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Abstract

This paper deals with the efficiency and distributional consequences of a switch from the current German income and corporate tax system to one special variant of an intertemporally neutral tax, an extended ACE (allowance for corporate equity) corporation tax. This tax is favoured by the IFS Capital Taxes Group and was implemented in Croatia in 1994. We not only calculate the welfare consequences of introducing the ACE, but also separate the efficiency effects from intragenerational as well as intergenerational redistribution. The quantitative analysis is based on a dynamic simulation model of the Auerbach-Kotlikoff type which distinguishes between five income classes within each generation. The numerical results indicate that such a fundamental tax reform could yield enormous efficiency gains without necessarily increasing income inequality.

JEL Classification: C68, H22, H25

Keywords: Corporate taxation, intra- and intergenerational incidence, dynamic CGE modeling

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1. Introduction

Reforming capital income taxation is at the forefront of Europe's agenda for tax policy in the next decade. Several issues are at stake. The major ones are the choice of the appropriate international taxation principle, the need for harmonizing capital income tax rates and/or tax bases and the design of a neutral capital income tax system. The present paper concentrates on the latter issue by quantifying the efficiency and distributional effects of a switch from the current system of capital income taxation in Germany[1] to one special variant of an intertemporally neutral tax system, an extended ACE (allowance for corporate equity) corporation tax system.

Currently, taxes on capital income distort the savings decision by driving a wedge between the rate of time preference and the before-tax return to savings; it also distorts the investment decision by driving a wedge between the before-tax and the after-tax return to capital and by favouring certain ways of financing investment. Therefore, the aim of an intertemporally neutral tax system, leaving the savings as well as investment decisions undistorted, has long been the subject of numerous articles, books and reports. Sinn (1987) is still the standard reference for most research on capital income taxation.

In the 80ies, the tax reform debate centered around the cash-flow tax proposals launched by the Meade Committee (1978) or by the Blueprints for Basic Tax Reform (Bradford, 1977). Even if cash flow taxes still seem to be the favorite reform candidates for academic tax experts, they have hardly ever crept into the inner tax policy circles. Among the reasons for this could be that they deviate too greatly from the conventional notion of economic profit and are feared to be ineligible for foreign tax credits in countries with traditional income taxes, or that they are considered to generate unpleasant distributional effects or unacceptable flows of tax revenues.

Therefore it is not surprising that, in the 90ies, another variant of intertemporally neutral capital income taxes has outstripped cash flow taxes. This rival concept is summarized by the term Allowance for Corporate Equity (ACE). While the theory is usually attributed to Boadway and Bruce (1984), the idea was made popular and first elaborated by the IFS Capital Taxes Group (1991, 1994). What might be less well-known is that the theory of ACE had been developed earlier in the German speaking literature by Wenger (1983) and that parallel to, but apparently independently of the IFS, a group of German tax experts had successfully assisted in implementing an interest adjusted income and profit tax (IAIPT) – which is basically the same as ACE – in Croatia[2]. This suggests that ACE is closer to the policy maker's notion of a fair and efficient system of capital income taxation and, hence, probably a better candidate for tax reform in central European countries than competing reform strategies.

[1]Note that Germany has changed its corporate tax system by abolishing the full imputation system and switching to the classical system combined with a so-called half-income method starting in 2002. At the same time the corporate tax rate was reduced to 25 percent as from January 1, 2001. Our benchmark equilibrium refers to the fiscal year 1996. Hence, whenever we speak of the "current" system of capital income taxation, we refer to the full imputation system.

[2]See, for example, Rose and Wiswesser (1998) or Schmidt, Wissel and Stoekler (1996).

The basic idea of ACE is simple: taxable profits should be calculated according to the current method, with an additional allowance for the opportunity cost of equity finance. As to the interaction with personal taxes, the IFS's preferred position and the one realized in Croatia is to combine an ACE allowance with the classical system of company taxation, i.e. to dispense with the imputation system, and to make any return to household savings free of personal taxes. In the following, the term ACE corporation tax includes both an allowance for corporate equity as well as the classical system of corporation taxation. We will speak of an **extended** ACE corporation tax (or simply of extended ACE tax), if, in addition, returns on savings are not taxed under the personal income tax.

Even if an extended ACE corporation tax guarantees intertemporal neutrality, its efficiency properties as compared with the current system of capital income taxation are somewhat less clear. From second best theory it is well-known that reducing the number of distortions does not necessarily increase welfare as long as some distortions cannot be removed. But even if ACE were an efficiency-enhancing reform, its distributional implications are far from obvious and could deter politicians from implementing this tax reform. As far as we know, a quantitative estimate of the efficiency and distributional effects of ACE within a fully dynamic equilibrium model is still lacking. We try to fill this gap by not only calculating the welfare consequences of introducing ACE, but also by separating the efficiency effects from the intragenerational as well as the intergenerational redistributional effects. In a nutshell, our numerical results suggest considerable efficiency gains with no deterioration in intragenerational equity and - at least in our opinion - acceptable consequences for intergenerational redistribution.

Our paper is structured as follows: in the second section we describe our simulation model with special emphasis on the modeling and efficiency properties of capital income tax systems. The third section discusses some methodological issues. We explain how to allocate corporate taxes consistently to households and how to separate efficiency and redistributive effects of tax reforms. Section four contains our simulation results and detailed economic explanations. We conclude with a summary and indicate some extensions.

2. Modeling the economy

This section describes the dynamic simulation model which is used to quantify the welfare effects of the policy reforms under consideration. Since our main focus is on corporate tax reform, we first discuss the tax base and the allocative properties of current German corporate taxation and the ACE corporation tax in greater detail. Then we describe the structure of the remaining model and the initial equilibrium.

2.1. Corporate taxation and investment decisions

Since the elimination of the wealth tax and the trade tax on capital, German companies are mainly burdened by profit taxation. In order to derive the tax base, one has to compute and modify economic profits. Similar to Sinn (1987), we choose a very general formulation which contains the current corporate tax system as well as the ACE corporation tax as special cases.

Let T^u define the corporate tax liability and τ^u the corporate tax rate. The following equation then holds:

$$T^u = \tau^u \Big\{ \underbrace{\Big[Y - wL - \delta K - rB \Big]}_{\substack{\text{economic profit} \\ \text{(without taxes)}}} - \underbrace{\Big[(\tilde{\delta}\widetilde{K} - \delta K) + \alpha_1 I \Big]}_{\substack{\text{changes in} \\ \text{hidden reserves}}} - \underbrace{\Big[(1-\alpha_2)D - \alpha_3 rB + \alpha_4 r\widetilde{K} \Big]}_{\text{auxilary terms}} \Big\} \tag{1}$$

Equation (1) decomposes the tax base of the corporate tax into three components. The first bracket defines economic profit as the difference between corporate earnings (Y) and labor cost (wL), physical depreciation of capital (δK) as well as interest on corporate debt (rB). The second bracket captures the difference between economic and taxable profits. First, we assume that a fraction α_1 of gross investment I may be immediately written off from the tax base. In addition, accelerated depreciation is allowed, where $\tilde{\delta}$ is the rate of fiscal depreciation, $\widetilde{K}$ is the book value of the capital stock and, hence, $\tilde{\delta}\widetilde{K}$ is the depreciation allowance claimed by the firm. Therefore, the second bracket describes the changes in hidden reserves. Due to the principle of uniform reporting, the tax balance sheet of the firm drawn up for the fiscal authorities must coincide with the commercial balance sheet drawn up for the shareholders. Profits (before taxes), Π, are therefore

$$\Pi = Y - wL - \delta K - rB - (\tilde{\delta}\widetilde{K} - \delta K) - \alpha_1 I. \tag{2}$$

The last bracket in equation (1) contains those parts of the tax base which distinguish between the current and the proposed corporate tax system. Germany uses the full imputation system. Therefore, the dummy variables $\alpha_2, \alpha_3, \alpha_4$ are zero and the corporate tax is levied on retained earnings only. Since we refrain from taxing dividends (D) at the firm level, the latter are only taxed at the household level. In the present model, the ACE corporation tax is then represented by[3] $\alpha_2 = \alpha_3 = \alpha_4 = 1$. Note that we retain the accelerated depreciation schemes as well as the investment write-offs even under the ACE corporation tax. Comparing the two tax bases in Table 1 then indicates that – at least in our model – the switch from the current corporate tax to an ACE profit tax only requires fairly modest adjustments in the tax base. Instead of the dividend deduction under the corporate tax, under the ACE corporation tax companies are entiteled to deduct an imputed normal return ("protective interest") on their equity which is equal to the difference between the book or accounting value of the capital stock ($\widetilde{K}$) and the stock of corporate debt (B). Due to our assumption of a perfect capital market, the "protective interest rate" in the present model has to be equal to the market interest rate r.

In order to derive the optimal investment decision, we first have to specify the financing of investment. The funds for net investment ($I - \delta K$) will either originate from retained earnings after taxes ($\Pi - D - T^u$), issues of corporate bonds ($\mathrm{d}B/\mathrm{d}t$) or new equity (Q),

[3] Of course, a different choice for the dummy variables $\alpha_1, \ldots, \alpha_4$ would also allow us to represent and analyze other corporate taxation systems, see for example Keuschnigg (1991).

Table 1: Tax bases

current corporate tax ($\alpha_2 = \alpha_3 = \alpha_4 = 0$)	ACE corporation tax ($\alpha_2 = \alpha_3 = \alpha_4 = 1$)
$Y - wL - \tilde{\delta}\widetilde{K} - \alpha_1 I - rB - D$	$Y - wL - \tilde{\delta}\widetilde{K} - \alpha_1 I - rB - r(\widetilde{K} - B)$

or from liquidation of reserves $[(\tilde{\delta}\widetilde{K} - \delta K) + \alpha_1 I]$. Therefore, we have

$$I - \delta K = (\Pi - D - T^u) + \mathrm{d}B/\mathrm{d}t + Q + (\tilde{\delta}\widetilde{K} - \delta K) + \alpha_1 I. \tag{3}$$

This identity is always valid, independent of the corporate tax system.

The relevant literature emphasizes the importance of institutional constraints for the optimal financing and investment decision of the firm[4]. We specify the most simple case by assuming that companies realize a fixed proportion of debt and capital

$$B = \beta K \tag{4}$$

and finance a fixed share γ of net investment with new equity issues:

$$Q = \gamma(I - \delta K). \tag{5}$$

Since $I - \delta K = \mathrm{d}K/\mathrm{d}t$, equation (4) also implies that a proportion β of net investment is financed by borrowing. This implies that remaining net investment is financed by retained earnings.

Substituting equations (1)-(2) and (4)-(5) in (3) yields dividends as

$$D = [1 - (1 - \alpha_2)\tau^u]^{-1} \Big\{ (1 - \tau^u)[Y - wL] - \big[(1 - (1 - \alpha_3)\tau^u)\beta r + (\beta + \gamma)\delta\big] K - (1 - \beta - \gamma - \alpha_1 \tau^u) I + \tau^u(\alpha_4 r + \tilde{\delta})\widetilde{K} \Big\}. \tag{6}$$

Corporate earnings Y are computed from the difference between gross earnings $F(K, L)$ and adjustment costs $\Phi(I, K)$, i.e.

$$Y = F(K, L) - \Phi(I, K). \tag{7}$$

The production technology $F(\cdot)$ is linear homogenous. Investment gives rise to adjustment costs which are captured as output losses. The installation technology $\Phi(\cdot)$ is also linear homogenous, shows increasing marginal costs of investment and is normalized to zero in the long run equilibrium.

[4]See, for example, Boadway and Bruce (1979), Sinn (1987) or Kanniainen and Södersten (1995).

The non-arbitrage condition

$$(1-\tau^d)D + (1-\tau^g)(\mathrm{d}V/\mathrm{d}t - Q) = (1-\tau^r)rV, \tag{8}$$

where V stands for the market value of shares and τ^d, τ^g and τ^r are the personal tax rates on cash dividends, capital gains and interest, can be rearranged to express the valuation of shares as

$$V = \int_{t_0}^{\infty} \left\{ \left(\frac{1-\tau^d}{1-\tau^g} \right) D(t) - Q(t) \right\} e^{-r^n(t-t_0)} \mathrm{d}t \quad \text{where} \quad r^n = r(1-\tau^r)/(1-\tau^g). \tag{9}$$

Since we consider a progressive capital income tax at the household level, individuals with different levels of capital income face different marginal tax rates. Therefore, in order to derive a uniform firm value in equation (9), we have to assume $\tau^d = \tau^r = \tau^g$. Due to the full imputation system practiced in Germany, this assumption is quite realistic for the dividend and interest income tax rate. The only problem is that in our formulation capital gains are fully included in the tax base, whereas in reality they are only taxed upon realization within some narrow speculation terms. However, this does not seem to be very problematic. On the one hand, the revenues from capital gains are rather unimportant in our model. On the other hand, we know that this assumption will tend to improve the allocative properties of the existing income tax of the Schanz-Haig-Simons type.

As usual, the objective of the firm is to maximize the value of shares V according to equation (9), taking into account (7), (6), (5) as well as the equations of motion for the physical and the accounting stock of capital

$$\mathrm{d}K/\mathrm{d}t = I - \delta K, \tag{10}$$

$$\mathrm{d}\widetilde{K}/\mathrm{d}t = (1-\alpha_1)I - \tilde{\delta}\widetilde{K}. \tag{11}$$

From the resulting optimality conditions it is possible to derive the following user cost of capital in the steady state for the two corporate tax systems under consideration.

Table 2: Steady state costs of capital

current corporate tax	ACE corporation tax
$\frac{1}{1-\tau^u}\left\{(\beta+\gamma)[(1-\tau^u)r+\delta]+ \left[1-\beta-\gamma-\tau^u\left(\alpha_1+\frac{(1-\alpha_1)\tilde{\delta}}{r+\tilde{\delta}}\right)\right](r+\delta)\right\}$	$r+\delta$

Under the ACE corporation tax, the user costs of capital are equal to the sum of interest and depreciation costs. Since these costs are independent of the tax system, the corporate tax has no impact on the investment decision of the firm (*investment neutrality*). If, in addition, capital income is not taxed at the household level, then the income tax system is also *intertemporally neutral*, since the time preference rate of households is equal to the (net) marginal product of capital. In the case of the currently existing corporate tax system, the situation is quite different. The user costs of capital now depend on the depreciation allowances and tax parameters, as well as on financial behavior of the firm. It is not even clear whether an increase in the corporate tax rate increases or decreases the cost of capital. If a high fraction of investment can be written off immediately or if depreciation for tax purposes is much higher than true economic depreciation, then it is possible that an increase in the tax rate may even reduce the cost of capital. In the literature [for example, Sinn (1987, 145)] this result is refered to as the taxation paradox. It is only in very special cases[5] that the corporate tax system will not distort investment decisions and capital allocation.

The long run values for the shadow prices of the accounting stock of capital $\tilde{q}$ and the physical capital stock, q, also yield some interesting insights. While the former denotes the present value of the tax savings associated with a specific tax system, the latter measures the present value of future net earnings associated with one unit of newly installed capital. Hayashi (1982) has shown that the value of the firm is equal to the sum of the physical and accounting stock of capital, valued with the respective shadow prices, i.e.

$$V = qK + \tilde{q}\widetilde{K}. \tag{12}$$

Under the ACE corporation tax, it can be shown that tax savings are completely independent of depreciation rules and equal to the tax rate, i.e.

$$\tilde{q} = \tau^u. \tag{13}$$

Consequently, accelerated depreciation or immediate investment write-offs have no impact on the present value of future net earnings from additional capital. This shadow price is simply derived as the share of a firm's own resources net of the corporate tax rate, i.e.

$$q = 1 - \beta - \tau^u. \tag{14}$$

In contrast, under the existing corporate tax system, tax savings increase with the depreciation rate allowed for tax purposes. Consequently, the shadow price of physical capital depends on the financing decision and the depreciation system.

Summing up, this section illustrates the attractivity of the ACE corporation tax in comparison to the existing corporate tax system. The ACE system is investment neutral and accelerated depreciation schemes have no impact on the return of alternative investment projects. From an efficiency point of view these are very attractive properties, which are also emphasized by the proponents of ACE. Our study goes beyond this general insight: on the one hand, we want to quantify these potential efficiency gains. On the other hand, we would like to know whether these positive efficiency effects must be paid for by negative intra- and intergenerational redistribution effects.

[5] For example, we could reproduce the neutrality result of equation (12) from Kanniainen and Södersten (1995) with specific parameter values in our model.

2.2. General structure and initial equilibrium of the simulation model

We have discussed the optimization problem of the firm in the previous subsection in great detail since this building block of the simulation model is of great importance for our purpose. The description of the remaining blocks of the model, on the other hand, will only be dealt with briefly. The interested reader is referred to our appendix or to Fehr (1999), on which our model is based. Here the following remarks will suffice:

As for the household sector, consumption, savings and labor supply decisions are derived from a 55 period life-cycle model. The idea is that each household or generation enters the labor force at the age of 20 and expects to die 55 years later. There is no uncertainty with respect to the time of death. Labor supply as well as participation decisions are endogenous. In each period, a new generation is born and it is assumed that the population grows at some exogenously fixed growth rate n. Within each generation, we distinguish between five different types of households, which differ with respect to labor productivity and, therefore, belong to different lifetime income quintiles[6]. Hence, in each period, our model distinguishes between 275 types of households according to age and income. Each household maximizes a time-separable, constant elasticity of substitution (CES) utility function, defined over consumption and leisure, subject to a lifetime budget constraint. Parameter values and functional forms are assumed to be the same for each household. This reflects the belief that poor households would behave the same as rich households, provided they had the same (higher) income.

In the different phases of their life cycle, households receive labor income, capital income and pensions. Pensions are based on former income-related contributions. The pay-as-you-go pension system and the tax treatment of contributions and benefits is modelled according to the institutional setting in Germany.

Labor income is taxed according to the linear progressive tax schedule currently valid in Germany[7]. To derive taxable income, all households are assumed to apply the same deduction from gross income. We thereby choose a deduction level which yields a realistic labor income tax revenue in the benchmark equilibrium. After a basic allowance of DM 12000/24000 for single/married households, marginal tax rates then rise from 25.9 per cent to a maximum of 53 per cent. This direct progressive labor income taxation is not altered in the simulations. In principle, capital income in Germany is subject to the same linear progressive tax rate schedule. However, a specific "savings allowance" of DM 6000/12000 for single/married housholds is granted. In addition, a variety of tax saving opportunities exist for high income earners. As a result, most of capital income is not taxed at all in practice. Since an exact representation of the present capital income tax system was not possible technically, we assume that capital income is subject to indirect progressive taxation, where (in addition to the savings allowance) higher income classes can also claim

[6] This is similar to Altig et al. (1997) or Kotlikoff et al. (1998) who distinguish between twelve lifetime income classes within each generation.

[7] See Fehr and Wiegard (1998) for a more detailed description of the German income tax system and tax reform discussion.

higher allowances on their capital income. In addition to the already explained income taxes, the government also levies a consumption tax and borrows on the capital market in order to finance the expenditures for public goods, transfers to households and interest payments on public debt. In the short run, all markets clear by means of price adjustments. In the long run equilibrium, all nominal variables such as GDP, capital stock etc. grow with the same rate.

In the appendix we report the parameters which have chosen exogenously in order to solve the model. These parameters are in accordance with previous studies and yield a benchmark equilibrium which resembles the macroeconomic situation in Germany in 1996, as illustrated by Tables 3 and 4.

Table 3: Macroeconomic structure in the benchmark and in reality

	Model benchmark	Germany 1996[1]
Expenditures on GDP (Per cent of GDP)		
Private consumption	68.3	57.6
Government consumption	18.4	19.6
Gross fixed investment	13.3	21.4
Export-import	0.0	1.4
General government indicators (Per cent of GDP)		
Aggregate pension benefits	7.2	10.0
Gross debt	60.0	60.7
Interest paid	5.4	3.7
Tax revenues		
Labor income tax	9.9	7.3
Capital yields tax	1.1	1.2[2]
Corporate income tax	1.4	1.6[3]
Tax on goods and services	10.2	9.3
Saving rate[4]	7.9	12.8

[1] *Source:* Deutsche Bundesbank (1997). [2] Withholding taxes on interest and capital yields plus corporate tax on distributed profits. [3] Trade tax on capital income plus corporate tax on retained earnings. [4] Change in assets as a percentage of disposable income.

We should mention that the current account is in equilibrium in the benchmark equilibrium. Starting from the same initial equilibrium, we are, therefore, able to compare the introduction of the neutral tax system in a small open as well as in a closed economy.

3. Separating efficiency and redistributive effects of tax reforms

The advocates of ACE or IAIPT promise a fairer and a more efficient tax system. However, almost no comprehensive quantitative estimates exist regarding the potential efficiency

Table 4: Income distribution in the model and in reality

	Model benchmark	West Germany 1992[1]
Gini-coefficients[2]	0.269	0.264
Quintile shares of annual income in %		
Lowest	9.3	9.48
Second	13.7	14.04
Third	17.4	17.78
Fourth	21.6	22.80
Top	38.0	35.91

[1] *Source:* Mueller et al. (1994, 49). [2] Based on annual disposable income.

and distributional effects resulting from a switch from the current to the proposed system of capital income taxation. But some knowledge of the relevant numbers is of crucial importance for a politician who has to decide upon the introduction of such a tax system. How large are the asserted efficiency gains, expressed, for example, in per cent of the GDP or in DM or EURO? Which households – rich or poor, old or young – win and which lose and by how much as a result of such a tax reform? In other words: what are the intragenerational and intergenerational redistribution effects of reforming capital income taxation? Are the efficiency and distributional effects quantitatively so important that the switch is worthwhile?

In order to answer questions like these, we proceed as follows: starting from the currently existing tax system, we compute the respective welfare levels realized by each household – old and young, poor and rich – in the benchmark. Then the tax reform is implemented in a specific period. Due to changes in prices and tax payments, investors and consumers will alter their behavior. As a consequence, the economy will leave the existing equilibrium path and approach a new steady state. Given the transition path and the new long run equilibrium, we are able to compute the new welfare position of each household living in the year of the reform as well as in future years. The difference ΔW between the welfare levels before and after the tax reform then shows whether a specific household is better off ($\Delta W > 0$) or worse off ($\Delta W < 0$). The computation of the welfare changes is most important for the characterization of the tax reform. Although this calculation is already fairly complicated, it is still relatively simple compared to the problem which we aim to solve. Our interest lies not only in the welfare effects of the tax reform, but rather we intend to quantify the efficiency and redistributive effects of such a reform. This means that we want to decompose the welfare changes into their respective efficiency and distributive components. Redistributionally determined welfare changes may arise for two different reasons: first, even tax reforms which are revenue neutral in the aggregate will alter the tax burdens for individual households. Some households will have to pay more, while other households will end up paying less taxes. Second, comprehensive tax reforms typically change not only relative after-tax prices, but also gross-of-tax prices. While the latter is irrelevant for efficiency considerations, it gives rise to redistributive effects. For example, if the market wage increases for whatever reason, workers will gain at the expense of the owners of firms.

Turning to the efficiency components of welfare changes, behavioral reactions come to the fore. In order to avoid taxes, households or firms will substitute away from more heavily taxed activities. Fehr and Kotlikoff (1996) or Fehr and Wiegard (1998) have demonstrated in detail how the total welfare changes (ΔW) following some policy experiment can be decomposed into the following three components: redistribution due to a different present value of tax payments (ΔT), redistribution due to a change in gross-of-tax prices (ΔP) and tax avoidance activities (ΔX), or formally:

$$\Delta W = -\Delta T + \Delta P + \Delta X. \tag{15}$$

Note that the negative sign indicates that an increase in the tax burden reduces welfare. Tax avoidance activities refer to behavioral reactions, including income as well as substitution effects. Therefore, this term should not be confused with the efficiency changes. In order to isolate the efficiency effects or excess burdens of the tax reform, one has to eliminate all income effects by compensating households for any distributional gains or losses. This means in our context that the redistributional content of the welfare change has to be neutralized by countervailing transfers. After eliminating income effects by appropriate transfers, tax avoidance effects are converted into pure efficiency effects or changes in excess burden (ΔEB).

In the following section, we numerically calculate the welfare changes (ΔW) as well as the respective efficiency changes (ΔEB) for different households and generations. The total redistributional content of the tax reform under consideration can be approximated by the difference $\Delta W - \Delta EB$. One central problem in separating the efficiency from the distributional component of welfare changes is to determine the tax burden for each houshold resulting from corporate taxes. Whereas the latter are levied upon the firm, the households are the ones which finally have to bear the burden of the tax. Allocating these burdens would not be necessary if we only intended to calculate the welfare effects of tax reforms. In this case, the burden resulting from corporate taxes is implicitly incorporated in the welfare changes. However, the decomposition of efficiency and distributional effects of corporate tax reforms explicitly requires the imputation of the corporate tax on private housholds.

For this reason, we extend the previous discussion in Fehr and Kotlikoff (1996) or Fehr and Wiegard (1998) by showing how an ACE corporation tax is allocated towards households. In order to concentrate on the central elements of our procedure, we must introduce some drastic simplifications. We will consider a two period life cycle model, where intragenerational heterogeneity is neglected. There are no adjustment costs and young and old generations are assumed to receive the same wage rate per unit of labor supply at a given point in time. Compared to the previous section, we also now switch to discrete time periods. In a given period t, the corporate tax revenue, therefore, has to be imputed to young and old households living in the same period in a consistent way. Consider first the tax revenue equation (1) for the case $\alpha_2 = \alpha_2 = \alpha_3 = 1$:

$$T_t^u = \tau_t^u \left[Y_t - w_t L_t - (r_t + \tilde{\delta}_t)\widetilde{K}_t - \alpha_1 I_t \right]. \tag{16}$$

Substituting the Euler equation for homogenous functions

$$Y_t = F_{L_t} L_t + F_{K_t} K_t \tag{17}$$

as well as the relationship

$$\alpha_1 I_t = [K_{t+1} - (1-\delta)K_t] - [\widetilde{K}_{t+1} - (1-\tilde{\delta}_t)\widetilde{K}_t]$$

which results from (10) and (11), we derive

$$T_t^u = \tau_t^u \left\{ \left[(1 + F_{K_t} - \delta)\, K_t - (1 + r_t)\widetilde{K}_t \right] - \left[K_{t+1} - \widetilde{K}_{t+1} \right] \right\}.$$

In the long run equilibrium, the last equation simplifies further to

$$T_t^u = \tau^u \left\{ (1+r)[K_t - \widetilde{K}_t] - [K_{t+1} - \widetilde{K}_{t+1}] \right\} \tag{18a}$$

$$= \tau^u \left\{ (r-n)[K_t - \widetilde{K}_t] \right\}. \tag{18b}$$

Theoretical as well as empirical studies[8] indicate that the long run growth rate of developed economies is below the market interest rate. The same applies for the calibration of the present numerical model. According to equation (18b), in the long run the ACE corporation tax only yields a positive annual revenue if, due to accelerated depreciation schemes ($\tilde{\delta} > \delta, \alpha_1 > 0$), hidden reserves exist in the commercial balance sheet of the firm. In the case of true economic depreciation, the revenue from the ACE system would disappear[9], while a positive revenue is achieved through accelerated depreciation. This somewhat surprising result is due to the fact that higher depreciation rates immediately reduce the accounting stock of capital and, consequently, the protective interest deduction is reduced as well.

Equation (18a) shows that the revenue from an ACE corporation tax can be decomposed into a tax on the already existing capital stock in period t and a subsidy on the future capital stock (or, more precisely on the difference between the true market value and the accounting value of the capital stock). In our two generation model, it is quite intuitive to allocate the revenue from the taxation of the old capital stock to its owners, i.e. the old generation living in period t, while allocating the subsidy payment $-\tau^u[K_{t+1} - \widetilde{K}_{t+1}] < 0$ to the respective young generation, which finances the future capital stock.

[8]For an empirical study, see Abel, et al. (1989); Homburg (1992) derives a theoretical explanation for $n < r$.

[9]Of course, this is due to the fact that the present model assumes perfect competition and no public investment or other fixed factors. In reality, positive economic rents exist due to imperfect competition and public infrastructure. An ACE system would tax these rents even in the case of true economic depreciation.

By considering the budget constraints of the old and young generation living in period t, i.e.

$$C_t^2 = w_t(1 - l_t^2) + (1 + r_t)A_t - T_t^2 \tag{19}$$

as well as

$$C_t^1 = w_t(1 - l_t^1) - A_{t+1} - T_t^1, \tag{20}$$

we can show that our approach is indeed consistent. In the last equations, C_t^1 and C_t^2 denote consumption, l_t^1 and l_t^2 leisure demand[10] and T_t^1 and T_t^2 the taxes of young and old generations living in period t. Taxes include labor and capital income taxes as well as consumption taxes, but not corporate taxes. A_t denotes the assets held by the old generation at the beginning of period t (having been built up in period $t-1$), which may consist of bonds and equity shares. Consequently, in the aggregated model we have

$$\begin{aligned} A_t &= V_t + B_t \\ &\overset{(12)}{=} q_t K_t + \tilde{q}_t \widetilde{K}_t + B_t. \end{aligned} \tag{21}$$

Similarily, A_{t+1} denotes the savings of the young generation in period t.

Substituting (21), (4) and – if we consider only the steady state – the values of q and $\tilde{q}$ from (14) and (13) in (19), after some manipulations by using the definition

$$T_t^{2,U} := \tau^u \left\{(1 + r)[K_t - \widetilde{K}_t]\right\} \tag{22}$$

for the share of the corporate tax which is born by the old generation, we obtain the equation

$$C_t^2 = w(1 - l_t^2) + (1 + r)K_t - (T_t^2 + T_t^{2,U}). \tag{23}$$

Thereby the term $(T_t^2 + T_t^{2,U})$ expresses the aggregate tax burden for the old generation in period t.

Even without a formal proof, it is obvious that, in a similar way, for the young generation we can derive:

$$C_t^1 = w(1 - l_t^1) - K_{t+1} - (T_t^1 + T_t^{1,U}) \tag{24}$$

with

$$T_t^{1,U} \ := -\tau^u[K_{t+1} - \widetilde{K}_{t+1}] < 0 \tag{25}$$

as the subsidy part of the ACE tax, accruing to the young generation.

Up to now we have only explained the imputation of an ACE corporation tax to households. In the same way, it is possible to allocate the revenue from the existing corporate tax. However, additional complications arise since, in this case, the capitalized tax subsidies from accelerated depreciation and immediate investment write-offs have to be taken into account. In the case of an ACE corporation tax, such calculations are not necessary. Taking into account adjustment costs during the transition from the old to the new long

[10] The time endowment is normalized to unity.

run equilibrium further complicates these equations. The interested reader is referred to our appendix.

4. Simulation results

Starting from the benchmark equilibrium as described in Tables 3 and 4, we will now simulate policy reforms and compute the resulting equity and efficiency consequences. Thereby the transition to the extended ACE corporation tax system is decomposed into various steps. In the first step, we simulate a reduction of the corporate tax rate from 53 to 45 per cent. This corresponds in our model with an elimination of the trade tax in Germany and gives us an idea of the implied welfare consequences of corporate tax rate reduction. Next we successively introduce the changes in the corporate tax base and eliminate the taxation of savings returns at the household level. First, we switch from the full imputation system to a corporate tax of the classical type by including dividends in the tax base (i.e. $\alpha_2 = 1$). After that, we introduce the ACE allowance, i.e. a protective interest deduction on the firm's equity (i.e. $\alpha_3 = \alpha_4 = 1$). We, therefore, now have an investment neutral tax system. In the last step, we switch to the intertemporally neutral extended ACE tax system by eliminating the taxation of capital income at the household level. All of these simulations are run in a small open and a closed economy. Since we assume that public consumption per capita is constant, the budget is always balanced by adjusting the consumption tax rate. The following tables report the numerical results of the different simulations. We first describe the macroeconomic response, and then the associated welfare, distributional and efficiency effects of each reform step.

4.1. Macroeconomic response

Table 5 provides a summary overview of the time path of some relevant macro-aggregates and prices after the reforms. The numbers in each consecutive column represent the cumulative effects of all the single steps considered before. For example, the numbers in the third column refer to a simultaneous reduction in the corporate tax rate, to a switch from an inputation to a classical system of corporate taxation as well as to an allowance of interest on corporate equity. Each experiment starts at the beginning of year 1, and year infinity denotes the new long run equilibrium. Since the capital stock is fixed in the initial period, we report the change in capital stock starting with year 2. Note that the trade balance is measured as a percentage of GDP, and that, therefore, the respective changes as well as the changes of the consumption tax rate are in percentage points and not in percentages.

Consider now the macroeconomic consequences of a reduction in the corporate tax rate in the first column of Table 5. In the short run, such a policy has two main effects: it lowers asset prices, since the value of the existing depreciation tax shield is reduced, and it increases investment demand, since the shadow price of capital rises. The negative wealth effect increases labor supply slightly. Investment, on the other hand, rises strongly, while consumption and exports fall on impact. During the transition, the capital stock rises, increasing wages and the GDP. The trade balance, therefore, improves temporarily and the

Table 5
Macroeconomic effects of an extended ACE corporation tax in a small open economy

Year	tax rate reduction	classical corporation tax	ACE corporation tax	extended ACE tax
Employment				
Year 1	0.2	6.4	4.2	7.3
Year 3	0.2	5.1	3.6	6.4
Year 5	0.3	4.1	2.9	5.4
Year infinity	-0.9	-2.1	-3.1	-4.6
Capital stock				
Year 2	0.8	0.9	3.2	3.5
Year 3	1.5	1.6	6.3	6.7
Year 5	2.8	2.8	11.4	12.2
Year infinity	6.8	3.0	30.5	28.5
GDP				
Year 1	0.1	4.5	2.4	4.5
Year 3	0.6	4.1	4.0	6.0
Year 5	1.0	3.7	5.0	7.0
Year infinity	1.2	-0.6	5.3	3.7
Trade balance				
Year 1	-0.6	4.8	0.6	3.1
Year 3	-0.2	4.0	1.3	3.6
Year 5	0.1	3.2	1.6	3.6
Year infinity	-0.7	-6.0	-4.5	-10.5
Asset price				
Year 1	-5.2	-45.6	-40.1	-39.2
Year 3	-6.2	-46.6	-42.5	-41.9
Year 5	-7.1	-47.3	-44.4	-44.0
Year infinity	-10.7	-49.1	-52.3	-52.3
Wage				
Year 1	0.0	-1.9	-1.3	-2.2
Year 3	0.4	-1.0	0.7	0.0
Year 5	0.7	-0.3	2.5	1.9
Year infinity	2.4	1.6	9.7	9.7
Consumption tax				
Year 1	0.0	-8.7	-3.3	-4.1
Year 3	0.0	-8.3	-3.6	-4.6
Year 5	-0.1	-8.2	-3.6	-4.7
Year infinity	-0.3	-7.6	-4.4	-2.9

All changes reported are percentage increases over baseline steady state, except for changes in the trade balance and the consumption tax, which are expressed as percentages.

consumption tax rate falls slightly due to the higher consumption tax base. In the long run, higher wages increase human wealth. Consequently, labor supply and employment fall again, while consumption increases. This explains the long run trade balance deterioration.

The inclusion of dividends in the tax base of the corporate tax has rather dramatic consequences. First, the double taxation of dividends reduces firm values enormously. The elderly, who own the capital stock, experience a sharp income reduction, while younger generations benefit. As a result, aggregate savings increase strongly. Second, due to the higher tax revenues from corporate taxation, consumption taxes can be reduced considerably on impact. Households, therefore, substitute goods for leisure consumption and increase their labor supply. Consequently, wages fall and employment increases more strongly than before. The higher employment increases capital productivity during the transition. Therefore, capital accumulation in the first years of the transition is slightly stronger in comparison to the previous simulation. However, labor supply and employment is much lower now in the new long run equilibrium. Since the long run capital stock also expands much less than in the first experiment, wages increase less than in the previous scenario.

In the next step, the ACE allowance is deducted from the corporate tax base. Corporate tax revenues are now lower and, therefore, consumption taxes are reduced much less than in the previous experiment. On impact, employment and GDP increase less than before. However, corporate taxation is now neutral, i.e. it no longer distorts investment decisions. Investment demand, therefore, rises strongly and the capital stock increases steadily during the transition. Due to the 30 per cent rise in the long run capital stock, wages increase now by almost 10 per cent.

Finally, the abolition of capital income taxation on the household side immediately drives up the net-of-tax interest rates for most households. This has two main consequences. First, human wealth decreases and, consequently, households reduce their leisure and consumption demand. Second, households will substitute current consumption for future consumption and save more. Consequently, labor supply and savings increase while consumption falls on impact. The former reduces wages on the labor market, which in turn drives up employment, asset prices and investment demand in comparison to the previous simulation. The latter improves the trade balance. Note that the long run costs of capital have to be identical in the last two experiments (see Table 2). Consequently, since long run employment falls more strongly, the long run capital stock will rise less than before. At the same time, long run wages and asset prices have to be identical in both simulations.

When the switch to an extended ACE corporation tax system is simulated in the closed economy, the increase in domestic savings is only invested domestically. Therefore, the capital stock, labor demand and wages rise much faster than before. During the transition, interest rates now fall on the capital market, increasing human wealth and reducing labor supply. In the short run, the reduced labor supply dominates and, consequently, employment increases less than in the small open economy. In the long run, however, employment falls much less than before due to the higher labor demand of firms.

Table 6: Aggregate equity and efficiency effects of ACE

	small open economy		closed economy	
	ACE corporation tax	extended ACE tax	ACE corporation tax	extended ACE tax
	Annual aggregate efficiency gain			
in % of tax revenue	8.83	10.73	7.20	9.27
in bill. DM	70.64	85.84	57.60	74.16
	Annual Gini-coefficient[1] (Base year: 0.270)			
Year 1	0.264	0.263	0.265	0.268
Year 10	0.263	0.265	0.264	0.262
Year 20	0.265	0.275	0.259	0.259
Year infinity	0.267	0.295	0.259	0.238

[1] Based on annual disposable income.

4.2. Welfare, efficiency and equity

We now arrive at the more interesting results of our study. Are there any efficiency gains and if so, how high are they? What are the distributional implications of an investment or even intertemporally neutral tax system? Before we discuss the details of our simulation results, the efficiency and distributional consequences of the main policy reforms are presented with some aggregate indices.

In the upper part of Table 6, we report the annual efficiency gains in per cent of the tax revenue from the initial equilibrium and in billion DM. As shown, the model predicts an annual efficiency gain between 60 and 70 billion DM for an ACE corporation tax and an annual gain between 75 and 85 billion DM for the extended ACE corporation tax. Of course, these are impressive numbers. However, they have to be interpreted carefully, since they depend on the chosen parametrization. Nevertheless, even if one would allow for a margin of error of 10 billion DM above and below these numbers – such variations typically result from alternative parameter values – the remaining efficiency gains are still considerable.

The lower part of Table 6 summarizes the distributional implications by reporting the Gini-coefficients of annual net income for specific years during the transition and for the final steady state. The relevant Gini-coefficient in the benchmark was 0.270. Therefore, an ACE corporation tax reduces annual income inequality in the closed economy, as well as in a small open economy. If, in addition, capital income taxation is eliminated at the household level, annual income inequality decreases even further in a closed economy, but increases in a small open economy.

Again, these results have to be interpreted carefully. Nevertheless, they indicate that the enormous efficiency gains are not necessarily accompanied by undesirable distributional effects. The interpretation of the Gini-coefficients is especially problematic, since they are based on *annual* net income. A systematic evaluation of the welfare consequences of such a tax reform has to be based on lifetime income. This will be done in the following.

Tables 7 contains the welfare consequences of the considered policy reforms in the small open economy. In each table, the first column lists the different lifetime income quintiles and representative generations for which the welfare effects are reported. We have selected only the lowest, the middle and the top income quintile. In addition, we also report the aggregate effect for the entire generation. The numbers in the head column refer to the birth year of a household or generation. The policy reform starts at the beginning of period 1 (which is identical with the end of period 0). The number "0", therefore, refers to the generation (or household) born at the end of period 0 which starts working 20 years after the tax reform. Similarily, the number "-20" refers to the generation which starts working in the reform period, while the number "-70" means that this generation is 70 years old at the time of reform and has 5 years to live. Finally, "Infinity" denotes the generations born after the new steady state equilibrium has been reached. The subsequent columns report the individual or aggregate welfare and efficiency changes resulting from the different reforms. All welfare changes are expressed as percentages of the remaining lifetime resources of the respective generation in the benchmark equilibrium. This is the standard practice in dynamic simulation models[11]. Similarily, whenever we refer to aggregate effects across income classes, the present value of remaining lifetime resources over all income classes is used as the reference magnitude. The *inter*generational welfare effects of a policy reform are reported in the lowest ("Aggregate") part of Table 7. The *intra*generational incidence effects are revealed by comparing the welfare changes of the different income classes.

Let us now explain the reported welfare consequences of the different simulation experiments in Table 7. Consider first the intergenerational effects of the reduction in the corporate tax rate. Not surprisingly, the implied lower intertemporal distortions result in efficiency gains for all generations. However, since the consumption tax rate falls during the transition, already retired generations experience almost no change in excess burdens, whereas the gains rise slightly for future generations. If one adds the income effects to these efficiency gains, one arrives at the welfare changes of the reform. Of course, the elderly have to bear a higher tax burden due to the tax induced reduction in asset prices. In contrast, tax burdens fall for younger and future generations since they buy the future capital stock and have to pay lower consumption taxes. Since the income losses dominate the efficiency gains, the reduction of the corporate tax rate hurts older generations. Younger and future generations, on the other hand, experience efficiency as well as distributional gains.

Next we turn to the different income quintiles. It appears that low income households experience underproportional efficiency gains, while at the same time their distributive gains are more than proportional. Due to the progressive labor income tax, labor supply of rich households is much more distorted than labor supply of low income households. The reduction in the consumption tax rates, therefore, increases efficiency for rich households more

[11] For a discussion, see Fullerton and Rogers (1993, 22f.).

Table 7
Welfare effects of an extended ACE corporation tax in a small open economy

	tax rate reduction		classical corporation tax		ACE corporation tax		extended ACE tax	
Birth year	ΔW	ΔEB	ΔW	ΔEB	ΔW	ΔEB	ΔW	ΔEB
Lowest Quintile								
-70	-0.75	0.03	-3.81	-0.05	-4.68	0.05	-4.02	0.02
-50	-0.22	0.19	-1.71	0.13	-1.89	0.53	0.01	0.79
-30	0.37	-0.01	1.87	0.13	1.86	-0.05	2.82	0.77
-20	0.62	0.09	3.25	0.37	3.42	0.27	4.03	0.83
0	1.07	0.19	3.66	0.43	5.34	0.49	5.58	0.97
Infinity	1.10	0.19	3.69	0.42	5.61	0.49	5.75	0.94
Third Quintile								
-70	-0.85	0.03	-4.79	-0.04	-5.42	0.04	-4.85	0.01
-50	-0.33	0.13	-2.17	0.47	-2.44	0.62	-1.01	1.13
-30	0.21	0.23	1.27	0.87	1.17	1.10	1.88	1.56
-20	0.43	0.20	2.68	0.70	2.62	0.99	3.04	1.26
0	0.73	0.24	2.92	0.70	3.89	1.26	3.97	1.52
Infinity	0.76	0.23	2.96	0.69	4.07	1.29	4.07	1.53
Top Quintile								
-70	-0.72	0.02	-4.15	-0.02	-4.62	0.02	-4.17	0.01
-50	-0.44	0.18	-2.61	1.25	-2.79	1.17	-2.48	0.94
-30	0.13	0.32	0.86	0.90	0.73	0.87	0.94	0.79
-20	0.39	0.17	2.44	0.81	2.36	0.78	2.51	0.72
0	0.67	0.25	2.69	0.84	3.11	1.03	2.95	0.99
Infinity	0.70	0.25	2.74	0.82	3.30	1.02	3.08	0.96
Aggregate								
-70	-0.77	0.02	-4.34	-0.03	-4.92	0.03	-4.40	0.01
-50	-0.35	0.17	-2.23	0.75	-2.45	0.86	-1.54	0.98
-30	0.20	0.23	1.17	0.81	1.07	0.89	1.30	1.17
-20	0.44	0.17	2.65	0.69	2.62	0.80	2.93	0.96
0	0.76	0.25	2.93	0.72	3.82	1.06	3.80	1.21
Infinity	0.79	0.24	2.96	0.71	4.02	1.06	3.93	1.19

Changes expressed as per cent of the present value of remaining lifetime resources.

strongly than for poor households. At the same time, tax burdens for low income households fall more than proportionally. Consumption taxation is, therefore, regressive in the present model, although we apply a lifetime incidence approach. This might be surprising on first sight, since in a life cycle setup, lifetime consumption is usually proportional to lifetime income[12]. On our model, however, rich households consume relatively more leisure than low income households due to the progressive labor income tax. As a consequence, consumption taxation is regressive even in a lifetime perspective.

The next columns show the welfare and efficiency consequences when the adjustments of the corporate tax base are taken into account. The introduction of a 'classical system' for corporate taxation has two counteracting effects on efficiency: on one hand, intertemporal distortions increase, depending on the share of investment financed out of new share issues[13]. On the other hand, intratemporal distortions are reduced since consumption tax rates fall strongly. Remember that only 5 per cent of marginal investment is financed out of new share issues. Consequently, the taxation of dividends implies the substitution of a distortionary tax, i.e. the consumption tax, by an almost non-distortive tax. The efficiency gains, therefore, increase strongly for all generations except for the already retired, who are not able to substitute intratemporally.

While the sharp decline in consumption tax rates reduces their tax burdens, the dramatic fall in asset prices hurts the elderly. Since the latter effect overcompensates the former, income is redistributed away from the elderly towards younger and future generations. Overall, older generations, therefore, experience welfare losses, while younger and future generations gain strongly. The intragenerational consequences follow the same pattern as explained above. Therefore, low income households benefit more than proportionally from the reduction in consumption taxes, while at the same time excess burdens are reduced less than proportionally.

The next two columns report the effects of the complete ACE reform proposals. The intergenerational efficiency effects are due to two countervailing effects: compared to the previous simulation, distortions of investment are now completely removed, which improves the intertemporal allocation. However, now the consumption tax rate can only be reduced less than before, implying higher intratemporal distortions. Since the former effect dominates the latter, efficiency increases for most generations compared to the previous experiment. The higher consumption taxes also increase the tax burdens of older generations. Younger and future generations, on the other hand, mainly benefit from the dramatic rise in long run wages. Consequently, the income redistribution from old towards young and future generations is stronger than in the previous experiment.

The stronger increase in wages leads to higher marginal labor income tax rates which dampen the efficiency increase, especially in the low and in the top income quintiles. Nev-

[12]Especially in the last few years, this argument has been made against annual incidence studies which show that the consumption tax is regressive, see the overview in Chernick and Reschovsky (1996).

[13]The taxation of dividends on the firm side is not distortionary as long as investment is financed by retained earnings. This is one of the central findings of the "New View" of dividend taxation, see Sinn (1991).

ertheless, the shift towards an investment neutral corporate tax redistributes tax burdens away from low and middle income households towards households from the top income quintile. The welfare gains in the lowest income quintile, therefore, rise particularly strongly, while the welfare gains in the top quintile rise only slightly compared to the previous simulation.

When the capital income tax is finally completely removed at the household level, efficiency gains increase for all generations. Note that generations around 30 to 50 years of age experience the highest efficiency gains compared to the previous experiment. Of course, these generations mainly benefit from the elimination of capital income taxes. Younger generations pay no capital income taxes at the time of the reform and, therefore, the efficiency gains are lower for them.

The tax burdens for the elderly fall, since they have to pay less consumption taxes now. In addition, some elderly might also benefit directly from the elimination of the capital income taxes. For young and future generations, however, tax burdens increase, since the long run consumption tax rates are higher than in the previous experiment. Therefore, income is now redistributed away from future generations towards the middle-aged and older generations living in the reform year. Finally, the disaggregation into different lifetime income quintiles reveals that low income households realize much higher efficiency gains than households from the top income quintile. This reflects the low personal allowances for capital income from low income households in the benchmark equilibrium. The direction of the intragenerational redistribution is not so clear. On the one hand, tax burdens for low income households fall more than proportionally, since they pay the most capital income taxes relative to lifetime income. On the other hand, they are hurt more than proportionally by the higher long run consumption tax rates.

In the appendix we report the welfare and efficiency consequences, when the last two experiments are repeated in a closed economy. There are three main differences compared to the small open economy: first, the efficiency gains are slightly reduced. Since there are no capital inflows from abroad, the short run capital accumulation is dampened. Consequently, intertemporal distortions are removed more slowly than before. Second, the intergenerational redistribution towards future generations is stronger. This is mainly due to changes in gross-of-tax prices. The long run capital stock rises more strongly than in the closed economy. Therefore, long run wages also increase much more strongly. Third, the intragenerational redistribution towards low income households is greater, especially in the long run. This is due to changes in tax burdens. The long run rise in wages increases the revenues from the progressive labor income tax, which in turn allows the regressive consumption taxation to be reduced further than in the small open economy.

This completes the explanation of our simulation results.

5. Summary and conclusions

The starting point for our paper were the recommendations of the IFS Capital Taxes Group (1991, 1994) and by related researchers [for example, Devereux and Freeman (1991); Bond, Devereux and Gammie (1996)] for a fundamental reform of capital income taxation. With respect to the taxation of business profits, the IFS favours the so-called ACE corporation tax which allows the deduction of the opportunity cost of corporate equity in calculating taxable profits. An additional recommendation is to combine this ACE allowance with a switch from the current imputation system to the classical system of corporate income taxation. The proposal for taxing personal savings implies that all income and gains earned on savings out of taxed sources should be exempt from further taxation. While in the United Kingdom such a fundamental reform is still hotly debated, the Republic of Croatia has implemented already such a tax system in 1994. Whereas the theoretical advantages of this tax experiment are quite known, information about the quatitative magnitude of the effects seems to be quite poor. Our paper tries to fill this gap by evaluating the efficiency and distributional effects of introducing an ACE corporation tax and exempting the returns on savings from the personal income tax in Germany. The aggregate efficiency effects are surprisingly high, amounting to about 80 billion DM annually or 10 per cent of the reform year's total tax revenue. Intragenerational distribution of annual disposable income as measured by the Gini-coefficient would remain more or less unaffected by the ACE corporation tax. An extended ACE tax system would deteriorate the intragenerational distribution in a small open economy, but improve it in a closed economy. With respect to the intergenerational redistribution, a switch to the ACE corporation tax or the extended ACE tax system would clearly favor young and future generations at the expense of currently living elderly.

Since the proposed tax reforms are not beneficial for all households, any evaluation involves some value judgement. Our position is that the implied intergenerational redistribution is not problematic, since it counteracts the ongoing redistribution towards the currently elderly through public debt and paygo financed public pension schemes.

All in all, our simulation exercise clearly indicates that the introduction of an ACE corporation tax, combined with a tax relief for personal savings, is a worthwile undertaking. On the one side it offers enormous efficiency gains, while at the same time the implied distributional consequences seem to be acceptable and provide no reason as to why this tax reforms should not be implemented.

We admit that our results are only a small part of the whole story. And the details of the envisaged tax reform might be intricate, see Isaac (1997). The taxation of the self-employed is a matter of concern, whenever income from capital and from labor are taxed at different rates. In addition, international taxation issues have to be carefully examined. McLure and Zodrow (1998) report that the U.S. Internal Revenue Service did not allow a foreign tax credit for a proposed cash flow tax in Bolivia. From an economic point of view, a business cash flow tax and the ACE corporation tax are closely related. Hence, introduction of ACE by one single country only could be a risky undertaking[14]. Additional complexities would arise, whenever an allowance for corporate equity would be granted, but the imputation system and the progressive taxation of returns on personal savings would be retained.

[14]As far as we know, Croatia has not yet signed any double tax treaty with one of the member states of the European Union.

The basic message of our paper is that despite all these difficulties, the ACE corporation tax should be seriously considered for introduction in Europe. Probably no other reform will yield similar efficiency gains without conflicting with distributional goals.

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