Capital Income Taxation and Resource Allocation

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Chapter 6: Taxation, Industry Structure, and the Legal Status of Firms

Chapter 6

TAXATION, INDUSTRY STRUCTURE, AND THE LEGAL STATUS OF FIRMS

A closed economy with only one sector was assumed for the basic model of intertemporal allocation that was presented in Chapter 2. This assumption will be removed in the following two chapters so as to investigate the significance of different systems of capital income taxation for the *intersectoral* and *international* allocation of capital as well as for the *legal structure* of the economy. At this stage, following the previous partial analytic treatment of the firm's investment planning, the study of such problems is appropriate since it does not require knowledge of households' intertemporal consumption decisions. Household decisions will be taken into account in Chapter 8 and the subsequent chapters, where the influence of taxation on the growth path of the economy will be studied. The structural problems now considered will there be neglected again.

This chapter treats problems related to the legal status of firms. One question considered is whether the tax system creates incentives for mergers between firms or changes in their legal status; this is treated in Section 6.1. Another question, discussed in Section 6.2, is whether capital income taxation leads to undesirable factor movements between firms with different legal status and hence distorts the real production structure of the economy itself.

6.1. The Significance of Capital Income Taxation for the Legal Structure of the Economy

Superficially, tax-induced changes in the legal structure of the economy do not imply Paretian welfare losses; they seem to be simply aspects relating to the social superstructure of the real production process. Keywords like "legal order", "limited liability", "proneness to crisis", or "concentration of economic power" define the area within which such changes are of interest.

In an indirect sense, however, the problem *is* related to allocation aspects, for the legal structure of the business sector can affect the level of transactions costs in the exchange of commodities and services and in this way have quite significant real effects. The legal structure is part of the rules of the game for economic behavior to which the "ordoliberals", following Eucken (1955), have given so much attention. Unintended changes in the institutional framework of the production process – changes that are merely by-products of taxation – should therefore also be avoided from the point of view of economic efficiency; such changes are serious shortcomings of the tax systems concerned.

It is not the kind of efficiency losses that will be examined here but their possible causes. Attention will be limited to causes that stem from the firm's goal of maximizing its shareholders' wealth. In Section 6.1.1 the way the tax systems under consideration affect the market value of the firm will be examined. On the basis of the results thus derived, an attempt will be made in Sections 6.1.2, 6.1.3, and 6.1.4 to find out under what conditions taxation of capital incomes induces mergers and changes in the legal status of firms.

6.1.1. Taxation and the Value of Equity

Because the production function of the firm is linearly homogeneous, the factor price paths are exogenous, and all taxes are assumed to be proportional, the market value of equity in the firm's optimum is, similarly to (2.54), a linearly homogeneous function of the state variables K and D_f. Because of Euler's theorem, it holds therefore at each point in time that $M = (\partial M/\partial K)K + (\partial M/\partial D_f)D_f$ or, using the general definition of the current-value costate variables:

$$M = \lambda_K K + \lambda_D D_f. \tag{6.1}$$

If the expressions for λ_K and λ_D that were calculated with (5.5) and (4.13) are used, then this equation becomes

$$M = [\theta_d(1 - \alpha_3) + (\theta_d/\theta_r)\alpha_3](KP_K - D_f), \tag{6.2}$$

where

$$P_K \equiv \frac{\dfrac{\theta_p \theta_r (1 - \sigma^* - \alpha_1 \tau_r)}{\max(\theta_d^*, \theta_r^*)} + \theta_r \sigma^* \left[1 + \alpha_3 \dfrac{\tau_r}{\theta_r}\right]}{\theta_r(1 - \alpha_3) + \alpha_3} \tag{6.3}$$

is the *effective price of capital.* The effective price of capital is that value of the debt–asset ratio D_f/K for which the market value of equity is zero. It has already been used with this definition as a primitive notation in Condition (3.33).

In the special case of deductible debt interest ($\alpha_3 = 0$), which characterizes all existing systems of capital income taxation, Equations (6.2) and (6.3) become[1]

$$M = \theta_d(KP_K - D_f) \qquad (\text{for } \alpha_3 = 0) \tag{6.4}$$

and

$$P_K = \frac{\theta_p(1 - \sigma^* - \alpha_1 \tau_r)}{\max(\theta_d^*, \theta_r^*)} + \sigma^* \qquad (\text{for } \alpha_3 = 0), \tag{6.5}$$

where the latter expression has already been introduced with (5.12). Only Equations (6.4) and (6.5) will be considered in the following sections. The more general formulas (6.2) and (6.3) will be needed for the discussion of reform proposals in Chapter 11.

While a detailed discussion of the roles of the various parameters that show up in (6.4) and (6.5) will be given in the context of the dynamic incidence analysis of Chapter 10, some basic remarks seem useful at this stage.

Equations (6.4) and (6.5) reveal that, in the special case of a perfectly integrated Schanz–Haig–Simons system, the market value of equity equals the difference between the firm's stock of capital valued at reproduction cost and the stock of outstanding debt:

$$M = K - D_f \qquad (\theta_d^* = \theta_r^* = \theta_p,\ \alpha_1 = 0). \tag{6.6}$$

This is the appropriate formula for a non-corporate firm in the case of true economic depreciation.

If accelerated depreciation is allowed while the assumption of a uniform tax rate on all kinds of capital income is maintained, the market value formula becomes

$$M = K - \alpha_1 \tau_r K - D_f \qquad (\theta_d^* = \theta_r^* = \theta_p). \tag{6.7}$$

[1] The limitation of parameter constellations given in connection with Equation (3.18) implies that $\alpha_2 = 0$ when $\alpha_3 = 0$. The parameter α_2 that measures the deductible proportion of *imputed and actual* interest cost does not show up in (6.3) since the advantage of deductibility is just compensated by a rise in the market rate of interest [see (5.6)]. A similar remark holds for the tax on the value of the capital stock, τ_k. See the economic discussion of this effect in Chapter 10.4.

Here, $\alpha_1 \tau_r K$ is the value of deferred taxes, the implicit tax liability from postponed tax payments due to accelerated depreciation.[2]

A further modification occurs if, other things being equal, a higher tax burden on distributed profits is allowed:

$$M = \theta_d(K - \alpha_1 \tau_r K - D_f) \qquad (\theta_d^* \leq \theta_r^* = \theta_p). \tag{6.8}$$

This equation can be taken to hold for a corporation that operates in a Miller equilibrium. It is true that the Miller equilibrium rests on the assumption of a progressive personal tax rate and that Equation (6.8) was derived under the assumption of a linear homogeneity of the market value function which calls for a proportionality of all taxes. Note, however, that the linear homogeneity merely requires that the tax rates are constant with regard to income variations the firm can bring about by its own actions. According to the specification of Chapter 4.3.4, this requirement is clearly satisfied in a Miller equilibrium as the shares of a single firm make up only an insignificant fraction of the well-diversified portfolio of its representative shareholder.

A common feature of Equations (6.7) and (6.8) is that the market value of shares is smaller than the difference between the value of the firm's assets and its outstanding debt: $M < K - D_f$. This is not a general feature of (6.4) and (6.5) though. If the flow constraint on debt financing, σ^*, is sufficiently small and the stock of debt is sufficiently high, $M > K - D_f$ may also prevail. This is the case for example if $D_f = K$, $\alpha_1 = \sigma^* = 0$, and $\theta_p > \max(\theta_d^*, \theta_r^*)$. On the other hand, if there is at least some degree of double taxation of dividends and/or accelerated depreciation with an endogenous explanation of the maximum marginal debt–asset ratio according to (5.19), then it holds that $M < K - D_f$ since $\theta_d < 1$ or, as shown with (5.63), $P_K < 1$, or both. This is probably the more relevant case.[3]

To enhance the understanding of Equations (6.4) and (6.5), these can also

[2]The analysis abstracts from the possibility that different depreciation rules are used for different parts of the capital stock. This problem can be important for the market value of equity in the period after the introduction of a new depreciation scheme. (To take account of the differences in depreciation rules the term $\alpha_1 \tau_r K$ would have to be split into components measuring separately the deferred taxes for assets installed before and after the tax reform.) This analysis foregoes an explicit treatment of the matter as the allocative results derived in this and the following chapters will only depend on the depreciation rules that are applied to *new* assets. The tax treatment of existing assets is allocatively irrelevant provided the firm is not driven into bankruptcy.

[3]The case is suggested by empirical findings of Revell (1967, especially p. 60) and von Fürstenberg (1977). The data provided by these authors imply averages of $M/(K\text{-}D_f)$ ranging from 0.6 (U.K. 1957–1961; Revell) to 0.8 (U.S.A. 1952–1977; von Fürstenberg).

be transformed to

$$M = K\left[\frac{\theta_d^*(1-\sigma^*-\alpha_1\tau_r)}{\max(\theta_d^*,\theta_r^*)} + (\sigma^*-\sigma)\theta_d\right], \tag{6.9}$$

where $\sigma(t) \equiv D_f(t)/K(t)$ is the average debt–asset ratio introduced with (5.10). If it is assumed that $\sigma^* = \sigma$, then (6.9) becomes

$$\begin{aligned} M &= K(\theta_d^*/\theta_r^*)(1-\alpha_1\tau_r-\sigma) \qquad (\theta_r^* \geq \theta_d^*;\ \sigma = \sigma^*) \\ &= (\theta_d^*/\theta_r^*)(K-\alpha_1\tau_r K - D_f) \end{aligned} \tag{6.10}$$

for the classical and closely related systems or, like (6.7),

$$\begin{aligned} M &= K(1-\alpha_1\tau_r-\sigma) \qquad (\theta_d^* \geq \theta_r^*;\ \sigma = \sigma^*) \\ &= K-\alpha_1\tau_r K - D_f \end{aligned} \tag{6.11}$$

for systems with no, or only a low, degree of double taxation of dividends.

Consider Equation (6.10) more closely. In the special case of the classical system with true economic depreciation, this equation can further be simplified to

$$M = (\theta_p/\theta_c)(K - D_f) \qquad (\theta_d = \theta_r,\ \alpha_1 = 0,\ \sigma = \sigma^*). \tag{6.12}$$

Using a different model, this formula was derived by Auerbach (1979a, p. 441) for the U.S. tax system.[4] While Auerbach's formula certainly characterizes an interesting case, the more general formula (6.9) shows that it omits two effects that might be of importance for the United States. On the one hand, it neglects the implicit tax liability that results from accelerated depreciation, an aspect that has become very important following the introduction of the Accelerated Cost Recovery System in 1981. On the other hand, the significant decline in the equity–asset ratios that has been observed in the United States and elsewhere during the last decades (see Chapter 4.3.3, Table 4.1) implies that the maximum marginal debt–asset ratio was above the average debt–asset ratio ($\sigma^* > \sigma$). As (6.9) reveals that these effects counteract each other with regard to the market value, (6.12) might not completely fail in empirical tests. However, there are questions for which Auerbach's equation would not appropriately reveal the right answers even if we limit our attention to the classical system of capital income taxation.

[4] Auerbach assumed a leverage dependence of the firm's discount rate and started from an initial version of the market value function that is formally different but, in its economic content, nevertheless related to the function (3.24) used in this book. Cf. Footnote 34 in Chapter 3.

Examples of such questions are treated in the following sections. There, the discussion will return to the general equations, (6.9) or (6.4), and it will not be assumed that the debt–asset ratio is fixed forever.

6.1.2. The Phenomenon of Branch-crossing Take-overs

In a detailed empirical study, Scherer and Ravenscraft (1984) examined the product lines of the 200 biggest U.S. firms and found that these firms significantly expanded the scope of their production activities between 1950 and 1975. While the average number of product lines per firm was slightly below 5 in 1950, it had more than doubled to about 11 by 1975. Only a small part of this increase is attributed by Scherer and Ravenscraft to internal diversification within the firms. The vast majority of the cases is attributed to a concentration process among firms in different industry branches that took place by taking over small corporations.[5] In the period under investigation, at least 1800 independent firms were acquired by those 148 firms that belonged to the set of the 200 largest U.S. firms both in 1950 and 1975!

Scherer and Ravenscraft do not attempt to explain the phenomenon they describe, and the reasons are indeed not obvious. The usual argument that the firms tried to increase their market power so as to control the product price is not applicable since the concentration process crossed industry branch borders. Even the argument that the firms tried to diversify for the sake of risk reduction does not seem too attractive in the light of the fact that such a diversification could have been much more easily accomplished within the portfolios of wealth owners.[6]

An explanation of the observed take-overs could, however, be given with the aid of the market value function (6.4).[7] Consider two firms A and B with

[5]The phenomenon of product diversification had already been described by Gort (1962), Shepherd (1964), and Neumann (1967). Scherer and Ravenscraft showed that this diversification took place by the acquisition of other firms.

[6]This argument retains some of its relevance, however, if there are principal-agent problems between shareholders and the managers of a corporation. Since the managers cannot reduce their share in the firm's risk through a diversification of their human capital, they could indeed have an incentive to increase the number of product lines. The question is then, however, why this increase is brought about by take-overs rather than by internal diversification.

[7]Apart from the occasional allusion to the fact that prohibition of repurchasing one's own shares, very attractive for taxation reasons, can be circumvented by mutual repurchasing of shares between two firms [cf. Auerbach (1979b, p. 392)], little attention has been paid in the literature to the following considerations.

the market value functions

$$M^i = \theta_d(K^i P_K - D_f^i), \quad i = \text{A,B}, \tag{6.13}$$

where K^A and K^B have to be interpreted as values rather than physical quantities and will therefore not necessarily measure the same capital good. Suppose firm A decides to take a loan of size

$$\tilde{D}_f^A = M^B \tag{6.14}$$

or, equivalently, to reduce its capital market investment by this same amount in order to buy the shares of firm B. Then the new market value $\tilde{M}^A$ of firm A is:

$$\begin{aligned}\tilde{M}^A &= \theta_d(K^A P_K + \cdot K^B P_K - D_f^A - \tilde{D}_f^A - D_f^B) \\ &= M^A + M^B - \theta_d M^B \\ &= M^A + \tau_d M^B.\end{aligned} \tag{6.15}$$

While the transaction does not affect the wealth of the previous shareholders of firm B, the wealth of firm A's shareholders changes since the value of its shares changes. After deducting the capital gains tax at the rate τ_c, firm A's shareholders enjoy net capital gains of size

$$\theta_c(\tilde{M}^A - M^A) = \theta_c \tau_d M^B. \tag{6.16}$$

Before interpreting this expression in economic terms, a remark on the nature of the underlying market value function is appropriate. Since, in the derivation of the shadow price of capital, λ_K, equilibrium factor prices were implicitly assumed, the market value function not only represents the effects of direct changes in the tax burden but, in principle, even those effects that arise from the transition to another market equilibrium with different factor prices. Because of the assumption of competitive behavior on the part of market agents, these effects must of course be disregarded in examining whether there is an incentive for the acquisition of another firm. Fortunately, the problem does not arise in the present context. Since *after* the transaction both parts of the new conglomerate are taxed precisely as if they were two independent units there are no real behavior changes that could affect the market prices, as is confirmed by looking at the marginal conditions (3.38) and (5.6). From the point of view of the shareholders of firm A also, (6.16) therefore indicates that value of the net capital gains which they believe they can realize through their own independent actions.

Except for the full imputation systems ($\tau_d = 0$) that are in operation in Greece, Italy, Norway, Portugal, and West Germany, these net capital gains

are strictly positive since there is at least a partial double taxation of distributed profits ($\tau_d > 0$). Particularly large capital gains are shown by Equation (6.16) for the United States, where the classical system of capital income taxation is in operation ($\tau_d = \tau_r$) and where Scherer observed such a large number of take-overs. Assume, to characterize the situation before the 1986 tax reform, a corporate tax rate of $\tau_r = \tau_d = 0.46$, a personal income tax rate of the representative shareholder of $\tau_p = 0.4$, and an effective marginal tax burden on capital gains of $\tau_c = 0.25 \cdot \tau_p = 0.1$.[8] Then the net capital gains to the shareholders of the acquiring firm would be about 40% of the market value of the purchased firm. This is an amount that could well have explained the attraction of the small corporations for the big cannibals. The 1986 tax reform changed these stylized facts to $\tau_d = \tau_r = 0.34$, $\tau_p = 0.28$, and $\tau_c = 0.6 \cdot \tau_p = 0.17$. The net capital gain will therefore reduce to 28%. This is less than before, but still enough to whet the appetite.

The explanation provided here does not indicate which industry branch the acquired firm belongs to and it cannot explain why acquisitions across branches are so frequent. The reason for the asymmetry in the concentration process can, however, easily be determined. It can clearly be attributed to the fact that the Antitrust Board of the United States, like all other antitrust boards, is particularly interested in preventing internal-branch concentration processes while mergers that encroach on other branches are tolerated. Given this institutional peculiarity, the described arbitrage possibility immediately explains the phenomenon described by Scherer and Ravenscraft.

The economic intuition behind (6.16) is not difficult to understand if one sees the policy of purchasing other firms' shares as a policy of hidden dividend payments from the corporate to the household sector. Suppose first that debt is strictly favored by the tax system [$\theta_p > \max(\theta_d^*, \theta_r^*)$] such that the hidden dividend payments are debt financed. One dollar of debt taken by the firm reduces the households' future flow of ordinary dividend payments net of corporate and personal dividend taxes by the amount $\$r\theta_d\theta_p$. If the proportion θ_d of this dollar is given to the household sector through a share repurchase and the households invest this amount in the capital market, the resulting net interest flow is $\$r\theta_d\theta_p$, just enough to compensate for the reduction in ordinary dividends. The firm therefore saves funds amounting to $\$\tau_d$. These funds could be retained, distributed through further shares purchases, or distributed in an ordinary manner. At

[8] With regard to the underlying stylized facts, compare the pieces of information cited from Bailey, Fullerton et al., and Bradford in Chapter 3.1.2.

any rate, there would be a net advantage for the shareholders that is directly related to the size of τ_d, just as (6.16) reveals.

While the assumption of debt-financed acquisitions is admissible for (6.16) and superficially seems to have been made with (6.14) it is by no means necessary. In general, Assumption (6.14) should better be interpreted in an "as if" sense. The decision of the acquiring firm is modelled *as if* this firm used debt to finance the shares it buys. It is not necessary that it really does this. Suppose, to see this point, the economy is in a Miller equilibrium with $\theta_p = \theta_r^*$; that is, in a situation where debt and retentions are equivalent sources of finance. In such a situation, the firm does not mind accumulating profits internally and investing them in the capital market in order to have sufficient funds for an acquisition when the time comes. The attractiveness of the acquisition does not depend on whether it is financed with debt or with equity.

In a Miller equilibrium, too, the policy of acquiring other firms can be seen as a hidden dividend payment from the corporate to the household sector, but one that can be financed by profits just as well as by debt. An ordinary distribution of profits from the corporate to the household sector involves paying personal income taxes and the corporate tax on dividends. A hidden distribution of profits through share purchases means paying the corporate tax on retained profits and the personal capital gains tax. By assumption, in a Miller equilibrium, the combined marginal tax factor for retained profits (θ_r^*), that measures the influence of the latter two taxes, equals the personal income tax factor (θ_p) that is applied to ordinary dividend payments. Thus the attractiveness of the policy of hidden profit distributions through acquiring other firms is higher the greater the corporate tax rate on dividends. This, too, confirms (6.16).

The common element in both debt and profit financed acquisitions is the fact that the corporate sector distributes funds to the household sector in a way that creates tax savings equal to the corporate tax that would have had to be paid had these funds been distributed in the form of ordinary dividends. This is the model's ultimate explanation for why the 148 biggest U.S. corporations gobbled up 1800 other corporations in only 25 years.

An important assumption underlying (6.16) is that the acquired firm is treated as a part of the acquiring firm in the tax laws. This is always the case if the acquired firm loses its legal independence completely or if a company is formed whose parts are at least no longer independent from the point of view of the tax laws. If the acquired firm is incorporated into an affiliated group as a subsidiary then the profits which this firm distributes to its parent company must enjoy what is sometimes called "affiliation privi-

lege". The affiliation privilege as defined here means that profits, transferred from the subsidiary to the parent, who then either retains or distributes them, are taxed in the two firms together exactly as if they were the parent firm's own retained or distributed profits.[9] For holdings of at least 25% of the voting shares the affiliation privilege is granted in nearly all OECD countries.[10]

Nearly all the economic literature seems to agree that the affiliation privilege by itself neither favors nor punishes mergers.[11] At first sight, it seems quite plausible that it is not a "privilege" if the government refrains from imposing a higher tax burden on a given profit simply because this profit is transferred from one firm to another in an affiliated group. However, in evaluating the incentives for mergers, it should not be forgotten *how* the parent acquired the right to receive the dividends of the subsidiary. If this happens, as described by Scherer and Ravenscraft, through the acquisition of the shares of another firm then the parent gets real productive assets more cheaply than by buying the assets themselves or by injecting funds into an existing subsidiary. This fact should not be forgotten in the evaluation of the affiliation privilege. The next section will say more about this.

6.1.3. Towards an Acquisition Neutrality of Capital Income Taxation

To prevent large corporations from continuing to grow like mushrooms, the tax incentives that fuel this growth should be dismantled. Two measures seem appropriate: a special tax on the value of shares purchased by

[9] Affiliation privilege is meant here in an economic sense only. The legal affiliation privilege defines exclusively the fact that the dividends given to the parent are tax-exempt *there*.

[10] Exceptions are Canada and Spain. Cf. Rupp (1983, pp. 317 n.). It is true, that in the United States the unlimited affiliation privilege requires a holding of at least 80% of the voting shares. However, with lower percentages the affiliation privilege is only marginally reduced in that 15% of the net dividend received by the parent is included in the parent's corporate tax base. [Cf. IRC (1983, Section 243 (a) in connection with Section 61).] As shown in the following section, only a complete removal of the affiliation privilege would abolish the incentive for acquiring other firms' shares.

[11] Many authors conclude from this fact that the affiliation privilege is desirable and that a further extension of its scope of applicability should be considered. Cf. e.g. Steuerreformkommission (1971, p. 301) or Jacobs (1983, p. 354) who, however, refers to the international affiliation privilege. Other authors, for example Pohmer (1980, p. 1083), Lenel (1968, p. 311), or Vogel (1966, pp. 97–104), welcome an abolition of the affiliation privilege since this would decelerate *otherwise motivated* mergers. These authors do not contend that the affiliation privilege induces a concentration process that would not be observable in the absence of taxes.

corporations or the removal of the affiliation privilege. Whether the incentive to merge can be eliminated by these measures – that is, whether to coin a phrase, *acquisition neutrality* of capital income taxation is achievable – will be examined by using a suitable modification of Equations (6.13) through (6.16).

Consider first the removal of the affiliation privilege. This implies that the shareholders of the acquiring firm A no longer ascribe the previous market value M^B to the acquired firm B as in (6.15) but rather a lower value $\tilde{M}^B$. This value can be calculated from Equations (6.4) and (6.5) where θ_d has to be replaced by θ_d^2 to take account of the double taxation of dividends that are distributed via firm A.[12] Assume that

$$\theta_r^* \geq \theta_d^* \quad \text{if} \quad \sigma^* < 1 - \alpha_1 \tau_r, \tag{6.17}$$

(and $\theta_d^* \lesseqgtr \theta_r^*$ if $\sigma^* = 1 - \alpha_1 \tau_r$) to avoid an increased dividend tax burden implying a change in real behavior through a disturbance of the marginal condition (5.6).[13] Then it follows from (6.4) and (6.5) that

$$\tilde{M}^B = \theta_d^2 (K^B P_K - D_f^B) = \theta_d M^B, \tag{6.18}$$

where M^B again indicates the market value of firm B before the transaction. Instead of (6.15) the expression

$$\tilde{M}^A = M^A + \theta_d M^B - \theta_d M^B = M^A \tag{6.19}$$

for the market value of the parent after the transaction is now obtained. Unlike the previous case, this equation shows that the market value of the acquiring firm will not rise through the transaction.

In striking contrast to what is frequently believed,[14] it can therefore be stated that under Assumption (6.17), the classical system of capital income taxation, the partial imputation systems, and the system with a split corporate tax rate are neutral with regard to take-overs if and only if the affiliation privilege is *not* granted. In this respect the affiliation privilege *is* a privilege!

Note, however, that the whole of the foregoing argumentation, and hence

[12] The possibility of a change in θ_r^* is not considered. On the one hand, the fact that there is at least a weak preference for debt financing (cf. Chapter 4.3) makes it possible, without much loss in generality, to assume that the parent does not retain the distributions of the subsidiary. On the other hand it can be assumed that a retention of profits on the part of the subsidiary will not imply a capital gains tax liability on the part of the parent since the parent will not resell the shares which it bought.

[13] Compare the explanation given above in connection with Equation (6.16).

[14] Cf. Footnote 11.

this result too, involves a merging through a purchase of shares *in the market place.* In the case where a corporation establishes a new subsidiary and provides the funds necessary for purchasing the production equipment in exchange for new shares there is a completely different situation. Here, the affiliation privilege by no means implies an incentive for take-overs but only an equal treatment of own investment of the parent company and investment within its subsidiary. To create neutrality with regard to both the take-over incentive and the incentive to found and fund new subsidiaries, a careful differentiation according to the kind of dividends is necessary. Only dividends on shares that were purchased in the market place should be denied the affiliation privilege.

Moreover, the meaning of Condition (6.17) has to be stressed. In the case where equity is included as a marginal source of finance, it requires that, even before the merger, distributed profits are taxed at least as heavily as retained profits so that there is a weak dominance of retentions over new issues of shares as the marginal source of equity finance. Since this condition is satisfied in the classical system of capital income taxation, a differentiated removal of the affiliation privilege will indeed be adequate to bring about acquisition neutrality of capital income taxation for the United States, for example. The condition can be violated, however, with the partial imputation systems that are applied in the United Kingdom or France or the system with a split corporate tax rate that is in operation in Austria. Since the firm in the case $\theta_d^* > \theta_r^*$ and $\sigma^* < 1 - \alpha_1 \tau_r$ chooses new issues of shares at least partially as the marginal source of finance, a removal of the affiliation privilege would not be investment neutral. It would therefore be difficult to precisely determine the conditions for an acquisition neutrality.

The problem can be circumvented if, instead of abolishing the affiliation privilege, a tax on the value of shares acquired by corporations in the market place is introduced, but not one on newly issued shares by the subsidiary. Such a tax would not have an impact on the value of the acquired firm and hence would not affect this firm's market behavior. With a tax rate of size τ_M, $0 \leq \tau_M < 1$, the acquiring firm would have to borrow the amount

$$\tilde{D}_f^A = (1 + \tau_M) M^B \tag{6.20}$$

instead of (6.14); its market value therefore would be given by

$$\tilde{M}^A = M^A + M^B - \theta_d M^B (1 + \tau_M), \tag{6.21}$$

instead of (6.15); and the net increase in the wealth of the acquiring company's shareholders would be

$$\theta_c(\tilde{M}^A - M^A) = \theta_c[1 - \theta_d(1 + \tau_M)]M^B, \tag{6.22}$$

instead of (6.16). Obviously this expression obtains the value of zero if

$$\tau_M = \tau_d/\theta_d. \tag{6.23}$$

This equation provides a value of τ_M that ensures an acquisition neutrality of capital income taxation.

A tax that satisfies Condition (6.23) can easily be established in practice since only the corporate tax on distributed profits matters and the personal marginal income tax rate of the representative shareholder among other things does not have to be known. With the full imputation system that is in operation in West Germany, Norway, and Italy, the optimal value of the "acquisition tax rate" is zero since $\tau_d = 0$. With the split rate system that was in operation in West Germany before 1977, the corporate tax rate on distributions was $\tau_d \approx 0.23$ and hence an acquisition tax rate $\tau_M \approx 0.3$ would have been necessary. For the system that was in operation in the United States before the 1986 tax reform, it follows from $\tau_d = 0.46$ that acquisition neutrality requires a tax rate of about 85% and for the post-reform tax system it follows from $\tau_d = 0.34$ that an acquisition tax of 52% is necessary. Stocks would have to cost one and a half time more to spoil the appetite of the large combines for small corporations whetted by the current tax system.

6.1.4. Tax-induced Changes in the Legal Status of Firms

A comparatively obvious side effect of corporate income taxation is to discourage incorporation. Since this effect has been extensively discussed in the literature,[15] it will only briefly be treated here.

At first sight, it seems that any tax-induced change in the market value of equity implied by Equations (6.4) and (6.5) indicates an incentive to change the legal status of a firm. However, once again competitive behavior implies that only those changes that come about with given factor price paths are relevant. This is a significant limitation of the applicability of the two equations to analyzing the choice of legal status. Unfortunately all those tax changes that affect the effective price of capital P_K must be excluded since it follows from (5.65) and similar equations that, in a capital market equilibrium where f_K, and not r, is fixed in the short run, these same tax changes would affect the market rate of interest.

[15] Cf. e.g. Siegel (1982, Section 6.2) or Wagner and Dirrigl (1980, Part 3, Section 2).

Thus only those special cases, where, despite a change in the legal status, P_K stays constant, can be analyzed in a meaningful way. As can be seen from (5.52), potential reasons for a constancy of P_K are the following:

(1) True economic depreciation is required ($\alpha_1 = 0$) and the firm only faces the legal constraint $\sigma^* = 1$ for debt financing. In this case $P_K = 1$.

(2) The classical or closely related systems of capital income taxation prevail ($\theta_d^* < \theta_r^*$) and the personal tax rate of the representative shareholder equals both the corporate tax rate on retentions ($\tau_p = \tau_r$) and the personal tax rate of the private owner of the non-corporate firm while no capital gains tax is applied ($\tau_c = 0$). Here, $P_K = 1 - \alpha_1 \tau_r = \text{constant}$.

Provided that one of these reasons for P_K remaining constant prevails, it is quite clear that the decision to incorporate is discouraged by the double taxation of dividends. From (6.4), the market value of equity of a non-corporate firm is

$$M^Y = KP_K - D_f \tag{6.24}$$

and that of a corporate firm is

$$M^X = \theta_d(KP_K - D_f). \tag{6.25}$$

Hence, the comparative loss from a decision to incorporate is

$$M^Y - M^X = \tau_d(KP_K - D_f). \tag{6.26}$$

The result supports the dominant view that double taxation of dividends is non-neutral with regard to the choice of legal status. It does not explain, however, why firms choose to incorporate. Clearly, this decision depends on many other important aspects including the transactions costs of collecting equity capital, the institution of limited liability, and the existence of cheap risk-reducing possibilities through portfolio diversification. It remains to be seen which of these aspects future research will find worthwhile linking with the tax discrimination effect considered in this section in a formal model.

This remark on the choice of legal status should suffice here. Empirically, the problem seems far less important than that of the branch crossing concentration process. The other advantages of the corporate firm seem to be large enough to prevent a trend towards non-corporate business showing up even in countries with very pronounced double taxation of dividends.[16]

[16] Frequently, double taxation of dividends is justified as the price of the privileges of incorporation. Cf. e.g. D. Schneider (1980, pp. 529–532).

6.2. Taxation and the Intersectoral Allocation of Capital: The Harberger Problem

In principle, capital income taxation can create three types of ordinary Paretian distortions. First, economic growth can be distorted because of a deviation between the rate of time preference of households and the marginal value product of capital. Second, a deviation between the rates of time preference of different households can distort the intertemporal allocation of consumption among these households. Third, a deviation among the marginal value products of capital in different groups of firms can bring about a suboptimal allocation of capital to competing economic uses.

The second type of distortion is not emphasized in this book but is mentioned occasionally (Chapters 7.1.1, 11.2–11.4). Chapters 8 through 10 and, to a large extent, 11 are devoted to an analysis of the first type of distortion. The following sections and the subsequent Chapter 7 will study distortions of the third type.

In line with the previous examination of the impact of taxation on the legal status of the firm, the groups of firms being considered for the time being are defined in terms of the corporate and non-corporate sectors of the economy. The question is no longer whether different taxation of these sectors induces a change in the legal status for any given firm but conversely, whether, given the legal status of each firm, a change in the allocation of capital among the two sectors is induced. In the literature this question is usually called the *Harberger problem.*

The analysis is carried out in five sub-sections. The first sub-section generalizes the basic model of Chapter 2 for the case of two sectors that are taxed differently. The second reports the traditional view as presented by Harberger. The remaining sub-sections criticize this view and present other results for the problem.

6.2.1. A Disaggregated Version of the Basic Model

Consider an industry in a perfectly competitive world. All factors are completely mobile and all firms in the industry are endowed with the same constant-returns-to-scale production function. However, the set of firms is separated into a sector of corporate firms and a sector of non-corporate firms. If sector-specific taxation is introduced, then factor cost increases more for one sector than for the other. As a result, the sector burdened more heavily stops producing and all factors of production that were

employed there move to the other sector. The total output of the industry does not change, and there are no welfare losses.

The assumption of perfect mobility of all factors characterizes an extreme case. Another extreme is described by the assumption of perfect immobility of all factors of production. Obviously, in this case too, there are no changes in the level of production and no welfare losses.

The interesting and seemingly realistic case is between these extremes. Some factors are mobile, others not. The immobile factors will usually include labor rather than capital since the firms are located in different places and capital movements incur lower pecuniary and subjective translocation costs than movements of labor. As an idealization, we therefore follow the traditional assumption[17] that the factor capital is completely mobile while the factor labor is completely immobile. Nothing decisive would change in the results yet to be derived if additional mobile factors of production were allowed. It is only necessary for the questions treated here that not *all* factors are mobile.[18]

In the basic model used in Chapter 2, the total net output of the economy is $f(K, L) - \delta K$. Let X and Y be superscripts that characterize the employment of factors in the sectors of corporate and non-corporate firms. Then it holds that

$$f(K, L) - \delta K = f(K^X, L^X) - \delta K^X + f(K^Y, L^Y) - \delta K^Y, \tag{6.27}$$

with

$$K = K^X + K^Y \tag{6.28}$$

and

$$L = L^X + L^Y. \tag{6.29}$$

In order to be able to write total output in the described way as a function of the sums of factor employment, it is necessary to define an aggregation rule; i.e., a rule that determines how the factor capital is allocated to the two sectors given L^X and L^Y. The rule that maximizes the joint output is to allocate capital so that its marginal product is the same in both sectors:

$$(\partial f/\partial K^X) - \delta = (\partial f/\partial K^Y) - \delta. \tag{6.30}$$

Because of the linear homogeneity of the production function, this rule

[17] Cf. Harberger (1966) and McLure (1974).

[18] This statement is contingent on the empirical fact that the production of a commodity is not confined to firms of only one legal category but that, in principle, each type of firm is allowed to produce each good.

implies that the marginal product of labor must also have the same value in both sectors:

$$\partial f/\partial L^X = \partial f/\partial L^Y. \tag{6.31}$$

Both conditions are satisfied by competitive markets in the absence of taxes and stay valid even with taxation, provided there are no sector-specific differences in taxation. Under these circumstances therefore, a disaggregation of the model is unnecessary. The problem to be analyzed now is, however, what distortions are brought about by a tax system that discriminates between firms of different legal status.

6.2.2. Harberger's Analysis of the Corporate Income Tax

Two decades ago, Harberger (1966) conjectured that the corporate income tax *of the classical type* brings about a sub-optimal intersectoral allocation of capital.[19] Since the tax is only levied on the corporate sector, it implies, he argued, that in equilibrium the marginal product of capital in this sector is higher than that in the sector of non-corporate firms. Thus, too much capital is employed in the non-corporate and too little in the corporate sector: efficiency losses are unavoidable. Harberger assumed that the corporate sector produces commodities different from those of the non-corporate sector. This assumption may be a good approximation of reality, but it is not really necessary for his argument. Nothing is lost if we stick to the assumption that the two legal categories of firms are direct competitors.

To capture the essence of Harberger's idea, assume first that there are no taxes other than the corporate tax. Then, with any given market rate of interest, the non-corporate sector employs capital until its marginal product equals the market rate of interest:

$$(\partial f/\partial K^Y) - \delta = r. \tag{6.32}$$

However, in the corporate sector the corporate tax implies a deviation between the marginal product of capital and the market rate of interest. The firms employ capital only up to the point where the net-of-tax marginal product of capital equals the market rate of interest. When τ denotes the tax rate we thus have

$$\left(\frac{\partial f}{\partial K^X} - \delta\right)(1 - \tau) = r. \tag{6.33}$$

[19] Cf. also Harberger's (1962) analysis of the incidence effects of the corporate tax.

Although Equations (6.32) and (6.33) were derived for the case where there is only the corporate tax, they could still be true in the case where there is, in addition, a personal income tax. This was shown in connection with Equation (5.47). Provided the classical system of capital income taxation prevails and provided new issues of shares are the marginal source of finance, the existence of a personal tax would simply mean that the personal tax factor θ_p would appear on both sides of the equations and could be factored out.

In a market equilibrium, when the rate of interest has adjusted so that the total amount of capital demanded by the two sectors equals the existing stock of capital, it therefore holds, contrary to (6.30), that

$$\frac{\partial f}{\partial K^Y} - \delta = (1 - \tau)\left(\frac{\partial f}{\partial K^X} - \delta\right). \tag{6.34}$$

Equation (6.34) implies a welfare loss in terms of a reduction in aggregate output. This loss is illustrated in Figure 6.1 by means of a simple diagram that was first used by Kemp (1961) in an international trade model. The downward sloping curve indicates the marginal product of capital in the corporate sector (X) as a function of the employment of capital in this sector (K^X), and the upward sloping curve indicates the marginal product of

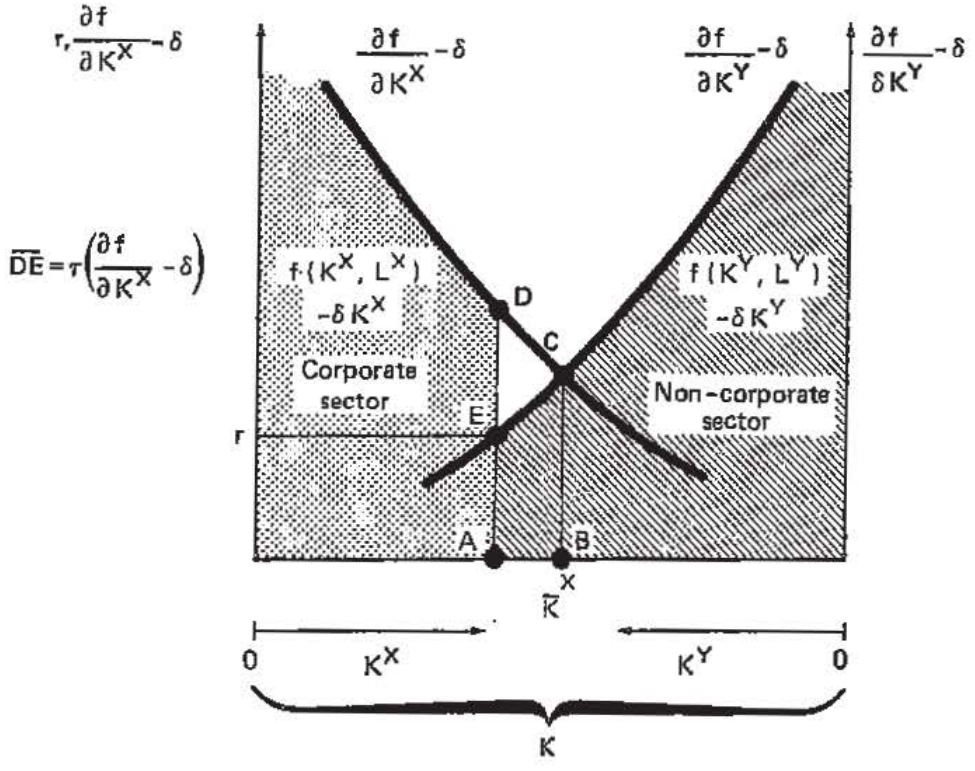

Figure 6.1. The welfare loss from corporate income taxation according to Harberger.

capital in the non-corporate sector (Y) as a function of its employment of capital (K^Y). The horizontal distance between the two verticals measures the total stock of capital available to the two sectors: $K = K^X + K^Y$. Since it holds by construction that

$$f(K^Z, L^Z) - \delta K^Z = \int_0^{K^Z} \left[\frac{\partial f(u, L^Z)}{\partial u} - \delta \right] du, \quad Z = X, Y, \tag{6.35}$$

the areas under the curves can be identified with the (net-of-depreciation) level of production in the two sectors. Because of (6.34), the stock of capital is allocated to the two sectors so that the marginal product of capital in the corporate sector exceeds the marginal product of capital in the non-corporate sector by $\tau[(\partial f/\partial K^X) - \delta]$. Thus the aggregate level of production is represented by the shaded area under both curves. Obviously, the level of production is less than the maximum level that could be achieved with $K^X = \bar{K}^X$. To induce the economy to reach the maximum level, the corporate tax would have to be removed for, in this case, (6.34) would become $(\partial f/\partial K^Y) - \delta = (\partial f/\partial K^X) - \delta$, as required by (6.30). The output of the corporate sector would increase by the amount indicated by the area ABCD and that of the non-corporate sector would fall by ABCE. Thus aggregate production would increase by the triangle ECD. This triangle therefore measures the welfare loss that Harberger attributed to the existence of the corporate income tax.

6.2.3. *An Alternative View on Intersectoral Distortions Caused by Corporate Income Taxation*

Harberger's analysis is usually accepted. Many contributions are concerned with his result but, rather than discussing the problem *whether* the corporate tax will indeed imply an equation like (6.34), the literature typically tries to assess the welfare loss that arises *if* the tax implies this equation. Marginal conditions like (6.32), (6.33), and (6.34) are typically assumed, not derived.

There are, however, sceptical voices. After an analysis of the investment and financial decisions of the firm, Stiglitz (1973, p. 33) argues that the tax does not affect the marginal decision on the optimal employment of capital and hence will not incur welfare losses. Stiglitz's analysis was criticized in Chapter 5.3.4. It concentrates on a case where the optimization problem of an infinitly long lived firm could not be solved since paying out dividends would never be worth-while. In the case considered by Stiglitz, debt

financing is dominated by retentions but nevertheless debt financing is chosen at the margin. This interesting possibility does not only imply a mathematical existence problem, it also does not fit the Harberger problem. Harberger's basic story assumes a corporate tax as the only tax in the economy.[20] Under the realistic assumption of deductible debt interest, corporate taxation is then characterized by $\theta_d^{*X} = \theta_r^{*X} < \theta_p^X = \theta_c^X = 1$, a constellation that defines the tax system of Type 2 in Figure 4.2. With this tax system, new issues of shares and retentions are strictly dominated by debt financing and, contrary to Stiglitz's model, the firm tries to pay out as many dividends as possible.

Despite this shortcoming, however, there is some truth in Stiglitz's analysis. He may have been right for the wrong reason. Using (5.47) and noting that $\theta_p^Y = \theta_d^{*Y} = \theta_r^{*Y}$ holds in the non-corporate sector, a capital market equilibrium is found that is characterized by[21]

$$\frac{\partial f}{\partial K^Y} - \delta = \frac{1}{\dfrac{\theta_p^X(1-\sigma^{*X})}{\max(\theta_d^{*X}, \theta_r^{*X})} + \sigma^{*X}} \left(\frac{\partial f}{\partial K^X} - \delta \right). \tag{6.36}$$

For the case of true economic depreciation ($\alpha_1 = 0$) and deductible debt interest ($\alpha_2 = \alpha_3 = 0$), this equilibrium condition is the counterpart of Harberger's formula (6.34), but does not support it.

If corporate firms can afford to finance all their net investment with debt ($\sigma^{*X} = 1$) or if there is a Miller equilibrium ($\theta_p^X = \theta_r^{*X}$) then (6.36) reduces to

$$\frac{\partial f}{\partial K^Y} - \delta = \frac{\partial f}{\partial K^X} - \delta \qquad (\sigma^{*X} = 1 \text{ and/or } \theta_p^X = \theta_r^{*X} \geq \theta_d^{*X}). \tag{6.37}$$

Thus, there is no intersectoral distortion at all, regardless of the tax rates.

If, for reasons that are exogenous to the model, there is a need for equity finance at the margin ($\sigma^{*X} < 1$) and if in addition, unlike with the Miller equilibrium, corporate debt financing is strictly favored by the tax system [$\theta_p^X > \max(\theta_d^{*X}, \theta_r^{*X})$], then Condition (6.36) does reveal a distortion that, in qualitative terms, is of the Harberger type. However, there are two reasons why this distortion must be lower than that implied by Harberger's formula. First, it would be empirically false to assume that 100% of the firm's net investment is financed with equity (see Table 4.1). It would certainly be truer to assume $\sigma^{*X} > 0$. Second, neither empirically nor theoretically can it

[20] See Harberger (1966, p. 108).

[21] As can be seen from (5.65) and (5.52), this formula is compatible with a uniform tax on the capital stocks employed. Moreover, according to Chapter 5.3.7, a uniform value-added tax would also be admissible.

be expected that the corporate sector prefers new issues of shares to retentions as the marginal source of equity finance. The classical system, that prevails in the United States and that Harberger had in mind, is characterized by $\theta_d^{*X} \equiv \theta_d^X\,\theta_p^X < \theta_r^{*X} \equiv \theta_r^X \theta_c^X$ as $\theta_r^X = \theta_d^X$ and $\theta_c^X > \theta_p^X$. Hence new issues are strictly dominated by retentions, and (6.36) becomes

$$\frac{\partial f}{\partial K^Y} - \delta = \frac{1}{(\theta_p^X/\theta_r^X\theta_c^X)(1 - \sigma^{*X}) + \sigma^{*X}}\left(\frac{\partial f}{\partial K^X} - \delta\right). \tag{6.38}$$

Only if we were to assume that the firm wants to *maximize* its cost of capital and hence finance 100% of its investment with new issues of shares, would it be possible to reproduce Harberger's formula.[22] In (6.36) this would mean setting $\sigma^{*X} = 0$ and replacing the term $\max(\theta_d^{*X}, \theta_r^{*X})$ with $\min(\theta_d^{*X}, \theta_r^{*X})$, for only then would this equation coincide with (6.34).

In order to get some idea of the magnitude of the differences between the distortions indicated by (6.34) and (6.38) respectively, even if the possibility of a Miller equilibrium is excluded, consider a Cobb–Douglas example. If it is assumed that $f(K^i, L^i) - \delta K^i = a(K^i)^{1-\beta}(L^i)^{\beta}$, $i = X, Y$, then it can be shown (see Appendix E) that the relative decline in aggregate output, ξ, brought about by the tax system is given by

$$\xi = 1 - \frac{\lambda^X + \chi^{(1-\beta)/\beta}\lambda^Y}{(\lambda^X + \chi^{1/\beta}\lambda^Y)^{1-\beta}}, \tag{6.39}$$

where λ^X and λ^Y are the relative shares of labor employed by the two sectors in the total labor force and χ is a measure of the discrimination of a marginal investment in the corporate sector relative to the non-corporate sector. In the case of true economic depreciation, this measure is defined as

$$\chi \equiv \begin{cases} [\theta_p^X/(\theta_r^X\theta_c^X)](1 - \sigma^{*X}) + \sigma^{*X} & \text{(this model)}, \\ 1/\theta_d^X (= 1/\theta_r^X) & \text{(Harberger)}. \end{cases} \tag{6.40}$$

If we use the stylized facts $\tau_p^X = 0.4$, $\tau_d^X = \tau_r^X = 0.46$, $\tau_c^X = 0.25 \cdot \tau_p^X = 0.1$ that were cited in Chapter 3.1.2 and applied to the situation before the 1986 U.S. tax reform, set[23] $\lambda^X = 0.15$, $\lambda^Y = 0.85$, $\beta = 0.8$, and assume that

[22] This statement is based on the implicit assumption that the firm is allowed to deduct its debt interest. In a comment to Stiglitz (1973), King (1975, p. 276) argued that Harberger implicitly assumed that debt interest is non-deductible. Indeed, this is a possibility. Set $\theta_d^* = \theta_r^* < \theta_p = \theta_c = \alpha_3 = 1$ and $\alpha_1 = \alpha_2 = \tau_k = 0$. Then the general formula (5.6) becomes $r = \theta_r(f_K - \delta)$ which, because of $\theta_r = \theta_d$, is Harberger's formula (6.33). For a third interpretation of Harberger see Asimakopulos and Burbidge (1975).

[23] In the absence of better information, the relative shares in aggregate production were taken to be rough estimates of λ^X and λ^Y. The wage share in the income earned in the corporate and non-corporate sectors was chosen as an approximation of β. See, e.g., *Survey of Current Business* 64, (1984, No. 7, Table 1.1).

$\sigma^{*X} = 0.5$, then (6.39) and (6.40) imply for the Harberger case that[24] $\xi = 4.8‰$ and for this model that $\xi = 0.19‰$. The latter is probably an overstatement of the true distortion. Table 4.1 reveals that, in the United States, the average debt–asset ratio was about one half in 1975 but had increased rapidly in the previous decade. Clearly this implies that the marginal debt–asset ratio was above the average: $\sigma^{*X} > 0.5$. Thus, with true economic depreciation, the Harberger assumptions imply a welfare loss that is at least 25 times that revealed by this model.

Suppose now, other things being equal, that $\tau_p^X = 0.28$, $\tau_d^X = \tau_r^X = 0.34$, and $\tau_c^X = 0.6 \cdot \tau_p^X = 0.17$ to represent the post-reform situation (again except for the depreciation problem).[25] Then the relative welfare loss is $\xi = 0.32‰$. Interestingly enough, it is larger than before the reform despite the cut in corporate and personal tax rates. The explanation is simply that the equivalent tax rate on accrued capital gains was assumed to increase from about 0.1 to about 0.17 as realized capital gains are now fully included in the personal tax base. The "Harberger measure" does not capture this effect. It reveals instead a halving of the relative welfare loss from $\xi = 4.8‰$ to $\xi = 2.4‰$ that results from the decline in the corporate tax rate from 0.46 to 0.34. The gap between the alternative welfare measures has therefore obviously become smaller, but the Harberger measure is still more than seven times that predicted by this model for the case of true economic depreciation – to say nothing about the different causes of the underlying distortions.

6.2.4. Double Taxation of Dividends and Economic Efficiency

It is hard to discover the ultimate cause of so many authors assuming that the classical system of capital income taxation heavily discriminates against the employment of capital in the corporate sector. An important reason is certainly the double taxation of distributed profits or, in other words, the fact that, unlike with the "distributions" to its creditors, the corporate firm is not allowed to deduct the distributions to its shareholders from the corporate tax base. Although plausible at first sight, this reason is not very convincing.[26]

[24] The order of magnitude of this value is not very different from values in the range $10‰ \leq \xi \leq 15‰$ that are usually calculated with the aid of sophisticated numerical general equilibrium models. See Shoven and Whalley (1972).

[25] Cf. Chapter 3.1.3 and Section 6.2.6.

[26] Cf. the discussion in Chapter 5.3.3, 5.3.6 and 5.4.1.

Suppose that, in some initial situation, retained profits, distributed profits, and interest income earned by households are taxed just once at the uniform rate τ wherever they originate. In this situation there is no discrimination against the employment of capital in either sector. Assume, however, that, other things being equal, the distributions of corporate firms are subject to double taxation in the sense that the tax factor for dividends falls from θ to θ^2 where θ is one minus the uniform tax rate. In this case, the tax system of Type 4 in Figure 4.2 applies in the corporate sector. Retentions are equivalent to debt, but there is a discrimination against new issues of shares. Why should there now be a reduction in demand for capital on the part of the corporate sector? Such a reduction cannot be expected if the firm stops issuing new shares, for, since this source of finance was equivalent to the two other sources before the change in the tax law (cf. Type 5 from Figure 4.2), the firm can easily do without it. There does not seem to be a problem with debt financing either. If the firm had planned to use this source, it does not even have to react. Substituting retentions for debt financing would not create any advantage, and the attractiveness of the marginal investment project would not be affected since this project would not have to bear taxes in any case. The remaining possibility is that the firm had planned to choose retentions as the marginal source of finance. Here, things are hardly different. It does not pay to replace retentions with debt financing or to reduce both them and the level of real investment. It is true that the flow of dividends that results from the marginal investment project will bear a higher tax burden, but this tax burden is irrelevant for the firm's decision since it applies to all other possible uses of its profits. Whether the firm decides to carry out the marginal investment project, whether it prefers to invest its profits in the capital market and to distribute them at a later point in time together with the interest they earned, or whether it transfers the available funds immediately to its shareholders, the present value of the additional tax burden is always the same.

Except for the discrimination of new issues of shares, the introduction of the double taxation of dividends is very similar to a once-and-for-all expropriation of existing shareholders. This expropriation is certainly a disadvantage and a significant loss of wealth for these shareholders. But it does not provide any incentive for them to vote for a policy of the firm different from the one they otherwise would have chosen. The government is a silent partner of the existing shareholders who contributes to all new real and financial investments on fair terms regardless of whether they are financed with retentions or debt. Thus it does not seem that there are fundamental forces through which double taxation of dividends could affect

the allocation of the aggregate stock of capital to the two sectors.[27]

This interpretation also permits a remark on the role of taxation in a more complicated world where firms are engaged in risky enterprises. It is frequently argued that the double taxation of dividends discriminates against the employment of "risk capital" and hence reduces the firm's ability to exploit the rich set of profitable, but risky investment opportunities that nature offers it. This view has a good deal of superficial plausibility, but as is often the case, it cannot withstand closer scrutiny.

In a riskless world, proportional dividend taxation is neutral since it does not alter the ranking of the present values of dividends that are attributed to alternative real and financial investment policies of the firm. It is true that this simple neutrality argument cannot be maintained for an uncertain world with risk averse shareholders. In the case of uncertainty, each potential policy of the firm is attributed a full probability distribution of present values of dividends, and both the expected values and the dispersions of the distributions that make up the firm's opportunity set are reduced by the tax. Clearly, the shareholders' choice among the net-of-tax distributions of present values of dividends will not generally result in the same policy of the firm as in the absence of taxation. However, there is no reason to expect that the deviation from neutrality is such that it supports the view cited. Instead, the famous argument of Domar and Musgrave (1944) suggests that the insurance aspect implicit in taxation induces shareholders to vote for more risky and more profitable investment strategies than they would have dared to do without taxation. Thus, instead of being discriminated against, risk taking is stimulated by the double taxation of corporate dividends![28]

Domar and Musgrave formulated their argument for a model profit tax and made no particular attempt to identify this tax with one of the existing capital income taxes. It has been frequently objected that this argument fails to hold in the presence of a limited loss-offset. With a limited loss-offset, it

[27] Indirectly the result is supported by a remark of Krzyzaniak (1966, pp. 50n, Footnote 45) which implies that attempts to find the effects predicted by Harberger failed empirically.

[28] There are subtleties with regard to the shareholder's risk preferences, and it is possible to construct cases where the Domar–Musgrave result is no longer true. For example, when the representative shareholder invests all his wealth in the shares of the firm being considered and when his preferences are characterized by constant relative risk aversion, he will vote for the same policy as in the absence of taxation. However, if some of the wealth is safely invested elsewhere (perhaps as human capital) and when the shareholder's preferences are characterized by non-decreasing relative risk aversion, the Domar–Musgrave result appears. All hypotheses on the shape of the von Neumann–Morgenstern function that have been developed in the literature satisfy this condition. Cf., e.g., Arrow (1970) and Sinn (1985c).

was maintained, the government does not provide fair insurance to the firm, since it participates in the positive variates of profit without contributing to the negative ones. Thus, in fact, taxation did seem to discriminate against risk taking.

As valid as this criticism may be for a model tax on profits in a static environment, it is not applicable to dividend taxation. It is true that, in the case of bankruptcy where dividends ought to be negative in order to cover the firm's liabilities, the loss-offset constraint of dividend taxes excludes any liability of the government. However, the shareholders of corporations enjoy a limited liability, too! Thus, the government's participation in the dividends *relative* to that of private shareholders is the same for all states of the world! There is no other tax in reality for which the Domar–Musgrave model fits better than the dividend tax, and the partnership interpretation of double taxation of dividends fits particularly well in an uncertain world. Introducing risk into the model clearly is not a way to rescue the Harberger result.

If there is a Harberger-type distortion through double taxation of corporate profits at all, then it seems that, in the classical system, this distortion originates from *double taxation of retained profits* rather than double taxation of dividends. This is the message that can be drawn from (6.38). The equation indicates that it is the joint effect of the corporate tax on retentions (θ_r^X) and the personal capital gains tax (θ_c^X) relative to the personal tax on interest income (θ_p^X) that is able to drive a wedge between the marginal products of capital in the two sectors and, as argued above, the 1986 U.S. tax reform seems to have increased this wedge.

In this light, proposals for switching from the classical system to a *partial* imputation system to improve the intersectoral allocation of capital seem doubtful to say the least. Such proposals will certainly benefit existing shareholders, but it cannot be expected that they will drive a significant amount of capital from the non-corporate sector into the corporate sector. To generate such an effect, more than marginal dividend tax cuts are necessary -- tax cuts that increase the dividend tax factor (θ_d^{*X}) beyond the tax factor for retentions (θ_r^{*X}) – for only then will the equilibrium condition (6.36) be affected. Only when the reform goes far enough to reverse the firm's preference ordering over retained profits and new issues of shares as marginal sources of equity finance will there be a reduction in the cost of capital for corporate firms, and an improvement in the intersectoral allocation of capital can be expected.

For the case where policy options are constrained to marginal measures, Equation (6.36) reveals that a *reduction* of the corporate tax rate on

retentions, a reduction of the personal capital gains tax rate, or an *increase* in the personal tax rate that applies to interest income shareholders can earn in the capital market are more efficient than a reduction of the degree of double taxation of dividends. These measures do not affect the investment policy of the non-corporate sector with any given rate of interest, but for owners of corporations they produce an incentive to substitute retentions-financed real investment within their firms for personal capital market investment. This substitution creates a shortage of funds offered in the capital market and raises the market rate of interest which in turn induces owners of non-corporate firms to demand less capital or supply part of the capital that was previously employed or that otherwise would have been employed. Through this process, the real stock of capital will be reallocated among the two sectors until a point is reached where the differential between the pre-tax rates of return in the corporate sector and the market rate of interest has fallen sufficiently to eliminate the shareholders' incentive to substitute.

For the above Cobb–Douglas example, with the stylized facts that characterize the situation after the 1986 U.S. tax reform, it follows from (6.39) that elimination of the capital gains tax reduces the welfare loss to 0.03‰ of aggregate output; that is, from 1/25 to 1/60 of the Harberger value. If, in addition, the corporate tax rate for retained profits were reduced to the representative shareholder's marginal personal tax rate (which was 28% in the example) the welfare loss would be abolished completely.

It should be stressed again that the statements made in the previous paragraphs are contingent upon the assumption that there is no Miller equilibrium and that corporate firms cannot optimize their financial decisions solely with regard to tax differentials so that at least some Harberger-type distortion occurs. If there is a Miller mechanism that equalizes the marginal personal tax rate with the combined tax rate on retained profits or if the corporate firm takes account of only the legal constraint $\sigma^{*X} = 1$ for its choice of debt financing, then there is no intersectoral distortion at all, regardless of the degree of intergration between corporate and personal taxation. Moreover, all considerations were based on the assumption of true economic depreciation. Both of these aspects are further discussed in the two following sections.

6.2.5. The Buffer Function of Financial Optimization

The stability in the sectoral allocation of the aggregate stock of capital

contrasts sharply with the tax-induced distortions in the firm's financial decisions that were studied in Chapter 4. A priori, distortions in the firm's financial structure might seem disadvantageous just as the Harberger-type distortions in the aggregate capital stock do. The prejudice that unintended tax-induced substitution effects are indicators of excess burden is quite common.

In fact however, the reverse seems to be true. Changes in the financial decisions of firms are primarily monetary phenomena that do not seem overly important from an allocative point of view. If attention is directed towards distortions in the real economy, tax-induced distortions in the financial decisions of firms should be welcomed. It is because firms react to the imposition of capital income taxes by changing their financial decisions that the taxes do not greatly change the cost of capital and bring about real distortions in the capital stock. On the one hand, the firms' financial reactions may change the size of the personal tax base and with it the marginal personal tax rate to maintain a Miller equilibrium. On the other hand, even if an insufficient flexibility of marginal tax rates excludes the Miller equilibrium, the economy may largely escape the real distortions simply because firms avoid financing new investment projects with financial instruments against which the tax system discriminates most heavily. In either case the financial decisions serve as a kind of *buffer* that protects the real economy from blows imposed by the tax system.

It is a matter of debate how thick this buffer really is, that is, how flexibly the firm can react with its choice of financial instruments to non-uniform taxation of the three basic kinds of capital income. The previous section discussed some alternatives. The Harberger assumption that there is no flexibility at all seems, however, implausible, even more so the assumption that the firm will exclusively choose the most heavily discriminated against financial instrument available. Firms certainly have *some* flexibility, particularly in the choice between the two alternative kinds of equity finance. At this stage, a good, general theory of the firm's debt–equity choice that explains an interior solution even in a world without taxes does not seem to be available. However, whatever future research in this field may bring, it seems hard to imagine that no substitutability at all between equity capital built up through retentions and equity capital built up through issues of new shares would be found. Thus it can be expected that, even in much more complicated models of the firm's financial choice, the buffer will not be completely torn to shreds and Harberger-type distortions that are attributed to double taxation of dividends will probably still appear to be an overstatement.

Despite this criticism of the Harberger literature, it must be admitted that it does have a point. A newly founded firm that needs equity capital cannot use retentions as the marginal source of finance, since there are no profits to be retained. Clearly, double taxation of dividends is an obstacle to founding new firms, and if a firm is nevertheless established – perhaps to capture the monopoly rents from an invention – it will enter the marginal conditions of the firm's investment decisions. Note however, that this must be a transitory phenomenon. As soon as the initial stock of equity capital, created through issuing shares, itself generates profits, further equity capital can be formed by retentions and, in principle, any desired stock of equity capital can be built up.

There may be objections to this view in that, in a growing economy, corporate profits might never be large enough to provide for the required equity share in the firm's real net investment. However, as discussed in Chapter 4.3.2 and shown in Appendix B, this argument is not valid. In the neighborhood of the steady state of an economy that satisfies the conditions for an intertemporal general equilibrium, any required marginal equity–asset ratio can be maintained forever. The stock of equity capital existing at any given point in time will then create corporate profits net of taxes that are strictly larger than the part of net investment that is to be financed with equity capital. Moreover, even if there is a time span where profits are not large enough, a period of sufficient self-perpetuating equity creation must begin at some stage. Thus it seems that, in a mature economy, the case of an insufficient size of retainable net profits might not be overly important for a creation of Harberger-type distortions.

Ultimately, the questions of whether the firm has sufficient profits and enough financial flexibility are empirical ones, and two observations suggest affirmative answers.

The first refers to the empirical results reported in Table 4.1. These results imply an impressive amount of flexibility in that firms in the Western industrial countries have been significantly willing to substitute debt for equity. In nearly all the countries considered, there was a dramatic fall in equity–asset ratios. This fall was not necessarily a sign of sound development in every respect, and the last couple of years has shown that there is reason enough to fear that too much debt financing makes an economy vulnerable to economic crisis. However, the trend towards debt financing must have helped avoid ordinary Paretian welfare losses, particularly intersectoral distortions of the Harberger type.

The second observation is simply that firms pay dividends. A firm that pays dividends cannot be forced to choose new issues of shares as the

marginal source of finance since it does have the choice of paying no dividends and retaining more profits. In the classical system where retaining profits is cheaper than issuing new shares, dividend taxation therefore cannot affect the firm's marginal investment decision. The very fact that firms are paying dividend taxes means that dividend taxation is investment neutral and cannot create the Harberger-type distortions!

This merits being confronted with the details of Harberger's empirical calculations. While the spirit of his theoretical reasoning seems best described along the lines of Section 6.2.2, his empirical estimates are based on a comparison of the actual total tax burdens, including personal taxes, imposed on capital incomes earned in the two sectors. An obvious implication of this procedure is that the size of the welfare loss depends crucially on the dividend-pay-out ratios.[29] The more profits are paid out as dividends, the higher is the actual, measurable tax burden on corporations and the higher the welfare loss calculated. In terms of the model developed in this book this must be dismissed as fundamentally misleading, for a high corporate tax burden resulting from high values of the aggregate dividend-pay-out ratio indicates financial flexibility high enough to allow firms to choose not to issue new shares. This then precludes double taxation of dividends from affecting firms' real investment decisions. In a sense therefore, the Harberger estimates of the welfare loss are inversely related to the true welfare loss. The higher they are, the lower the real distortions caused by corporate income taxation.

6.2.6. Marginal Tax Effects with Accelerated Depreciation

No realistic description of the existing systems of capital income taxation can abstract from the phenomenon of accelerated tax depreciation rules. At the time of writing, Anglo-Saxon countries in particular offer large "bribes" – to use Samuelson's (1964) term – to their investors.[30] It will be seen in the next chapter that these "bribes" can be expected to distort the international allocation of capital heavily, since they are not offered by all countries. The question to be considered now is how they affect the intersectoral allocation of capital in the case where they are offered uniformly to all sectors.

Accelerated depreciation not only interferes directly with the firm's investment decisions through increasing the present value of tax depre-

[29] Cf. Harberger (1966, pp. 110–112, in particular Footnote[6]) to Table 16).
[30] Cf. Chapter 3.1.3.

ciation but also indirectly through the firm's financial decisions. As shown in Chapter 5.2, growing firms have to finance part of their net investment with equity to avoid a situation where a limited loss-offset deprives them of the chance to deduct marginal debt interest from the profit tax base. This and the following section will discuss the effects of accelerated depreciation as such and, at the same time, the effects that arise from an endogenous explanation of the firm's constraint on debt financing.

A more general formula for the capital market equilibrium than (6.38) that includes the case of accelerated depreciation follows from (5.51):

$$\frac{(\partial f/\partial K^Y) - \delta}{P_K^Y} = r = \frac{(\partial f/\partial K^X) - \delta}{P_K^X}, \tag{6.41}$$

where P_K^X and P_K^Y are the effective prices of capital in the two sectors. According to (5.52), the effective price of capital in the non-corporate sector is

$$P_K^Y = 1 - \alpha_1 \tau_p^Y \quad (\text{with } \tau_p^Y = \tau_r^Y) \tag{6.42}$$

and the effective price of capital in the corporate sector is

$$P_K^X = \frac{\theta_p^X(1 - \sigma^{*X} - \alpha_1 \tau_r^X)}{\max(\theta_d^{*X}, \theta_r^{*X})} + \sigma^{*X}. \tag{6.43}$$

The endogenous explanation of the corporate firm's constraint on debt financing is, from (5.19) and (5.20),

$$\begin{cases} \sigma^{*X} = 1 - \alpha_1 \tau_r^X - \varepsilon^{*X}, \\ \varepsilon^{*X} = \alpha_1 W^X \max(\theta_d^{*X}, \theta_r^{*X}), \end{cases} \tag{6.44}$$

where σ^{*X} is the maximum marginal debt–asset ratio and ε^{*X} the minimum marginal equity–asset ratio. The parameter α_1 is the proportion of gross investment that can be written-off immediately and W^X is the growth factor defined in (5.21). The other variables are defined as above; in particular it holds that $\theta_d^{*X} \equiv \theta_d^X \theta_p^X$ and $\theta_r^{*X} \equiv \theta_r^X \theta_c^X$.

It can be shown that the personal tax rate of shareholder households τ_p^X, the corporate tax rate on dividends τ_d^X, and the capital gains tax rate τ_c^X play qualitatively the same role in these equations as discussed in the previous sections for the case where ε^{*X} was assumed to be an exogenously determined, strictly positive, constant. The roles of the personal tax rate of owners of non-corporate firms, τ_p^Y, and of the corporate tax rate on retained profits, τ_r^X, are new however. With accelerated depreciation, both of these tax rates implicitly give rise to a subsidy effect that stimulates investment

and is able to produce seemingly perverse capital movements between the two sectors.

Using the market clearing condition $dK^X + dK^Y = 0$ and the property of declining marginal returns, it follows from (6.41)–(6.44) that[31]

$$dK^X/d\tau_p^Y < 0 \qquad \text{where } \tau_p^Y = \tau_r^Y \tag{6.45}$$

and, in conjunction with (5.63), that[32]

$$dK^X/d\tau_r^X > 0 \qquad \text{where } d\tau_d^X/d\tau_r^X = \tau_d^X/\tau_r^X = \text{constant.} \tag{6.46}$$

Under true economic depreciation the personal income tax rate of owners of non-corporate firms was irrelevant for the sectoral structure of capital and an increase in the corporate tax rate, if it induced any reaction at all, was shown to drive capital out of the corporate sector. Under accelerated tax depreciation and the corresponding endogenous explanation of the constraint on debt financing these results are no longer true. A reduction in the personal tax rate of owners of non-corporate firms and/or an increase in the corporate tax rate drives capital from the non-corporate into the corporate sector! This is a direct implication of the taxation paradox discussed in Chapter 5.4.3 that clearly is to its credit.

It is worth noting that (6.46) was not derived under the assumption that the corporate tax rate on retained profits is altered given the tax rate on distributed profits. While such an assumption would be admissible for the result, it is by no means necessary. As shown in Chapter 5.4.3.5 the paradox holds even when the system of capital income taxation as such is given and the corporate tax rate on distributed profits varies uno actu with that on retained profits. Thus it was indeed correct to say that an increase in *the* corporate tax rate drives capital into the corporate sector.

In addition to the corporate tax rate on distributed profits, the personal tax rate of the shareholder household and the capital gains tax rate could be allowed to vary together with τ_r^X. If this variation is carried out such that $\theta_p^X = \theta_r^X \theta_c^X$ is maintained, as appropriate for studying the transition between Miller equilibria, the taxation paradox would a fortiori be operative.[33] It would even be possible in this case to dispense with Assumption (6.44) that

[31] These differential quotients should be interpreted as changes in a growth trend or in comparison to that capital structure that would have prevailed in the future had the tax rate structure been constant; they do not require negative net investment in any sector.

[32] These results hold independently of whether W is treated as a constant or whether, in the definition $W \equiv \lim_{t\to\infty} \hat{K}(t)/[r(t)\theta_p]$ from (5.21), $\lim_{t\to\infty} \hat{K}(t)$ is treated as constant and $\lim_{t\to\infty} r(t)$ is identified with the value of r that appears in (6.41) and refers to the point in time considered. Cf. Footnote 7.21.

[33] Cf. Chapter 5.4.3.

determines σ^{*X} and ε^{*X} and thus defines the firm's degree of financial flexibility. Financial flexibility is necessary for the Miller equilibrium to exist, but, given that it does exist, each single firm is indifferent between debt and equity finance and so the particular value of σ^{*X} does not have any direct bearing on the real investment decisions.

Outside a Miller equilibrium, however, σ^{*X} *is* important for the firm's real investment behavior. An isolated increase in the corporate tax rate will only be able to stimulate corporate investment when the corporate firms enjoy sufficient financial flexibility. It is true that the possibility of full debt financing of investment is not necessary and that there is no hidden assumption that requires the government to collect negative taxes from the firm. The derivative reported in (6.46) was calculated assuming that the corporations choose sufficient equity finance to avoid violating the corporate loss-offset constraint. In fact, as shown in Chapter 5.4.3.4, it would even be admissible for them to use so much equity finance at the margin that the corporate tax base grows permanently in proportion to the total imputed capital income generated in the corporate sector. However, with a sufficiently high requirement of equity finance at the margin, the taxation paradox clearly fails to hold. With (5.60), the values $\alpha_1 \theta_r^X$ for the classical and related systems and $\alpha_1 \theta_d^X \tau_r^X / \tau_d^X$ for the full imputation and related systems were shown to be borderlines of the minimum marginal equity–asset ratio ε^{*X}. When ε^{*X} is above the respective borderline, an increase in the corporate tax rate will drive capital out of the corporate sector as is commonly expected.

6.2.7. The Inverted Harberger Model

In addition to the marginal considerations made in the previous section, it is interesting to assess the role of the taxation paradox for the Harberger problem in the narrow sense. Is it still true that too much capital is employed in the non-corporate sector? An answer to this question is provided by Equations (6.41)–(6.44). Straightforward manipulations of these equations yield:

$$K^X \{\gtrless\} \bar{K}^X \Leftrightarrow \tau_r^X - W^X[\theta_p^X - \max(\theta_d^X \theta_p^X, \theta_r^X \theta_c^X)] \{\gtrless\} \tau_p^Y \quad (\sigma^{*X} \text{ endogenous}), \tag{6.47}$$

where $\bar{K}^X$ is the Pareto optimal employment of capital in the corporate

sector as implicitly defined by (6.37). Condition (6.47) shows that, depending on the structure of the tax system, both the Harberger result $K^X < \bar{K}^X$ and the reverse may be present.

Harberger's result is implied by (6.47), for example, if the corporate tax rate for retained profits, the personal income tax rate of shareholder households, and the personal tax rate of owners of non-corporate firms are the same ($\tau_r^X = \tau_p^X = \tau_p^Y$), if there is at least partial double taxation of dividends and retained profits ($\theta_d^X < 1, \theta_c^X < 1$), and if $W^X > 0$. Under these assumptions, the subsidy effect implicit in accelerated depreciation is the same in both sectors but, as equity capital is used for financing marginal investment projects, the discrimination against this source of finance through double taxation of corporate profits scares away part of the capital that could usefully be employed in the corporate sector. However, this result is not generally true.

Provided the corporate tax rate for retained profits exceeds the personal tax rate of owners of non-corporate firms ($\tau_r^X > \tau_p^Y$), it is easily possible that *too much* capital is employed in the corporate sector. This will definitely be the case if the corporate sector is in a Miller equilibrium. Since the Miller equilibrium is characterized by $\theta_p^X = \theta_c^X \theta_r^X \geq \theta_d^X \theta_p^X$, in (6.47) the term in squared brackets vanishes, and indeed $K^X > \bar{K}^X$ results.

It should be stressed that the particular hypothesis on σ^{*X} that was assumed with (6.44) is irrelevant for this result as, in a Miller equilibrium, debt and retained profits are equivalent sources of finance. This can be seen most clearly from Equations (6.41)–(6.43). These equations imply

$$\left(\frac{\partial f}{\partial K^Y} - \delta\right)(1 - \alpha_1 \tau_r^X) = \left(\frac{\partial f}{\partial K^X} - \delta\right)(1 - \alpha_1 \tau_p^Y)$$

(Miller equilibrium), (6.48)

and it is obvious that $K^X > \bar{K}^X$ when $\tau_r^X > \tau_p^Y$.

While the Miller equilibrium together with $\tau_r^X > \tau_p^Y$ is a sufficient condition for the result, Expression (6.47) shows that other plausible parameter constellations are also possible. Provided the discrimination of equity finance through the capital gains tax is sufficiently small, and provided σ^{*X} is endogenously determined such that a violation of the corporate loss-offset constraint is just avoided, it would even be possible to assume that the personal income tax rate of corporate shareholders equals that of the owners of non-corporate firms. This can easily be seen in (6.47) if the situation $\theta_r^X = \theta_p^X = \theta_p^Y$, $\theta_c^X = \theta_d^X = 1$, which obviously implies $K^X = \bar{K}^X$ is first considered and then τ_d^X and τ_r^X are increased. Because of the result

$dK^X/d\tau_r^X > 0$ (with $d\tau_d^X/d\tau_r^X = \tau_d^X/\tau_r^X =$ constant) reported in (6.46) it follows that $K^X > \bar{K}^X$, if $\theta_r^X < \theta_p^X = \theta_p^Y < \theta_c^X = 1$.

Figure 6.2 illustrates these findings. As in Harberger's model, there is a loss in output through distortion of the capital structure. However – and this turns the Harberger model on its head – the marginal product of capital in the corporate sector falls short of the marginal product of capital in the non-corporate sector. Too many resources are employed by corporate firms. The figure is therefore the mirror image of Figure 6.1. The employment of capital by corporations is not FA but FA'. And the welfare loss is not measured by the triangle DEC, but by the triangle CE'D'.

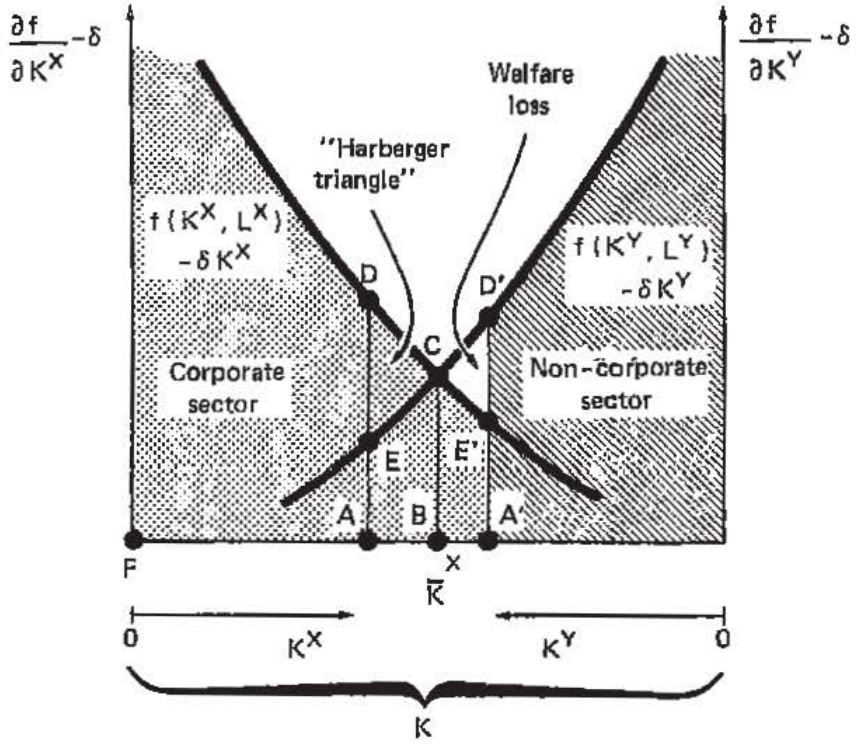

Figure 6.2. Accelerated depreciation and the welfare loss from corporate income taxation: the inverted Harberger model.

It should be stressed at this stage that the reservations concerning the result $dK^X/d\tau_r^X > 0$ that were made in the previous section partly apply also to the result described in Figure 6.2. In the case where $\theta_r^X < \theta_p^X = \theta_p^Y < \theta_c^X = 1$, the size of σ^{*X} *is* important for this result. Moreover, the assumption that there is no capital gains tax for the corporate sector is crucial when the classical or a closely related system of capital income taxation operates.

To illustrate this, it may be useful to calculate some numerical examples considering the general case $\sigma^{*X} \leq 1 - \alpha_1 \tau_r^X$ which includes the possibility of σ^{*X} being endogenously explained. From (6.41)–(6.44) it follows that,

when accelerated depreciation is allowed, the discrimination measure used in (6.39) and (6.40) becomes

$$\chi = \frac{P_K^X}{P_K^Y} = \frac{[\theta_p^X(1 - \alpha_1\tau_r^X - \sigma^{*X})/\max(\theta_d^{*X}, \theta_r^{*X})] + \sigma^{*X}}{1 - \alpha_1\tau_p^Y}. \tag{6.49}$$

If $\chi > 1$ the distortion is in the Harberger direction, if $\chi = 1$ there is no distortion, and if $\chi < 1$ the distortion is in the "wrong" direction as illustrated in Figure 6.2. Assume the same stylized facts as used in the case without accelerated depreciation to characterize the situations before and after the 1986 U.S. tax reform: $\tau_r^X = 0.46, 0.34$; $\tau_c^X = 0.1, 0.17$; $\tau_p^X = \tau_p^Y = 0.4, 0.28$. However, use $\alpha_1 = 0.5$ and $\alpha_1 = 0.3$, respectively, as pre and post-reform values of the depreciation parameter, as suggested in Chapter 3.1.3.

With full financial flexibility within the legal constraints ($\sigma^{*X} = 1 - \alpha_1\tau_r^X$), $\chi = 0.96$ then results for the time before the reform and, accordingly, (6.39) reveals a relative welfare loss of $\xi = 0.024‰$. The analogous values for the time after the reform are $\chi = 0.98$ and $\xi = 0.006‰$. In both cases, the loss results from a distortion in the "wrong" direction.

With narrower constraints to debt financing this result is not ensured though. It can be calculated from (6.49) that the critical values for the maximum marginal debt–asset ratio which just produce intersectoral efficiency are $\sigma^{*X} \approx 0.64$ for the time before, and $\sigma^{*X} \approx 0.84$ for the time after, the 1986 reform. Lower values of σ^{*X} will produce a distortion in Harberger's direction. However, unless the maximum marginal debt–asset ratio is sufficiently strongly *negative*, it is impossible to reproduce the order of magnitude of the Harberger estimates. Even without any debt financing at the margin ($\sigma^{*X} = 0$), the respective welfare losses would be 0.45‰ and 0.9‰, figures which are far below the "Harberger values" of 4.8‰ and 2.4‰ that were reported in Section 6.2.3.

It is worth noting that the two critical values exceed those critical values of σ^{*X} above which the taxation paradox (of Type B) becomes operative and produces the perverse result that a rise in the corporate tax rate attracts capital from the non-corporate sector as discussed in the previous section. Under the classical system, the latter type of critical value is given by $\sigma_B^{*X} = 1 - \alpha_1\tau_r^X - \varepsilon_B^{*X}$ or, as $\varepsilon_B^{*X} = \alpha_1\theta_r^X$, by $\sigma_B^{*X} = 1 - \alpha_1$ which is about 0.5 for the time before, and 0.7 for the time after, the reform. Obviously, therefore, the condition for the reaction of the capital structure to a marginal change in the corporate tax rate to be perverse is weaker than the condition for a perverted structure itself.

The reason for a divergence in the critical values is the existence of capital gains taxation. This can easily be seen from (6.49). When $\sigma^{*X} =$

$\sigma_B^{*X} = 1 - \alpha_1$, this expression becomes

$$\chi = \frac{(\theta_p^X \alpha_1/\theta_c) + 1 - \alpha_1}{1 - \alpha_1 \tau_p^Y} \qquad \text{(classical system, } \sigma^{*X} = \sigma_B^{*X}\text{).} \tag{6.50}$$

Given the assumption of identical personal tax rates in the corporate and non-corporate sectors ($\tau_p^Y = \tau_p^X$), (6.50) shows that $\chi\{\gtreqless\}1 \Leftrightarrow \theta_c\{\gtreqless\}1$. Thus, the condition for a perverted capital structure just coincides with that for a reaction to marginal tax rate changes to be perverse if there is no capital gains tax on corporate shares. In the presence of such a tax, however, the capital structure is distorted in the "right" direction when the maximum marginal debt–asset ratio has a value that just immunizes the capital structure against changes in the corporate tax rate.

All numerical examples considered so far have in common that they are based on the assumption of identical personal tax rates in the corporate and non-corporate sectors. In the light of the Miller equilibrium this may not be a realistic assumption. If the financial policy of corporate firms drives the marginal personal tax rate of the representative shareholder to a level which equals that of the joint marginal tax burden of corporate and capital gains taxation, then Condition (6.48) applies and a perverted capital structure will occur regardless of the assumption on the size of σ^{*X}. Recalculating the pre-reform part of the numerical example for this case ($\theta_p^X = \theta_r^{*X} = 0.54 \cdot 0.9 \approx 0.49$, $\theta_p^Y = 0.6$) gives $\chi = 0.96$ and $\xi = 0.02‰$. Despite a full double taxation of dividends, despite identical depreciation allowances in both sectors, despite a substantial use of equity finance, and "despite" higher tax rates in the corporate sector, the pre-1986 U.S. tax system must therefore have discriminated against capital employed in the personal sector and must have created a welfare loss through a distortion in the "wrong" direction, if the U.S. economy was sufficiently close to a Miller equilibrium.

As mentioned earlier,[34] the new U.S. tax law now excludes a Miller equilibrium and so we must return to the example presented on the previous page. A reasonable guess for the maximum marginal debt-asset ratio may be $\sigma^{*X} = 0.5$. As this value is below the critical value of 0.84, as calculated above, it is clear that there is a distortion in Harberger's direction. However, the welfare loss implied by (6.39) and (6.49) is only $\xi = 0.19‰$, which happens to be the same as the pre-reform value of the welfare loss calculated on p. 176 for the hypothetical case of true economic depreciation. On the basis of the 1985 U.S. GDP, which is about $3900

[34] Cf. Chapter 4.3.4 in connection with 3.1.2.

billion, this would be less than $800 million, or less than one third of a space shuttle.

Summarizing the theoretical findings of this section, it can be stated that, under accelerated depreciation, an inversion of the Harberger result will not necessarily occur, but seems clearly possible under plausible parameter constellations. Not only can a marginal rise in the corporate tax rate attract capital from the non-corporate sector; it might even be the case that too much capital is employed in this sector compared to the Pareto efficient allocation of capital. This is definitely so, for example, when the corporate sector is in a Miller equilibrium, the same accelerated depreciation rules apply to both sectors, and the corporate tax rate exceeds the capital income tax rate that applies to the non-corporate sector. The economic reason for the inversion of the Harberger result is that the tax system subsidizes marginal investment projects but taxes intramarginal ones. A high corporate tax rate is a heavy burden on corporations. However, rather than reducing the scale of operations, the corporate firm may well have an incentive to escape at least part of this burden through increased employment of capital. With accelerated depreciation, attack may be the best form of defence against the corporate income tax.