Discussion Paper No. 02-47

Investment Decisions and Tax Revenues Under an Allowance for Corporate Equity

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Non-technical Summary

In recent years, a number of European countries have relied on elements of an allowance for corporate equity (ACE) in the design of their tax systems. Making use of an allowance for corporate equity, firms may deduct an imputed rate of return – the so-called protective interest rate – on their equity for the determination of taxable income. Furthermore, a pure ACE-based tax system would be designed as a personal consumption tax. Income from interest payments at arm's-length-conditions would therefore be exempt from personal income taxation.

The effective tax burden thus varies with the rate of return of an investment. This variation has an effect on the firms' cost of capital, i.e. the pre-tax rate of return at which an investor is indifferent between investing and not investing. Besides this minimum rate of return and the effective marginal tax rate (EMTR), which can be derived thereon, the prominent role of effective average tax rates (EATR) is more and more recognised in economics and business management. EATRs denote the effective tax burden on inframarginal investments, i.e. investments that earn more than the minimum rate of return.

This paper investigates the basic effects of corporate tax systems which rely on an allowance for corporate equity on rates of return, EMTRs, and EATRs. By relying on a simple model, we show how neutrality with respect to investment decisions – which exists under some strict assumptions – is lost in case the protective interest rate deviates from the market interest rate.

Also, we show how the relevance of the allowance for corporate equity decreases with an increasing rate of return. We conclude that a country might weaken its position in tax competition for very profitable investments by switching towards an ACE-tax, supposed the country cannot adjust headline tax rates to be in accordance with those of competing countries which have a broader tax base. These findings might theoretically explain why some countries have recently turned away from the ACE-concept.

Besides, by relying on our model we can gain interesting insights into the revenue effects of an ACE-based tax system. We find that some robust revenues seem to be generated by combinations of low protective interest rates and medium statutory tax rates, which, however, should not exceed the statutory tax rates of competing locations.

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Abstract

In recent years, some European countries have relied on elements of an allowance for corporate equity (ACE) in the design of their tax systems. We analyse the effects of ACE-based taxation on rates of return and effective tax rates. Investment neutrality is lost if the imputed interest rate deviates from the market interest rate. With increasing profitability, the relative importance of the ACE compared with the statutory tax rate decreases. This might induce disadvantages for countries that compete for profitable, multinational companies. Revenue effects indicate that tax rates under an ACE-based tax system should not exceed those in competing countries by much.

JEL-Classification: H25, H21

Keywords: Allowance for Corporate Equity; Corporate Taxation; Effective Tax Rates; Tax Revenues

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Structure of the Paper

1. Introduction

In recent years, a number of European countries have relied on elements of an allowance for corporate equity (ACE) in the design of their tax systems. Making use of an allowance for corporate equity, firms may deduct an imputed rate of return – the so-called protective interest rate – on their equity for the determination of taxable income. Furthermore, a pure ACE-based tax system would be designed as a personal consumption tax. Income from interest payments at arm's-length-conditions would therefore be exempt from personal income taxation.

The effective tax burden thus varies with the rate of return of an investment. This variation has an effect on the firms' cost of capital, i.e. the pre-tax rate of return at which an investor is indifferent between investing and not investing. Besides this minimum rate of return and the effective marginal tax rate (EMTR), which can be derived thereon, the prominent role of effective average tax rates (EATR) is more and more recognised in economics and business management. EATRs denote the effective tax burden on inframarginal investments, i.e. investments that earn more than the minimum rate of return.

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Also, we show how the relevance of the allowance for corporate equity decreases with an increasing rate of return. We conclude that a country might weaken its position in tax competition for very profitable investments by switching towards an ACE-tax, supposed the country cannot adjust headline tax rates to be in accordance with those of competing countries which have a broader tax base. These findings might theoretically explain why some countries have recently turned away from the ACE-concept.

Besides, by relying on our model we can gain interesting insights into the revenue effects of an ACE-based tax system. We find that some robust revenues seem to be generated by combinations of low protective interest rates and medium statutory tax rates, which, however, should not exceed the statutory tax rates of competing locations.

The structure of the paper is as follows: In section 2, we investigate the effects of taxation on profitability. Section 3 is dedicated to the effects on tax revenue. Section 4 briefly concludes.

2. Effects of ACE-Based Taxation on Profitability

2.1 Starting Point and Assumptions

2.1.1 The Concepts of Neutrality and Effective Tax Burdens

2.1.1.1 Investment-Neutral Tax Systems

The starting point for considering the impact of taxation on investment activity is investment neutrality. A tax system is neutral with respect to investment decisions if the ranking of net present values of different investment projects is not affected by taxation and the tax system does not alter the ranking with respect to the alternative use of funds:

$$NPV^A > NPV^B \Rightarrow NPV_t^A > NPV_t^B \text{ for all investment projects } A, B, \quad (1)$$

$$NPV = 0 \Rightarrow NPV_t = 0 \text{ for all investment projects,} \quad (2)$$

with NPV and NPV_t denoting the pre-tax and post-tax net present values, respectively.

Besides the taxation of true economic profits,[1] a cash flow tax with an exemption of interest income satisfies these conditions. The discount rate ρ, which provides a benchmark rate of return for an investor, is untouched, and net present values are reduced proportionately.[2]

Under an ACE-tax, an imputed rate of return, usually set by the government, is deductible for determining the taxable income of a corporation.[3] If we assume perfect capital markets and choose the protective interest rate appropriately, the ACE-tax is a net present value-equivalent intertemporal transformation of the cash flow tax.[4] Things change, however, if the protective interest rate is fixed at a higher or at a lower level than the market interest rate.

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[1] See for example the seminal work by *Samuelson* (1964) and *Johansson* (1969).

[2] See the seminal work by *Brown* (1948).

[3] For the ACE-tax, see the seminal work by *Wenger* (1983) and *Boadway/ Bruce* (1984); see also *IFS Capital Taxes Group* (1991).

[4] See for example the numerical illustration by *Hiller* (1999), p. 204.

In recent years, a number of European countries have gained experience with elements of the ACE-tax: Between 1994 and 2000,[5] the concept has been consequently implemented upon recommendation of a group of German academics[6] in Croatia. Other European countries like Italy, Austria, Sweden, Norway and Finland have relied or still rely on elements of an ACE-based company tax. There, for some companies the part of the profits that does not exceed an imputed rate of return on the whole equity or a part of the equity is taxed at a lower rate than the part that exceeds this imputed rate of return.[7]

2.1.1.2 Effective Marginal Tax Burdens

In the past, instruments that measure effective marginal tax burdens have often been applied to evaluate a tax system's neutrality properties.[8] Marginal investment projects only earn the post-tax minimum rate of return required by an investor. Therefore, their net present value is zero by definition, and they are remarkably suited to check whether condition (2) holds. It holds in case the cost of capital $\tilde{p}$ is equal to the market interest rate *r*.

To calculate the effective marginal tax rate (EMTR) $\tilde{t}$, the tax wedge $\tilde{w}$, i.e. the difference between the cost of capital and the post-tax rate of return of a marginal investment, is divided by the cost of capital:

$$\tilde{t} = \frac{\tilde{w}}{\tilde{p}} = \frac{\tilde{p} - \tilde{s}}{\tilde{p}}, \tag{3}$$

where $\tilde{s}$ denotes the post-tax rate of return for the investor.

The benchmark value which indicates neutrality depends on the type of tax system that is analysed. For a comprehensive income tax, which includes the

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[5] For the repeal see *Knoll* (2001), pp. 340-341.

[6] See *Wagner/ Wenger* (1996); *Rose* (1998).

[7] See *Kiesewetter* (1997). For Austria, see in detail *Bruckner/ Gassner/ Riener-Micheler* (2000), pp. 271-279; for Italy, see *Bordignon/ Giannini/ Panteghini* (2000). Since mid-2001, no allowance for corporate equity has been granted for new investments any more; a recent draft tax legislation aims at implementing a comprehensive tax reform and establishing the abolition of the dual income tax, see *Lobis* (2002), p. 2. For Sweden, Norway and Finland, see for example *Sørensen* (1998). A protective interest rate is only applied for the purpose of separating deemed capital income from deemed labour income in case of sole traders and closely held companies.

[8] See *King/ Fullerton* (1984), and – building on this work – *OECD* (1991), *European Commission* (1992) and (2001); *Caron & Stevens/ Baker & McKenzie* (1999); *Baker & McKenzie* (2001). The impact of an ACE-based tax on investment decisions was also analysed by *Schmidt* (1998), *Kiesewetter* (1999), *Lammersen* (1999), *Heinhold/ Hüsing/ Pasch* (2000).

taxation of interest payments, the benchmark value equals the tax rate on interest income. For a cash flow-based tax, the EMTR which indicates neutrality is zero; marginal investments are not taxed. As only marginal investments are analysed, we cannot prove whether condition (1) is also satisfied by relying on EMTR. However, a statement on whether an investment is tax-favoured or -deprived can be made if investment projects exhibit different tax wedges. This indicates that the invariance with respect to the pre-tax and post-tax ranking might not always be given. Equal EMTR can thus be deemed to be a necessary condition for investment neutrality to hold in all theoretically conceivable cases.

2.1.1.3 Effective Average Tax Burdens

Recently, the measurement of the effective tax burdens of inframarginal investments by effective average tax rates (EATR) has gained prominence. EATR are deemed to be especially relevant for the location decisions of profitable, multinational firms.[9] Analogously to (3) we can define an EATR t by

$$t = \frac{p - s}{p}, \tag{4}$$

with p and s denoting the pre-tax and the post-tax rate of return of an investment, respectively. The EMTR is a special case of equation (4).

With respect to investment neutrality, based on the EATR only a loose connection can be established to condition (1). This condition would be violated if two investment projects had to earn different pre-tax rates of return to generate the same post-tax rate of return. EATR usually are calculated based on a given pre-tax rate of return p. With $NPV^A = NPV^B$, condition (1) then cannot be analysed. Nevertheless, different EATR might provide strong arguments for the potential effect of taxation on the ranking of inframarginal investments.

2.1.2 Assumptions and Structure of the Model

Based on a simple model, we now employ these two instruments to analyse the potential impact of an ACE-based tax system on investment decisions.

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[9] See *Devereux/ Griffith* (1998), pp. 353, 362; *Richter/ Seitz/ Wiegard* (1996), p. 19. For a recent extensive study which estimates EMTR as well as EATR in the European Union, see *European Commission* (2001).

We assume perfect capital markets with a unique given market interest rate, price stability, time-invariant interest and tax rates, and an immediate loss compensation. We ignore a number of issues, in particular wealth taxation, indirect taxation, and uncertainty and thus risk premiums. Also, we do not consider any dynamic effects, e.g. transition effects. We analyse an equity-financed one-period investment, i.e. the investment is undertaken at the beginning of the period, while the whole return on the capital employed occurs at the end.

Under a cash flow-tax or a pure ACE-tax, there is no second layer of capital income taxation at the personal level. We therefore ignore personal taxes. This is equivalent to a point of view of a corporation's management that ignores shareholder taxation in their corporate decision-making.[10] In this case, the benchmark for an investment is the market interest rate r. The tax wedge is computed as

$$\widetilde{w} = \widetilde{p} - r. \tag{5}$$

At first, we assume a decreasing marginal product of capital, economic rents that are completely tied to a particular location, and arbitrarily divisible investments. We explain the effects of relaxing these assumptions in section 2.3.

2.2 Comparison of Effective Tax Burdens

König has derived a formula which is well-suited to show the effects of investment-neutral tax systems on rates of return.[11] *König* supposes an (arbitrarily chosen) tax system that reduces pre-tax net present values by the constant factor $(1 - c)$, with $0 \leq c \leq 1$. This would imply $c = \tau$ with τ denoting the statutory tax rate for a cash flow tax, and $c = 0$ for a tax on true economic income. Furthermore, *König* assumes that the funds available for investment are not reduced by taxation.

Then, for an operation period of the investment L and a post-tax discount rate ρ_t *König* obtains a general expression for the post-tax rate of return s:

$$s = (1+\rho_t) \cdot \sqrt[L]{\left[\frac{(1+p)^L}{(1+\rho)^L} - 1\right] \cdot (1-c) + 1} - 1. \tag{6}$$

[10] A good reason for ignoring personal taxes is delivered by the fact that management might not know the tax position of the marginal shareholder, which is quite conceivable to be the case for large corporations which have access to international capital markets. See also *OECD* (1991), p. 91.

[11] See *König* (1997), pp. 54-57.

For a cash-flow tax, the post-tax discount rate ρ_t is equal to the pre-tax discount rate ρ and thus the market interest rate r. For $L = 1$, we obtain:

$$s = (p - r) \cdot (1 - \tau) + r \,. \tag{7}$$

A marginal investment, which yields only the market interest rate r, is not taxed, and the part of the return p which exceeds the market interest rate is taxed proportionately. By applying the corresponding values, we now will illustrate this connection between pre-tax and post-tax rates of return under a cash flow tax or an ACE-tax.

2.2.1 Cash Flow Taxation and Optimal ACE-Based Taxation

For a cash flow tax and an optimally configured ACE-based tax where the protective interest rate z is equal to the unique market interest rate r, the rate of return of a marginal investment is not reduced. Only the economic rent, i.e. the part of the return that exceeds the market interest rate,[12] is taxed,[13] as *fig. 1* illustrates. We assume $r = z = 5$ per cent, $L = 1$, $\tau = 40$ per cent. The abscissa contains a proxy for the level of investment which is delivered by the marginal rate of return on the capital employed. The ordinate in addition to the pre-tax rate of return contains the associated post-tax rates of return and the discount rate.

The effects of such an ACE-tax on profitability exactly match those under a cash flow tax. Due to the taxation of the generated return, the pre-tax rate of return p is cut by the factor $(1 - \tau)$. This is illustrated by the rotation of p around the zero-point. We obtain $p \cdot (1 - \tau)$.

The allowance for corporate equity is equivalent to an increase in the rate of return by $z \cdot \tau$, while the immediate deduction under the cash flow tax increases the rate of return by $r \cdot \tau$. With $z = r$, the deduction of the allowance for corporate equity with a simultaneous capitalisation of the investment for purposes of tax law is equivalent to the immediate deduction of the initial cost under a cash

[12] We assume that both the risk premium – as we suppose certainty – and the imputed wage income of the entrepreneurs are zero. Otherwise, the statement above would have to be modified, as the risk premium and the imputed wage are economically not a part of the economic rent but are taxed by a cash flow tax. See – also with respect to the definitions – *Homburg* (2000), pp. 132-133.

[13] By relaxing the assumption that the invested amount is not affected by taxation, from the point of view of an investor the pre-tax rate of return would equal the post-tax rate of return under a cash flow tax. See *König* (1997), p. 57.

flow tax.[14] Both tax systems induce an increase in the rate of return from $p \cdot (1 - \tau)$ to $p \cdot (1 - \tau) + r \cdot \tau$, which is equivalent to equation (7).

Regardless of the level of profitability, the capital employed always qualifies for the allowance or the immediate deduction. This is reflected in an upward shift of $p \cdot (1 - \tau)$ by the amount of $r \cdot \tau$. The resulting line indicates the post-tax rate of return for an optimally configured cash flow- or ACE-tax s^{opt}.

The economic rent is reduced proportionately, as indicated by s^{opt}, which splits the extra-rate of return illustrated by the distance between p and r by the factor τ. Extramarginal, i.e. non-profitable investments might be subsidised.[15] However, for $\tau < 100$ per cent, these projects do not become profitable. The more profitable an investment, the higher its EATR t. The effective tax burden on the marginal investment is zero per cent.

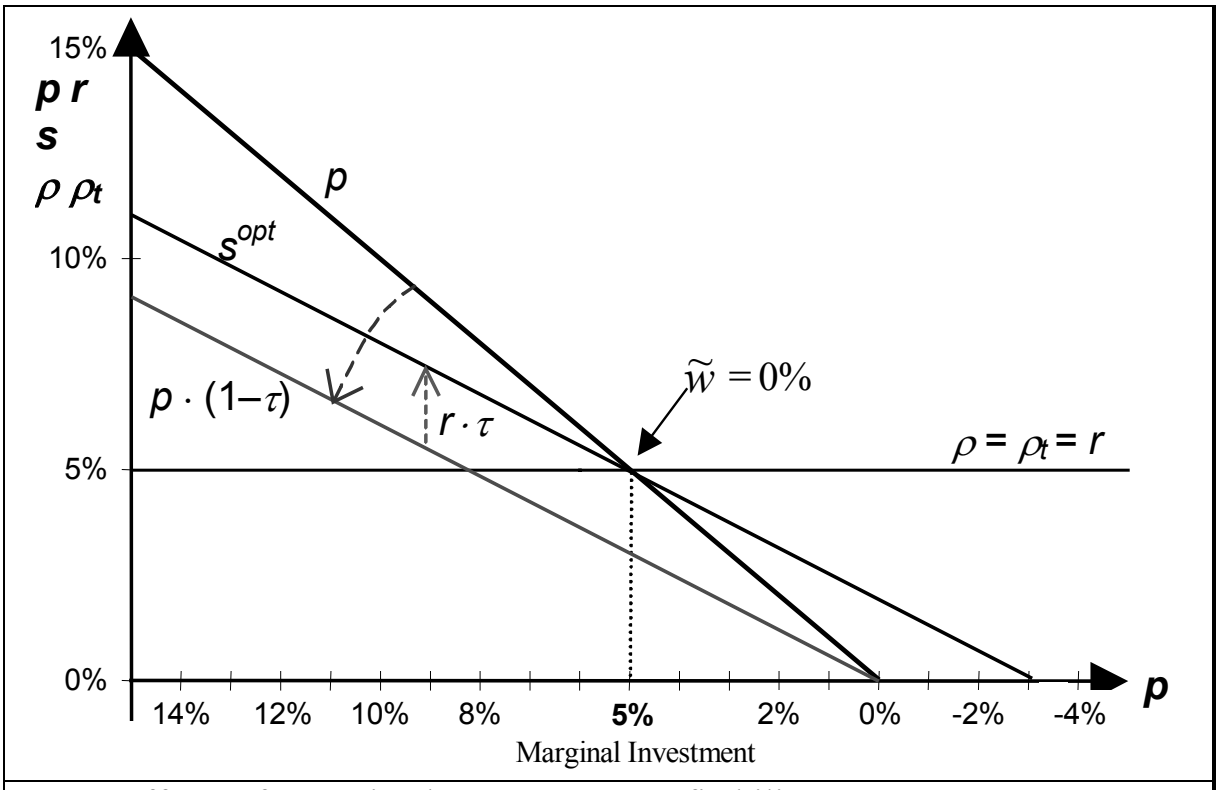

Fig. 1: Effects of an optimal ACE-tax on profitability.

[14] See the early considerations by *Lücke* (1955).

[15] We rely on this term to describe a situation where the post-tax rate of return exceeds the pre-tax rate of return of an investment. A different definition might consider an investment as subsidised even if the post-tax rate of return was lower than the pre-tax rate of return, but greater than the post-tax rate of return under systematic taxation.

2.2.2 Misconfigured ACE-Tax

2.2.2.1 Deviation of the Protective Interest Rate and Neutral Depreciation

Based on the considerations underlying *fig. 1* we now analyse the effects of an ACE-tax on profitability and on decision-making in case the protective interest rate is above or below the optimum level. At first, we suppose that the investment neither depreciates economically nor for tax purposes. The cash flow is equivalent to the one generated by a financial asset which yields a given rate of return.

With respect to an additional investment of an existing, profitable firm, a suboptimally low protective interest rate is equivalent to a partial exemption of the allowance for corporate equity, where the imputed interest is taxed at a low but still positive statutory tax rate. This is very relevant as most real-world tax systems that rely on an allowance for corporate equity only permit such a partial exemption.[16]

We assume $z = 2.5$ per cent and retain the other assumptions from above. Now, the value of the allowance for corporate equity $z \cdot \tau$ is lower than before. This is illustrated by a smaller parallel shift of the $p \cdot (1 - \tau)$-line (*fig. 2*). Compared with a cash flow-tax or an optimal ACE-tax, the pre-tax rate of return is additionally cut by the amount $(r - z) \cdot \tau$. The extraordinary part of the rate of return is therefore no longer taxed proportionately. High extra-rates of return are taxed at a lower effective tax rate than low extra-rates of return.[17] However, according to (4) investments which are more profitable still bear a greater effective tax burden t than those which are less profitable.

With respect to the marginal investment, now there is a positive tax wedge. The post-tax rate of return of an investment s has to equal at least the market interest rate r in order to be profitable from the point of view of an investor. In the example, this condition is satisfied for a pre-tax rate of return of 6.67 per cent. Thus we obtain a tax wedge $\tilde{w}^Z$ of 1.67 per cent.[18] This is equivalent to an EMTR of 25 per cent.

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[16] In detail, see the references mentioned in footnote 7.

[17] This is illustrated by *fig. 2*: The relation between the distance $p - s$ (tax burden) and the distance $p - r$ (extra rate of return) decreases with an increasing pre-tax rate of return of the investment p.

[18] See *Lammersen* (1999), pp. 76-99, for a more technical model which permits the derivation of effective marginal tax burdens in more general cases and which is based on the approach by *King*/*Fullerton* (1984).

In case we regard the *p*-line as the marginal product of capital, the triangle defined by the *p*-line, the *r*-line and the tax wedge illustrates the excess burden of taxation. The excess burden increases more than proportionately with an increasing statutory tax rate. The same holds true for an increasing difference between the market interest rate and the protective interest rate.

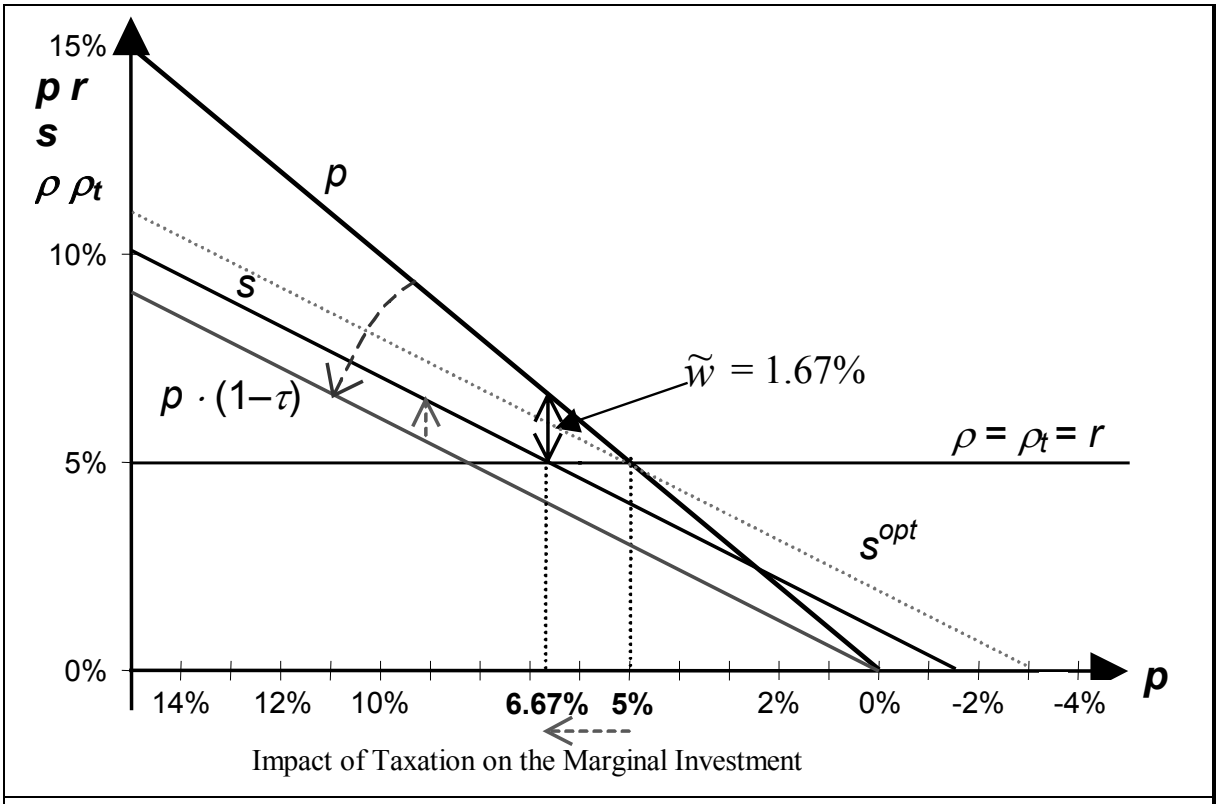

Fig. 2: Rates of return and tax wedge under an ACE-tax and a suboptimally low protective interest rate.

For a suboptimally high protective interest rate, the great value of the allowance for corporate equity $z \cdot \tau$ shifts the $p \cdot (1 - \tau)$-line above the intersection point of the *p*-line and the *r*-line, which determines the marginal investment in case of a neutral tax system (*fig. 3*). Compared with the optimal case, the rate of return of all the investments is increased by $(z - r) \cdot \tau$. Even some of those investments that would be inframarginal without taxation are subsidised; their pre-tax rate of return *s* exceeds their post-tax rate of return *p*.

Meanwhile the discount rate increases. The investor could buy financial assets inside the corporation which yield the market interest rate. The return on these

assets would be taxed at the statutory tax rate; also, the amount invested would qualify for the allowance for corporate equity. Thus, the financial asset would yield a post tax rate of return which marks the opportunity costs of any real investment of

$$\rho_t^* = r \cdot (1 - \tau) + z \cdot \tau, \tag{8}$$

Although the protective interest rate deviates from the market interest rate, there is no wedge between the cost of capital $\tilde{p}$ and the market interest rate r. Compared with the market interest rate, the post-tax rate of return of the financial asset increases by the amount of $(z - r) \cdot \tau$. Thus, compared with the pre-tax level of investment, no additional real investment is undertaken. Any additional real investment would earn less than the subsidised financial asset. However, in the long-run there might be changes in the level of the market interest rate and therefore some consequential effects on real investment.

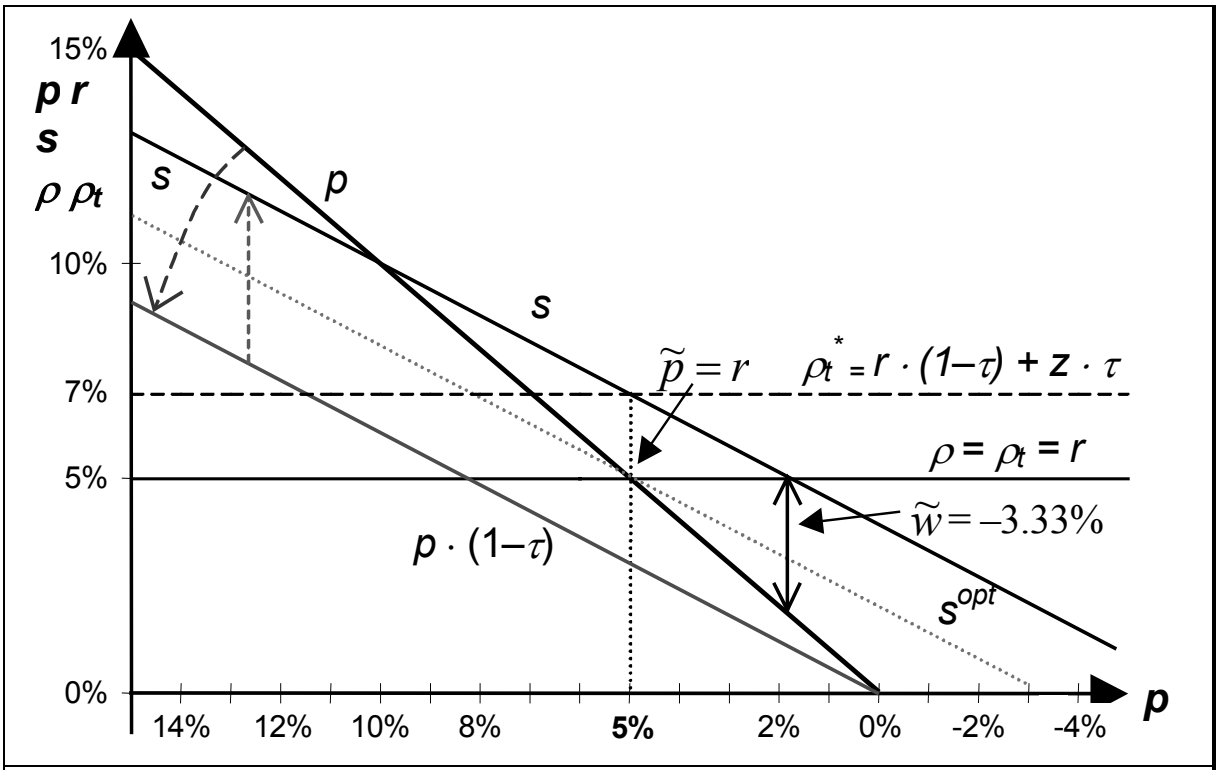

Fig. 3: Rates of return and tax wedge under an ACE-tax and a suboptimally high protective interest rate.

In case the increased protective interest rate applied only to real investment, the discount rate would not increase. Then the market interest rate r would be the benchmark for the post-tax rate of return of any real investment. Due to the sub-

sidy by the increased protective interest rate z, there would be a negative tax wedge $\widetilde{w}$ and a positive excess burden due to overinvestment, as illustrated by *fig. 3*.

To conclude, there might be asymmetric effects of high and low protective interest rates on investment behaviour. A suboptimally high protective interest rate can be offset by the increased rate of return of a firm's financial assets, at least with respect to the primary effects. In contrast, a suboptimally low protective interest rate distorts investment decisions because the financial assets, which are purchased outside the company in this case, are not equally disadvantaged.[19]

2.2.2.2 Deviation of the Protective Interest Rate and Non-Neutral Depreciation

In case of an investment which depreciates economically, we have to consider effects that stem from the tax deductions due to depreciation allowances in addition to the effects that stem from the statutory tax rate and the allowance for corporate equity. Again, we will consider a one-period investment. In this way, the change in the rate of return due to the depreciation allowances can be analysed in isolation.

If we assume the investment to have an initial cost of one, an advantage from an accelerated (decelerated) tax depreciation at a value of deductions of a compared with true economic depreciation at a value of δ induces a tax advantage (disadvantage) of $(a - \delta) \cdot \tau$. According to our assumptions, this advantage is reversed right after one period. Therefore, the final effect is only due to an interest-free tax deferment (tax prepayment). Consequently, the effective advantage (disadvantage) amounts to $\rho_t \cdot (a - \delta) \cdot \tau$. Additionally, the allowance for corporate equity decreases (increases) by $(a - \delta) \cdot z$. The value of this effect is $\tau \cdot (a - \delta) \cdot z$. The whole effect thus amounts to:

$$\Delta s = \tau \cdot (a - \delta) \cdot (\rho_t - z). \tag{9}$$

In case the discount rate ρ_t equals the market interest rate r, there is a positive effect on rates of return in case there is an accelerated (decelerated) tax depre-

[19] The financial assets might, however, be equally disadvantaged if the institutions issuing these assets are also disadvantaged by a low protective interest rate. We do not analyse this case since we assume that a lender might always obtain the unique market interest rate for his funds.

ciation schedule and the protective interest rate is lower (higher) than the market interest rate.

There is a negative effect if an accelerated (decelerated) depreciation schedule is combined with a protective interest rate which is higher (lower) than the market interest rate. Under a suboptimally high protective interest rate, i.e. a protective interest rate that exceeds the unique market interest rate, an accelerated depreciation schedule thus decreases the post-tax rate of return since the value of the interest-free tax deferment from increased depreciation allowances is lower than the one from the lost part of the allowance for corporate equity.

Depreciation allowances do not have an effect on rates of return if there is a neutral depreciation schedule or if the protective interest rate equals the market interest rate and thus the discount rate.

Expression (9) is independent of the pre-tax rate of return of the investment p. This indicates that under these assumptions, an advantage or disadvantage given by the tax base is equivalent to an advantage or disadvantage given by an increased or decreased allowance for corporate equity. Such an effect would be illustrated by a parallel shift. Both effects are based on the initial cost of the investment, not on the rate of return. Thus, their relative importance decreases compared with the relevance of the statutory tax rate with an increasing rate of return of an investment.

2.3 Summary of the Effects on Profitability and Conclusions

2.3.1 Effects Under Theoretical Tax Systems

To sum up, the effects illustrated in *fig. 1* to *3* can be transformed into the effective tax rates calculated by expression (4) and shown in *fig. 4*.

The choice of the protective interest rate is very important for investments that earn a low rate of return. Up to a rate of return equal to the protective interest rate, investment is subsidised ($s > p$; EATR < 0). For a more and more increasing rate of return, the EATR tends towards the statutory tax rate τ. This occurs because the allowance for corporate equity is independent of the rate of return of the investment. Thus, for given tax parameters, the allowance for corporate equity works like a lump-sum subsidy on the capital employed. The greater the

pre-tax rate of return, the relatively less important this lump-sum amount. In principle, the same would be true for a tax advantage given by generous depreciation allowances.

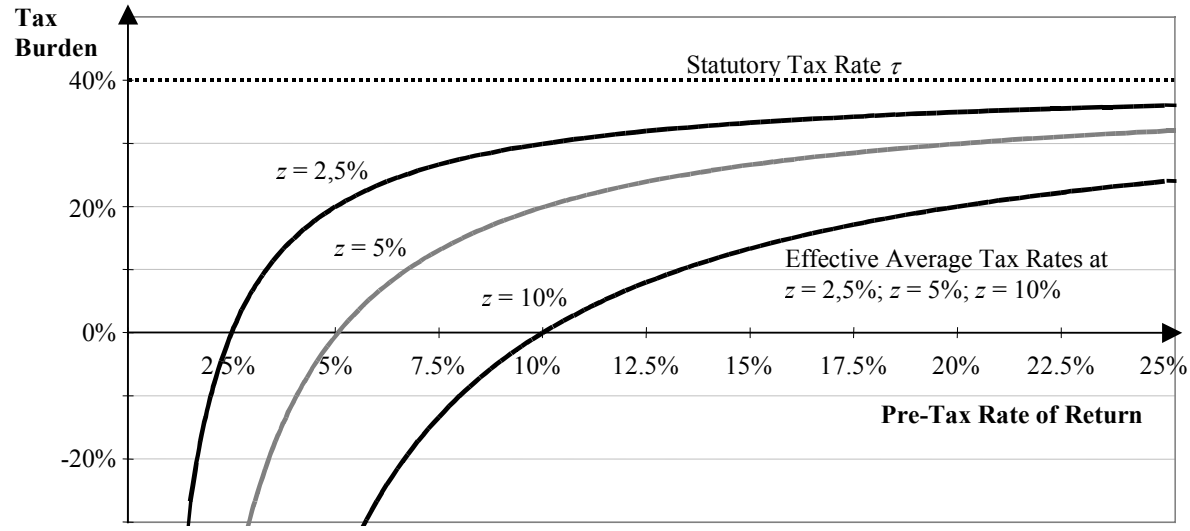

Fig. 4: Effective Average Tax Burdens under an ACE-tax.

To conclude: Under an ACE-based tax system, highly profitable investments face a higher EATR than less profitable investments. The choice of the protective interest rate is (1) important for the determination of the point that separates subsidised from taxed investments. Thereupon, it (2) determines the value of the quasi-lump-sum amount paid by the government on the employed capital. The relative importance of this lump-sum amount decreases with an increasing rate of return, while the relative importance of the statutory tax rate increases.

Therefore, an ACE-based tax might exhibit a disadvantage in international tax competition. This becomes clear when we relax the assumption that any economic rent is completely location-specific and that any investment is arbitrarily divisible.

In fact, investment projects of multinational firms are shaped by discrete decision structures, i.e., the projects are not arbitrarily divisible and are mutually exclusive, and by the existence of relatively high rates of return.[20] To a large

[20] See *Devereux/ Hubbard* (2000), p. 3.

extent, these economic rents are firm-specific and thus independent of a particular location.

If an investor has to decide between an investment in a country that offers a favourable tax base but a high statutory tax rate and a country that offers a less favourable definition of the tax base but a low statutory tax rate, a great expected rate of return in principle is a strong argument for choosing the country that offers the lower statutory tax rate.[21] We show this effect by a real world tax burden comparison now.

2.3.2 Effects Under Existing Tax Systems

We rely on the detailed approach by *Devereux* and *Griffith*[22] for the calculation of the cost of capital, EMTR, and EATR. This approach permits modelling a number of further issues of taxation, e.g. different sources of finance, different assets with complex tax depreciation rules, or inflation. We concentrate on taxation at the corporate level. In analogy to the considerations above, under our assumptions the effective tax rates t calculated by the *Devereux/ Griffith*-approach are a weighted average of the EMTR $\tilde{t}$ imposed on the rate of return as far as it covers the cost of capital, and the statutory corporate tax rate τ imposed on the part of the rate of return which exceeds the cost of capital:[23]

$$t = \frac{\tilde{p}}{p} \cdot \tilde{t} + \frac{p - \tilde{p}}{p} \cdot \tau \,. \tag{10}$$

If two tax systems exhibit different costs of capital and different statutory tax rates, it might depend on the pre-tax rate of return which one of the two tax systems offers the lower effective tax burden.

For example, we show this by relying on the tax systems of Sweden and Italy in early 2001. In addition to depreciation allowances, Italy granted a low tax rate of 23.25 per cent on the part of the profits that did not exceed an imputed interest rate based on equity invested. Effectively, this imputed interest rate ex-

[21] See also *Bond* (2000), p. 173.

[22] See *Devereux/ Griffith* (1999). For technical descriptions of the approach, see also *European Commission* (2001), Annex A, and *Schreiber/ Spengel/ Lammersen* (2002).

[23] See *Spengel/ Lammersen* (2001), pp. 227-228; *Devereux/ Griffith* (2002), p. 11; *Schreiber/ Spengel/ Lammersen* (2002), pp. 13-14.

ceeded the market interest rate.[24] Profits above this imputed interest were taxed at a comparatively high statutory tax rate of 40.25%. In Sweden, the rules for the determination of the taxable base were more restrictive, whereas the statutory tax rate at effectively 26 per cent[25] was significantly lower than the one in Italy.

Starting off from the marginal investment, *fig. 5* plots the effective tax rates for an additional investment[26] computed by the *Devereux/ Griffith* approach.

The cost of capital of an Italian investment is lower than the one of a Swedish investment. This is illustrated by the fact that the solid line representing the Italian investment begins further to the left than the dashed line representing the Swedish investment. Consequently, the EMTR is significantly lower in Italy than in Sweden. It is even negative, indicating that the investment has to earn less than the market interest rate.

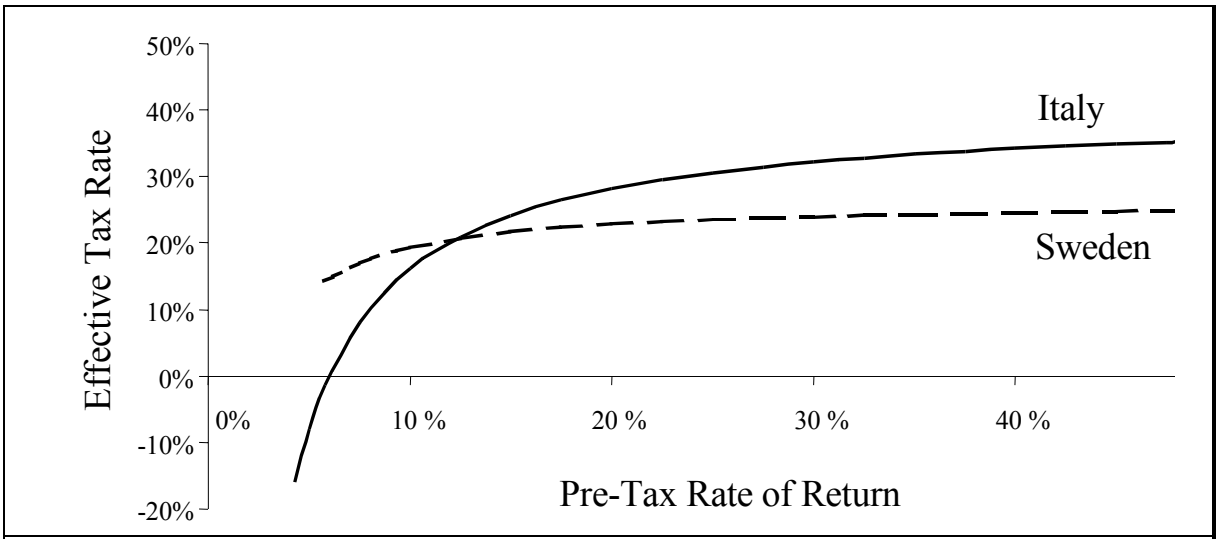

Fig. 5: Effective Tax Burden on a Model Investment in Italy and in Sweden.

[24] See in detail *Bordignon/ Giannini/ Panteghini* (2000).

[25] The statutory tax rate was 28 per cent; by allocating a part of the profits into a tax exempt reserve for up to five years, the effective statutory rate can be reduced to 26 per cent. See *International Bureau of Fiscal Documentation* (2001), p. 554. Furthermore, we assume that the Swedish corporation is a large listed corporation which does not qualify for the profit split rules of the Swedish dual income tax.

[26] The assumed investment consists of a bundle of five different types of assets (industrial buildings, patents, machinery, financial assets, inventories), which is financed by a mix of retained earnings, new equity, and debt. The parameters for the calculations are taken from *European Commission* (2001), pp. 201 and Annex B.

For an increasing rate of return, the weight of more generous depreciation allowances and of the rules for the corporate equity allowance diminishes according to expression (10). Every Euro earned in addition to the cost of capital is taxed at the (effective) statutory tax rate, i.e. 40.25 per cent in Italy and 26 per cent in Sweden. Italy's advantage soon disappears. Under these assumptions, already for low two-digit pre-tax rates of return Sweden regularly is the location where the investor can expect to be left with the greater post-tax economic rent. For highly profitable investments, the EATR approaches the respective statutory tax rate.

According to the theory of the cost of capital and the EMTR, more investments should be realised in Italy than in Sweden. If, however, an investor faces a choice between realising a very profitable investment either in Italy or in Sweden, she will regularly prefer Sweden.

This might indicate that a country has to take account of its headline tax rate, regardless of any elements of an ACE-tax. This headline tax rate on corporate profits should not exceed the one prevailing in competing countries by too much.

With effect from January 2001, Croatia has given up its ACE-based tax system and simultaneously has reduced the statutory corporate income tax rate from 35 per cent to 20 per cent.[27] Regardless of the actual motives of the Croatian government for acting this way, the considerations above might provide a theoretically consistent argument for such a policy. Also, Italy has abandoned its ACE-elements in the meantime.[28] There are statements by the Italian government that the effective statutory corporate profit tax rate should be reduced from 40.25 per cent in 2001 to 33 per cent.[29]

3. Revenue Effects of ACE-Based Taxation

3.1 Starting Point and Assumptions

Based on the simple model developed above, we will now analyse potential revenue effects of an ACE-based tax system. The investigation is limited to

[27] See *Knoll* (2001), pp. 240-241.
[28] See already the remarks in footnote 7.
[29] See *KPMG* (2002).

capital income taxation at the corporate level. Under a pure ACE-tax, there would be no additional tax layer for personal income from capital anyway. However, we do not regard those tax revenues that would result from the taxation of labour income.

In case the ACE-tax is optimally configured, positive tax revenues are only collected from capital that earns an economic rent. To analyse the revenue effects for different levels of the protective interest rate and the statutory tax rate, we will rely on the considerations taken above. Thus the assumptions regarding the economic conditions mentioned in section 2 and used as a basis for *fig. 1* remain valid.

3.2 Estimation of Revenue Effects

To derive an expression for computing the tax payments of a model firm which faces the production function and the economic conditions illustrated by *fig. 1* to *3*, we assume that only real investment qualifies for an increased protective interest rate. The protective interest rate for corporate financial assets is thus limited to the market interest rate.[30]

As we suppose that the funds available for investment are not affected by taxation, the tax-induced reduction in the rate of return is equivalent to the tax paid. With respect to highly profitable investments, there is a positive tax payment by the corporation. If we assume the model firm to be representative for the whole economy, these investment projects generate positive tax revenues. In *fig. 3*, this can be illustrated by the area between p, s, and the ordinate.

Meanwhile, the government might subsidise a number of realised investments due to an excessive protective interest rate. The rate of return of these investments is increased by taxation. From the point of view of the economy as a whole, these investments reduce tax revenue. In *fig. 3*, this is illustrated by the triangle between p, s, and the tax wedge.

On balance, these two effects constitute the whole revenue effect. The tax revenue T can be quantified by measuring the area between the pre-tax rate of return p, the post-tax rate of return s, the highest yielding investment project at $p = 15$

[30] Without this assumption there might be a potential for arbitrage, which might lead to changes in the interest rates. Thus no statements about revenue effects would be possible without a quantification of the effects of these changes.

per cent, and the marginal investment, which exhibits a pre-tax rate of return of $\tilde{p}$. The firm does not undertake any investments beyond the marginal investment, thus there are no further revenue effects.

Algebraically, this area is quantified by:

$$T = \int_{\tilde{p}}^{15\%} p - s \, dp = \int_{\tilde{p}}^{15\%} p - \left[p \cdot (1-\tau) + z \cdot \tau\right] dp \,. \tag{11}$$

Thus the tax revenue is:

$$T = (0{,}0225 \cdot \frac{\tau}{2} - 0{,}15 \cdot z \cdot \tau) - (\tilde{p}^2 \cdot \frac{\tau}{2} - \tilde{p} \cdot z \cdot \tau) \,. \tag{12}$$

To calculate particular values, we have to determine the pre-tax rate of return of the marginal investment $\tilde{p}$ by equating the post-tax rate of return *s* with the market interest rate *r*. Thus:

$$\tilde{p} \cdot (1-\tau) + z \cdot \tau = r \;\Rightarrow\; \tilde{p} = \frac{r - z \cdot \tau}{(1-\tau)} \,. \tag{13}$$

The tax revenue is zero in case the cost of capital exceeds the pre-tax rate of return of the highest-yielding investment, i.e. 15 per cent. Thus:

$$T = (0.0225 \;\frac{\tau}{2} - 0.15 \cdot z \cdot \tau) - (\tilde{p}^2 \cdot \frac{\tau}{2} - \tilde{p} \cdot z \cdot \tau) \quad \text{for } \frac{r - z \cdot \tau}{(1-\tau)} < 15\% \tag{14}$$

$$= 0 \qquad \text{else.}$$

From these expressions, tax revenue can be estimated for all relevant parameter constellations.

3.3 Analysis and Conclusions

Fig. 6 illustrates the revenue effects of this model case.[31]

[31] The expressions are based only on the economic environment illustrated by *fig. 2*. Thus they cannot be applied universally. This does, however, not mean that the principle results cannot be generalised. These results appear plausible also for other economic environments, i.e. production functions which exhibit a different shape or depreciating investments.

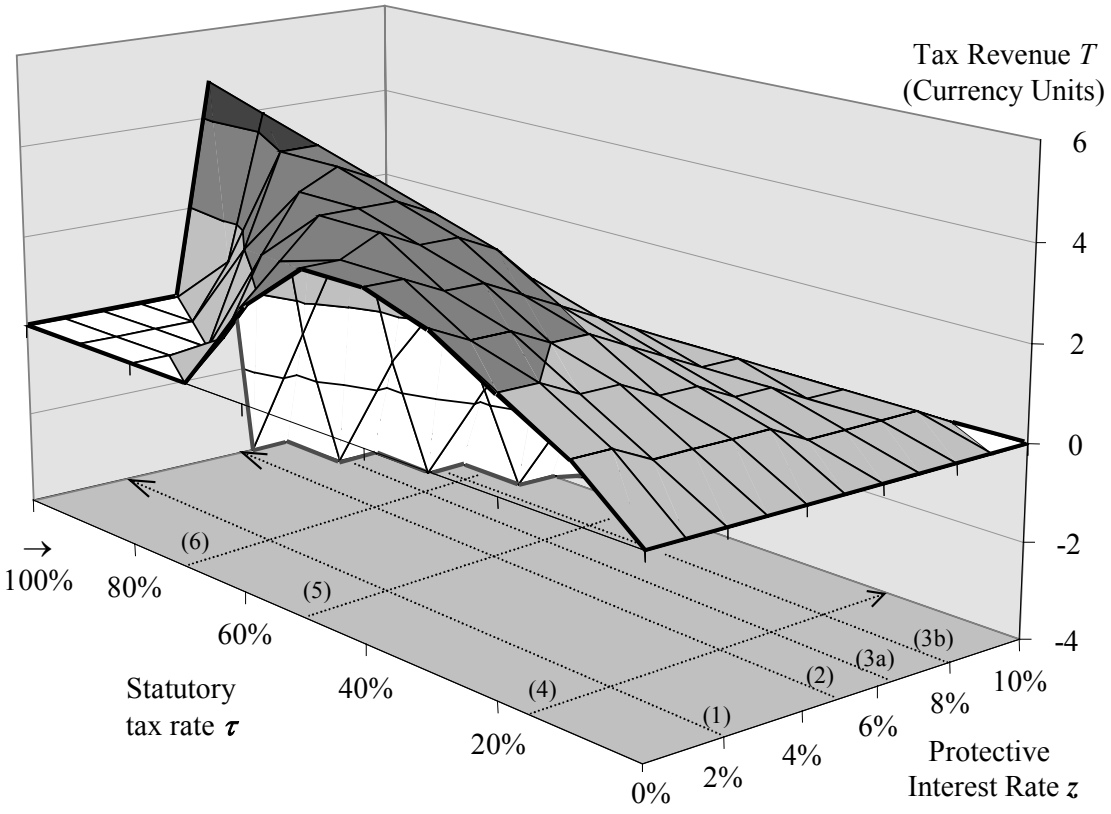

Fig. 6: Tax Revenues for Different Combinations of the Protective Interest Rate and the Statutory Tax Rate.

At first, we vary the level of the statutory corporate tax rate for a given protective interest rate. This is equivalent to a longitudinal section of *fig. 6*. We can distinguish between three different areas:

(1) In case the protective interest rate is lower than the market interest rate, we obtain a revenue effect which is similar to the well-known "Laffer Curve":[32] For low tax rates, an increase in the tax rate leads to an increase in tax revenues. The greater the tax rates, however, the greater will be the tax wedge, as the protective interest rate is too low. The cost of capital increases at the expense of less investment activity and less tax revenue. With an increasing statutory tax rate, this effect becomes more and more dominant. At some point, the cost of capital exceeds the pre-tax rate of return of the highest yielding investment, investment drops to zero, and the tax revenue is zero.

[32] For the *Laffer*-curve see for example *Grüske* (1991).

(2) In case the protective interest rate equals the market interest rate, the revenue effect of an increase in the statutory tax rate is always linearly positive. Investment decisions are not affected by taxation. The economic rent is taxed proportionately. For a tax rate very close to 100 per cent, the economic rent is practically completely seized.

(3) In case the protective interest rate exceeds the market interest rate, there are strong negative effects on tax revenue: First, there are revenue losses and even subsidies of investments that were inframarginal before taxes are considered. Second, due to negative tax wedges, investors increase investment activity and undertake investments that were extramarginal before taxes are considered. In case the protective interest rate is (a) only slightly above the market interest rate, the negative effects on tax revenue dominate positive effects only for high statutory tax rates. This is due to the fact that a higher statutory tax rate admittedly enlarges an existing tax wedge disproportionately.[33] However, if the tax wedge is relatively small, also the effect of an increased tax rate is small. Under a (b) highly excessive protective interest rate negative effects soon dominate positive effects. Especially the negative effect induced by increased investment activity is very costly for the government.

So far, we assumed an immediate loss compensation. Unless an immediate loss compensation is provided, it has to be noted that negative net revenues cannot be expected. The negative revenues illustrated in *fig. 6* mirror the following facts: Firms can build huge tax loss carryforwards and thus might avoid (potential) future tax payments, which reduces (potential) future tax revenue. This strategy is only profitable for corporations if they expect profits which permit the use of the tax loss carryforward. In the long run, under the assumption of time-invariant potential rates of return and a time invariant-tax system, this is not possible. Thus the tax loss carryforward would be worthless for them; the revenue under these combinations of tax rates and the protective interest rate would in fact be zero.

A variation in the protective interest rate, which would be equivalent to a cross-section of *fig. 6*, would have the following effects:

[33] In more detail, see *Lammersen* (1999), p. 104.

(4) For low statutory tax rates, an increase in the protective interest rate leads to a moderate reduction of tax revenues. The tax wedge and thus the effects of taxation on investment decisions do not play an important role here.

(5) For medium-sized statutory tax rates, the revenue maximum shifts into the direction of the optimal protective interest rate as effects of taxation on decision-making become more and more dominant.

(6) For high statutory tax rates, the effects on decision-making are very strong. The tax authorities can only collect tax revenues worth mentioning if the protective interest rate is (almost) optimally configured. Then there are almost no distortions to the investment decision, and the tax raises the maximum revenue. However, *fig. 6* impressively illustrates what a balancing act it is to determine the protective interest rate in this area. Already small deviations from the market interest rate would induce huge revenue losses.

Thus, from a legal point of view, an ACE-based tax in principle exhibits a smaller tax base than e.g. a traditional comprehensive income tax. If there exist economic rents, however, the part of the tax which taxes capital income might collect tax revenues which (theoretically) might seize the whole economic rent. These revenues would surely not be negligible. According to these results, tax revenues which are relatively high and simultaneously not very much affected by a variation of parameters, i.e. which do not require a special „fine tuning“, can be obtained by relying on medium-sized tax rates combined with a rather low protective interest rate.[34]

If we relax the assumptions and permit that international location decisions are shaped by a discrete character and non-location specific economic rents, the considerations mentioned above need a modification. As such location decisions are probably influenced strongly by statutory tax rates, greater tax revenues can be expected for low levels of statutory tax rates. Then, a country might manage to attract a number of profitable investment projects, which would otherwise be realised in different tax territories. Depending on the tax level prevailing in competing locations, for an increasing domestic statutory tax rate, ceteris paribus, more and more relatively profitable investments are withdrawn.

[34] In the example illustrated by *fig. 6*, a statutory tax rate between 40 and 60 per cent combined with a protective interest rate between 1 and 4 per cent generates tax revenues between about 50 and 70 per cent of the economic rent.

Thus tax revenue for high statutory tax rates can be expected to be lower than indicated by *fig. 6*.

Therefore, also from the perspective of tax revenues, the claim that statutory corporate tax rates should not exceed those of other countries by much is supported.

4. Summary

(1) An optimally configured ACE-based tax theoretically satisfies the claim to be neutral with respect to investment decisions.

(2) In case the protective interest rate deviates from the market interest rate, in the model investment neutrality is lost. In order to analyse the effects on investment decisions, the interplay of the protective interest rate and the definition of the tax base have to be considered. For example, an accelerated depreciation allowance might increase the cost of capital in case of an excessive protective interest rate.

(3) The allowance for corporate equity is a tax deduction that is effectively based on the initial cost of an investment. As such, the relative importance of this deduction decreases with an increasing rate of return, whereas the relative importance of the statutory tax rate increases.

(4) Theoretically, an ACE-based tax is suited to generate tax revenues which are not negligible from an economic point of view. To estimate these effects, one has to take the effects from the choice of the protective interest rate and the statutory tax rate on investment decisions into account. Robust tax revenues appear to be generated by a combination of a low protective interest rate and medium-sized statutory tax rates.

(5) Supposed that investment decisions of multinational firms are shaped by firm-specific economic rents and mutually exclusive, discrete alternatives, an ACE-based tax might induce disadvantages in international tax competition insofar as the tax imposes a heavier burden on profitable than on less profitable investments. The statutory tax rate of an ACE-based tax should therefore not exceed the one prevailing in competing locations by much.

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