illustrated with numerical examples. In the model used there is a corporate tax advantage to debt but there are no direct bankruptcy costs. The effect of bankruptcy rather is to delay investment decisions. Although these delays are not in themselves costly, they can put the bankrupt firm at a strategic disadvantage and can result in the firm being forced to liquidate. In order to prevent this happening it is optimal for firms to use a sufficient amount of equity in their capital structure to prevent bankruptcy.

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1. Introduction

The question of how firms choose their capital structure is an important one for at least two reasons. First, a thorough understanding of financing decisions is necessary in order to be able to analyze firms' real investment decisions. This is a crucial component of normative theories of capital budgeting and also of many analyses of savings. Second, it is important for any analysis of the corporate income tax, which in a number of countries and in particular in the U.S., is one of the major sources of government revenue. However, it is widely acknowledged this question has not been satisfactorily answered yet: current theories seem to be unable to explain the financing decisions firms actually make.

Good empirical evidence on capital structure is scarce. However, there do appear to be some regularities which the theoretical literature has attempted to explain. The first of these is that there is some evidence that there are systematic differences in capital structure between industries (see Schwartz and Aronson (1967), Scott (1972) and Scott and Chatterjee (1984)). For example, it appears that the debt ratios adopted by gas and electric utilities are higher than those of other industrial firms such as those in manufacturing. Secondly, Miller (1963; 1977) and Schwartz and Aronson (1967) have presented evidence that the amount of debt used by corporations has only increased a small amount over time despite significant increases in corporate tax rates. Thirdly, corporations pay substantial amounts of corporate income tax. For example, in 1980 corporations as a whole paid a total of around $105 billion in corporate income tax (Internal Revenue Service (1983a)). Moreover, debt ratios are typically of the order of only twenty to thirty percent and many thriving corporations such as IBM and Kodak use very little debt despite paying substantial amounts in corporate income tax (Miller 1977). Fourthly a

large proportion of corporate bankruptcies that reach the stage of judicial action result in liquidation. For example, Stanley and Girth (1971) found that in 1969 only around 12.5 percent of corporate bankrupts attempted to reorganize and of these many were ultimately unsuccessful.

Any satisfactory theory of capital structure should be able to explain these observations. In addition, there is also some evidence on bankruptcy costs which the assumptions of any theory should be consistent with. In particular, it appears the direct costs of bankruptcy are small in relation to the asset values of the firm (see Warner (1977) and Ang, Chua and McConnell (1982)).

Before the publication of Modigliani and Miller's (1958) well-known paper it was argued that the cost of debt was lower than the cost of equity, but that firms should use only a limited amount of debt finance because of the risk of bankruptcy and liquidation induced by a high debt ratio. Modigliani and Miller challenged this analysis. Their result has subsequently been extended by a number of authors (see, e.g., Baron (1974; 1976), Fama (1978), Hellwig (1981), Hirshleifer (1970), Stiglitz (1969; 1974)). The basic argument is that provided there are no taxes and capital markets are perfect, a firm's capital structure is irrelevant in determining its total value, since anything the firm does leaves the opportunity sets of investors unchanged.

In their (1963) paper Modigliani and Miller extended the analysis to allow for a corporate income tax of the type used in the U.S., where debt interest is tax deductible but dividends are not. The implication of this change is that instead of capital structure being irrelevant, firms should use debt finance almost entirely, because of the deductibility of interest. As it stands, this theory is obviously difficult to reconcile with the empirical evidence.

It was noted by a number of authors (see, e.g., Baxter (1967) and Hirshleifer (1970)) that bankruptcy costs might be able to reconcile the Modigliani-Miller model with firm behavior. Among others Kraus and Litzenberger (1973), Scott (1976), Kim (1976) and Turnbull (197) explicitly introduced costs of bankruptcy into their formal models. These costs offset the corporate tax advantage of debt and result in a theory of capital structure with a finite optimal debt/equity ratio.

The problem with this rehabilitation of the traditional position is that given current corporate tax rates in the U.S. are of the order of fifty percent, the bankruptcy costs required to explain the sort of debt ratios and corporate tax payments that are typically observed, are large. In particular, for firms such as IBM and Kodak, they would have to be very large.

As noted earlier, studies of direct bankruptcy costs, such as legal and administrative costs, by Warner (1977) and Ang, Chua and McConnell (1982) have found that these are low. The studies do not include indirect bankruptcy costs such as the costs associated with the problems of running the business while it is in bankruptcy court. It has been suggested (see e.g., Gordon and Malkiel (1981)) that these indirect costs are sufficiently large to make the theory plausible, but there are severe problems in measuring these.

However, Haugen and Senbet (1978) have argued liquidation is really a capital budgeting decision that should be considered independently from the event of bankruptcy which is simply a transfer of ownership from stockholders to creditors. Any costs associated with bankruptcy must be limited by the costs of avoiding the transfer. They suggest these costs are given by the transaction costs associated with issuing new shares and repurchasing the fixed claims of debtors. These are likely to be much too small to offset the

corporate tax advantage of debt and to provide a rationale for firms' observed behavior.

One problem with this argument is that it may be difficult for a firm to repurchase its debt securities if it is near bankruptcy. If some people accept the repurchase offer from the firm, anybody who holds out and refuses the offer can expect the value of their securities to increase. Another problem is that it is possible to construct examples where conflicts of interest provide incentives for debtholders to force bankruptcy even though it would be more profitable to avoid the costs associated with bankruptcy (see Bulow and Shoven (1978) and White (1980)). These arguments suggest bankruptcy is a likely event if a firm is in financial distress. However, they do not invalidate Haugen and Senbet's basic point which is, why are firms which are bankrupt liquidated and all the costs of breaking up the firm incurred? Unless liquidation is in any case optimal, it should always be profitable for somebody to step in before a firm is broken up and offer to pay the securityholders whatever they would otherwise receive. However, as indicated above it is only rarely that firms which are bankrupt are not liquidated. The corporate tax versus bankruptcy cost theory does not explain this phenomenon yet it is a crucial part of the argument as to why bankruptcy is so undesirable.

These difficulties with the modified Modigliani-Miller theory have led to a number of other theories being developed. One extension that has been widely adopted is to include personal taxes in addition to corporate taxes (see, e.g., Stiglitz (1973), King (1974), Miller (1977) and DeAngelo and Masulis (1980)). Although debt has a corporate tax advantage because of interest deductibility, it can be argued that it has a personal tax disadvantage. For equity the reverse is true. The corporate income tax has

already been discussed. Bond interest is taxed at the personal level. However, by retaining earnings and repurchasing shares, for example, firms can ensure that the personal income tax on equity income is mostly avoided. This notion leads to a clientele theory of asset holding where, in the simplest models, those with personal marginal tax rates above the corporate tax rate hold predominantly equity securities and those with personal rates below hold debt securities. People with personal rates which are the same as the corporate rate are indifferent between the two types of security. This implies that for each firm taken individually capital structure is irrelevant since any change in the firm's position will be offset by the indifferent group. Thus the original Modigliani-Miller conclusion is reached but in a model with taxes.

One advantage of this type of theory is that it is capable of explaining why debt ratios have increased only a small amount over time. Although corporate taxes have risen significantly so also have personal taxes, so that the relative levels of the two taxes, which is what is important for the theory, have remained relatively unchanged.

As far as the systematic differences in capital structure across industries are concerned, since the theory predicts irrelevance any pattern can be explained. However it seems more likely that if capital structure were irrelevant the observed pattern would not be systematic.

One of the other weaknesses of the theory is its reliance on the fact that personal taxes on equity income are avoided. This is difficult to reconcile with firms' dividend policies. Firms do pay substantial dividends which, to a large extent, are received by people in high marginal tax brackets (see, e.g., Internal Revenue Service (1983b), Tables 1.3 and 3.3). Miller and Scholes (1978) have provided a possible explanation of this. People may

prefer dividends to other forms of income because they permit limits on interest deductions to be avoided so that the effective marginal rate on dividends could in fact be zero. However, Feenberg (1981) has presented empirical evidence which discounts the importance of this explanation.

Another class of theories which involves a more radical departure from the Modigliani-Miller framework is concerned with the moral hazard problems that arise with debt contracts (see, e.g., Jensen and Meckling (1976) and Myers (1977)). Having issued debt at a certain interest rate, the equityholders may be able to change the risk of the assets the firm owns by changing its investment policies. If this makes the debt more risky then it causes a transfer of wealth from debtholders to shareholders. It may be difficult for bondholders to prevent this except by limiting the amount of debt the firm uses. Ross (1977) has suggested another theory based on informational imperfections. In his model firms use the amount of debt as a signal to investors of management's expectations about bankruptcy risk. Unfortunately empirical evidence on the importance of these theories is lacking. Although it would appear to be widely thought these factors can be important, especially at high debt ratios, it would seem to be difficult to believe they offset the corporate tax advantage of debt sufficiently to explain firms' behavior.

To summarize, a number of theories of capital structure have been suggested but none of these is widely accepted. All of them seem in one way or another to be inconsistent with the empirical evidence.

The purpose of this paper is to present numerical examples which illustrate a theory of capital structure that is based on imperfections in firms' product markets. In the model used there is a corporate tax advantage to debt but there are no direct bankruptcy costs. The effect of bankruptcy

rather is to delay investment decisions. Although these delays are not in themselves costly, they can put the bankrupt firm at a strategic disadvantage. This results in the firm being "pushed out" of the market and forced to liquidate. There is therefore a large indirect cost of bankruptcy. In order to prevent this happening, it is optimal for firms to use a sufficient amount of equity in their capital structure to prevent bankruptcy. The next section presents the numerical examples and argues that the underlying theory is consistent with the empirical observations outlined initially. Section 3 contains concluding remarks.

2. The Examples

The basic assumption of the theory is that the product market of the firms being considered is imperfectly competitive. For most corporations, particularly large ones, this is not an unreasonable assumption since most major industries are dominated by a few large firms. For simplicity, in the examples to be considered there are two identical firms A and B in the industry and there are no possibilities for entry by other firms.

The other main assumption is that there are no bankruptcy costs, but if the firm becomes bankrupt it cannot undertake new investments until it is out of bankruptcy court. Thus the effect of bankruptcy is that investment decisions are delayed. Although in itself this is costless, it will be seen below that it puts the firm at a strategic disadvantage and it is for this reason that bankruptcy is to be avoided. The empirical evidence on the degree of delay is that it is usually substantial. For example, Stanley and Girth (1971, p. 143) found that a typical reorganization under Chapter XI took about eighteen months from filing to closing. This was only slightly less than the typical time for a straight bankruptcy which was twenty-three months.

The model lasts for two periods (t = 0, 1, 2). At t = 0 the level of demand at t = 1 and 2 is uncertain. There is a 0.5 probability the industry will boom and a 0.5 probability there will be a recession. The level of demand in periods 1 and 2 is the same so that if there is a boom in period 1 there will be a boom in period 2 and so on.

At the beginning of each period each firm has three investment possibilities. These are shown in Table 1. They can be thought of as either representing investments in tangible real assets or in intangibles such as research and development.

Investment	High (H)	Low (L)	Liquidate (λ)
Cost	20	10	0

Table 1. Investment opportunities.

The before-tax gross returns each period to the various possible combinations of investment strategies are given in Table 2 for the case where there is a boom and in Table 3 for the case where there is a recession. (Firm A's returns are the first entry and B's are the second.)

A \ B	H	L	λ
H	11,11	15,10	60,0
L	10,15	22,22	50,0
λ	0,60	0,50	0,0

Table 2. Gross returns if there is a recession.

A \ B	H	L	λ
H	90,90	95,30	100,0
L	30,95	35,35	60,0
λ	0,100	0,60	0,0

Table 3. Gross returns if there is a boom.

Capital markets are perfect so that there are no transactions costs, no informational imperfections and so on. Everybody is risk neutral and the expected return on all securities is 10 percent.

The objective of firms is to maximize the expected value of their own profits.

For simplicity the financing possibilities are taken to be discrete. If a firm needs to raise 20 to undertake the high level of investment, it has two possibilities. It can raise it by issuing 20 of debt. This is referred to as HD. Alternatively it can raise 10 by debt and 10 by equity. This is referred to as HE. If they need to raise 10 to undertake the low level of investment, they do it by issuing debt and this is denoted L.

There are no personal taxes or equivalently the marginal personal rate on equity income is the same as the marginal rate on debt income. Personal tax advantages on equity could easily be incorporated without affecting the nature of the results. The corporate income tax rate is initially 20 percent. This is only levied on positive corporate incomes: there is no subsidy if the firm makes a loss and there are no loss carryovers or transfers of any type. Since investments only last for one period, they are deducted as expenses rather than depreciated. These assumptions are adopted for computational simplicity and are not important for the form of the result.

A rational expectations perfect Nash equilibrium concept is used. The example is solved backwards by first considering the equilibrium strategies at t = 1 given that there is a boom or a recession and the equilibrium at t = 0 is then found.

The main purpose of the first example is to illustrate that the optimal equilibrium strategy for each firm at t = 0 is to use the equity alternative (HE) rather than all debt (HD) to finance the high level of investment, despite there being a corporate tax advantage to debt.

(i) Equilibrium at t = 1 if there is a recession.

Each firm has four strategies it can adopt at t = 1 if it turns out there is a recession. They can undertake the high level of investment and finance it by equity and debt (HE) or they can finance it purely by debt (HD). Alternatively they can undertake the low level of investment and finance it by debt (L) or they can liquidate (λ). The net present values (NPV's) at t = 1 of the after-tax cash flows for every possible combination of strategies are given in Table 4.

A \ B	HE	HD	L	λ
HE	-10.0, -10.0	-10.0, -10.0	-6.4, -0.9	27.5, 0
HD	-10.0, -10.0	-10.0, -10.0	-6.4, -0.9	27.6, 0
L	-0.9, -6.4	-0.9, -6.4	8.0, 8.0	28.4, 0
λ	0, 27.5	0, 27.6	0, 28.4	0, 0

Table 4. NPV's at t = 1 if there is a recession.

To see how these figures are arrived at, consider the case where A and B both choose HE. No taxes are paid since the gross return is less than the investment. Hence

$$NPV = -20 + \frac{11}{1.1} = -10.0 \ .$$

As an example of NPV's when taxes are paid, consider the case where they both choose L. Total deductions are 10 for the investment expense and 1 for the interest paid so

$$Taxes = 0.2(22 - 11) = 2.2 \ .$$

It then follows

$$NPV = -10 + \frac{(22 - 2.2)}{1.1} = 8.0 \ .$$

The other entries are calculated similarly.

The form of the game played at this stage depends on the financing decision made in the previous period. If a firm used 10 in debt at t = 0 then it is able to repay the principal and interest at the end of period 1 and remain solvent, provided its gross receipts are 11 or more. However, if a firm used 20 in debt and its gross receipts are less than 22, it would necessarily go bankrupt at t = 1. There are three possibilities at t = 1: either both firms are solvent or both are bankrupt or one is solvent and one is bankrupt. If both are solvent or both are bankrupt, then they make their investment decisions simultaneously. However, if one is bankrupt and one is solvent, the one that is solvent makes its investment decision before the one that is tied up in bankruptcy court. The effect of bankruptcy for one firm is to change the game from a standard Nash form to a Stackelberg form with the solvent firm as leader and the bankrupt one as follower.

Consider first the equilibrium when both firms are solvent or both are bankrupt so that they choose their investments simultaneously. In this case

it can be seen from Table 4 that the unique equilibrium is (L, L) and the corresponding NPV's are (8.0, 8.0).

However, if one firm is solvent and one is bankrupt the solvent one, which is the leader, will choose the high level of investment and finance it by debt (HD) and receive a payoff of 27.6. The bankrupt firm, which is the follower, will then choose to liquidate (λ) since this gives its highest available payoff which is 0.

This difference in game form is the crucial feature of the model. The penalty of bankruptcy is not that it is costly in itself but that it puts the firm at a strategic disadvantage which results in it being pushed out of the market. The penalty of bankruptcy is the opportunity cost of being forced out in this way. If the bankrupt firm had been solvent it would have a payoff of 8.0, but because it is bankrupt and liquidates it receives 0. It is this disadvantage of bankruptcy which offsets the corporate tax advantage of debt.

(ii) Equilibrium at t = 1 if there is a boom.

The strategies the firm can adopt if it turns out there is a boom are the same as before and the payoffs can be calculated similarly. They are shown in Table 5.

A \ B	HE	HD	L	λ
HE	49.3, 49.3	49.3, 49.5	52.9, 13.8	56.5, 0
HD	49.5, 49.3	49.5, 49.5	53.1, 13.8	56.7, 0
L	13.8, 52.9	13.8, 53.1	17.5, 17.5	35.6, 0
λ	0, 56.5	0, 56.7	0, 35.6	0, 0

Table 5. NPV's at t = 1 if there is a boom.

If it turns out there is a boom, neither firm goes bankrupt no matter which investment and financing plan they adopted at t = 0. Hence at t = 1 both firms will be solvent and will choose their investment and financing plans simultaneously. I can be seen from Table 5 that the unique Nash equilibrium involves both firms choosing HD with an NPV of 30.9.

(iii) Equilibrium at t = 0.

It is now possible to calculate expected total payoffs at t = 0. Since perfect equilibria are being considered, it is possible to restrict attention to the case where equilibrium strategies will be chosen at t = 1. Given this, there are once again four courses of action that firms can undertake at t = 0. The expected total NPV's at t = 0 from the various possible combinations of actions, given equilibrium strategies are used at t = 1, are given in Table 6.

A \ B	HE	HD	L	λ
HE	45.8, 45.8	54.7, 43.2	58.3, 29.0	80.6, 0
HD	43.2, 54.7	46.8, 46.8	50.1, 32.7	80.8, 0
L	29.0, 58.3	32.7, 50.1	38.8, 38.8	70.7, 0
λ	0, 80.6	0, 80.8	0, 70.7	0, 0

Table 6. Expected NPV's at t = 0 given equilibrium strategies at t = 1.

To see how these entries are found, consider the case where they both choose HE. If there is a recession they each receive a payoff of 11. Hence no taxes are paid and the NPV of the initial investment is -10.0 as in Table 4. Neither firm goes bankrupt and for the second period investment they both choose the equilibrium strategy L which has NPV at t = 1 of 8.6. At t = 0 the total NPV of HE for each firm, given the other is choosing HE and there is a

recession, is therefore

$$\text{NPV(Recession)} = -10.0 + \frac{8.0}{1.1} = -2.7 \ .$$

Similarly if there is a boom the NPV of the first period investment is 49.3. The equilibrium strategies at t = 1 are then HD for both firms and the NPV's of the second period investment are 49.5. The total NPV of HE at t = 0 for both firms given there is a boom is

$$\text{NPV(Boom)} = 49.3 + \frac{49.5}{1.1} = 94.2 \ .$$

Since there is a 0.5 probability of a recession or a boom the expected total NPV at t = 0 of HE given the other firm is choosing HE is

$$\text{ENPV} = 0.5(-2.7 + 94.2) = 45.8 \ .$$

If firm A chooses HE and firm B HD, they again receive a payoff of 11 if there is a recession so that the NPV of the first period investment is -10.0 as before. However in this case B, which chose HD, goes bankrupt whereas A, which chose HE, stays solvent. At t = 1 A becomes the Stackelberg leader and chooses HD. B is the follower and given A has chosen HD is best off to liquidate. For the second period A's investment has NPV at t = 1 of 27.6 and B's has one of 0. Hence overall

$$\text{NPV}_A\text{(Recession)} = -10.0 + \frac{27.6}{1.1} = 15.1 \ ,$$

$$\text{NPV}_B\text{(Recession)} = -10.0 + \frac{0}{1.1} = -10.0 \ .$$

If it turns out there is a boom, then the NPV of firm A's first period investment is 49.3 as in Table 5. However, the NPV of firm B's investment is higher because of the extra tax shield the firm's debt provides. Since the firm goes bankrupt if there is a recession and debtholders only receive 11,

the debt is risky. In order for the expected return on these risky bonds to be 10 percent, it can easily be seen the coupon interest rate must be 65 percent. Hence the total deductions for the corporate income tax are 33 which consists of 20 for the investment expense and 13 for the interest. Thus for B

$$\text{Taxes} = 0.2(90 - 33) = 11.4 \ .$$

The NPV at t = 0 of B's first period investment is

$$\text{NPV} = -20.0 + \frac{(90 - 11.4)}{1.1} = 51.5 \ .$$

Since both firms remain solvent they both choose HD at t = 1 and the NPV of this second period investment is 49.5 as before in Table 5. It follows

$$\text{NPV}_A(\text{Boom}) = 49.3 + \frac{49.5}{1.1} = 94.2 \ ,$$

$$\text{NPV}_B(\text{Boom}) = 51.5 + \frac{49.5}{1.1} = 96.4 \ .$$

The expected total NPV's at t = 0 for the two firms are

$$\text{ENPV}_A = 0.5(15.1 + 94.2) = 54.7$$

$$\text{ENPV}_B = 0.5(-10.0 + 96.4) = 43.2 \ .$$

If both firms choose HD the analysis is similar to the case where they both choose HE, except the tax shields are greater when there is a boom. If there is a recession the analysis is the same and each firm's total NPV at t = 0 is -2.7. Both firms' debt is risky so that as for B when it chose HD and A chose HE, the coupon interest rate is 65 percent and the NPV of their first period investment if there is a boom is 51.5. At t = 1 they both choose HD again and this time since the debt is no longer risky, receive payoffs with NPV at t = 1 of 49.5. So

$$NPV(Boom) = 51.5 + \frac{49.5}{1.1} = 96.4$$

and

$$ENPV = 0.5(-2.7 + 96.4) = 46.8 \ .$$

The other entries are found in a similar way.

It can be seen from Table 6 that the unique Nash equilibrium involves both firms choosing HE. If a firm were to switch to HD, with the other firm remaining at HE it would be worse off. Although it pays lower taxes if there is a boom because of the extra debt tax shields, it goes bankrupt if there is a recession and is forced to liquidate. Acting noncooperatively, it is worthwhile for each firm to choose the financing strategy with equity rather than debt. The firms would be better off if they both chose debt because of the extra tax shields, but this is not an equilibrium. By switching to equity a firm can force its competition into liquidation should there be a recession and the advantage of this outweighs the higher taxes from lower debt shields.

The second example assumes a corporate tax rate of 50 percent. The counterparts of Tables 4-6 are 7-9 respectively and are found in the same way. It can be seen from Table 7 that if both firms are solvent or both bankrupt there is a Nash equilibrium at (L, L) with payoffs (5.0, 5.0). If one is solvent and one is bankrupt, the solvent firm becomes leader and the bankrupt one follower and the Stackelberg equilibrium is at (HD, λ) with payoffs (17.2, 0). In Table 8 the unique Nash equilibrium is (HD, HD) and the payoffs are (30.9, 30.9). However it can be seen from Table 9 that at $t = 0$ the Nash equilibrium is no longer at (HE, HE). Instead (HD, HE) with payoffs (27.0, 32.1) is now a Nash equilibrium. One firm finds it better to go for the tax benefits of debt, despite the fact it has to liquidate in the event of

A \ B	HE	HD	L	λ
HE	-10.0, -10.0	-10.0, -10.0	-6.4, -0.9	16.8, 0
HD	-10.0, -10.0	-10.0, -10.0	-6.4, -0.9	17.2, 0
L	-0.9, -6.4	-0.9, -6.4	5.0, 5.0	17.7, 0
λ	0, 16.8	0, 17.2	0, 17.7	0, 0

Table 7. NPV's at t = 1 if there is a recession.

A \ B	HE	HD	L	λ
HE	30.5, 30.5	30.5, 30.9	32.7, 8.6	35.0, 0
HD	30.9, 30.5	30.9, 30.9	33.2, 8.6	35.5, 0
L	8.6, 32.7	8.6, 33.2	10.9, 10.9	22.3, 0
λ	0, 35.0	0, 35.5	0, 22.3	0, 0

Table 8. NPV's at t = 1 if there is a boom.

A \ B	HE	HD	L	λ
HE	26.5, 26.5	32.1, 27.0	35.0, 18.1	50.1, 0
HD	27.0, 32.1	29.3, 29.3	31.3, 20.4	50.5, 0
L	18.1, 35.0	20.4, 31.3	24.3, 24.3	44.2, 0
λ	0, 50.1	0, 50.5	0, 44.2	0, 0

Table 9. Expected NPV's at t = 0
given equilibrium strategies at t = 1.

a recession, while the other chooses equity to ensure it retains the advantage of becoming a monopolist in the second period if there is a recession. The effect of the increase in the corporate tax in this case is therefore that only one firm increases its use of debt while the other still uses equity.

The structure of the model is designed for simplicity of analysis rather than realism and therefore not much importance should be attached to the numbers. The important thing that the model illustrates is that with imperfect competition in product markets, bankruptcy is undesirable because it causes a delay in investment decisions. This is not costly in itself but allows competitors to seize the initiative. By the time a firm is ready to make investment decisions again, it is faced by a fait accompli and is best off liquidating rather than continuing. Thus the tradeoff firms face when choosing their capital structure is between the extra tax advantages of debt versus the permanent loss of earnings should the firm go bankrupt and have to liquidate.

Although a complete theory has not been developed, it can be argued that the type of theory underlying the example above is consistent with the empirical observations outlined initially. The first of these was the pattern of different capital structures adopted in different industries. In the example, the amount of debt in the HE financing option was the most that was consistent with the firm remaining solvent if there was a recession. If earnings in the recession had been lower, then the optimal amount of debt would also have been lower. This suggests industries with a high variance of earnings where the nature of competition is such that strategic behavior is crucial would be expected to have low debt ratios. It could perhaps be argued that many manufacturing industries are in this type of situation. In contrast, industries with a low variance of earnings where competitive

strategic behavior is unimportant, such as the gas and electric utility industries, would be expected to have much higher debt ratios. The theory is thus consistent with the first observation.

The second observation was that on average debt ratios have only increased a small amount over time despite large increases in the corporate tax rate. The examples above illustrate that as the corporate tax rate is increased it is possible that firms don't all change their capital structures simultaneously, instead one at a time does. If there are a few firms in an industry, the average debt ratio may not change very much. The model is thus consistent with the second observation.

The third observation was that on average corporations do pay substantial amounts of tax. Moreover, typical debt ratios are only around twenty to thirty percent with some corporations such as IBM and Kodak having virtually no debt despite paying large amounts in taxes. This is consistent with the type of theory above. If firms think in bad recessions earnings will be very low, then it may well be optimal not to use any debt at all. This may be so even though it involves large corporate tax payments. In the example above, tax payments were significantly higher from adopting equity financing; nevertheless this was the optimal equilibrium strategy.

The fourth observation was that once the stage of judicial action is reached, the vast majority of bankrupt corporations are liquidated. Attempts at reorganization or sales of the business as a going concern to repay creditors are rare. It can be seen from the analysis of equilibrium at $t = 1$ when there is a recession, that the theory is consistent with this. The crucial feature of the model is that bankruptcy leads to a delay in investment decisions and this changes the structure of competition. In particular, the solvent firm can make its investment decisions before the bankrupt firm. By

committing to a large investment despite the recession, the solvent firm makes liquidation the bankrupt firm's best response.

3. Concluding remarks.

In this paper a theory of capital structure based on imperfect competition in product markets has been illustrated using numerical examples. In contrast to previous explanations of firms' decisions this theory is consistent with all the empirical regularities that theories have attempted to explain.

One of the assumptions of the model was that firms had to use short term debt. If they had been able to use long term debt then the problem of bankruptcy would not have arisen. However, it can be seen it is possible even with long term debt to construct examples where the same effect occurs because firms aren't able to cover the interest expenses of the debt.

The examples focused on the extreme case where the bankrupt firm is forced to liquidate. However, it is also possible to construct examples where benkruptcy does not cause liquidation but instead leads to a diminished size relative to what would have happened if the firm had not gone bankrupt. In this case, there will again be a tradeoff between the tax advantages of debt and the indirect costs of bankruptcy caused by a delay in the investment decision.

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