Small Business Economics (2007) 29:101–118
DOI 10.1007/s11187-006-0003-1

Effects of Corporate Tax Reforms on SMEs' Investment Decisions under the Particular Consideration of Inflation*

Chang Woon Nam
Doina Maria Radulescu

ABSTRACT. Corporate tax reforms carried out in EU countries since 1980 entail lower statutory tax rates and reductions in generous tax depreciation provisions. Several countries including the UK have reduced tax rates for small and medium sized enterprises (SMEs). This study compares incentive effects of such reforms on the SMEs' investment decisions adopting a simple present value model. Ceteris paribus, tax rates and depreciation rules vary in the model simulation, while the application of historical cost accounting method in inflationary phases leads to fictitious increases in nominal net present value. Apart from the construction of international ranking, country-specific patterns of reform effects are also illustrated.

KEY WORDS: corporate tax reform, EU countries, inflation, investment decision, SMEs, tax base determination

JEL CLASSIFICATION: H25, H32

1. Introduction

The vast majority of firms that operate in advanced countries are small and medium-sized enterprises (SMEs). Therefore, SMEs' competitiveness significantly affects the competitive position of a country's economy as a whole. The concentration of SMEs' activities on domestic market leads to a bounded business vision. Combined with the asymmetric information about profit opportunities abroad, this fact tends to limit the diversification of SMEs' investments in an international context. Consequently they appear to be more directly affected by the national corporate tax reform than is the case with large multinational firms. On the other hand, SMEs have quite often been the primary target group of such an investment promotion policy (Chen et al., 2002; Devereux et al., 2004; Hendricks et al., 1997). According to Coyne (1995), SMEs are generally more responsive to domestic tax incentives than large ones. Taxes may play a more important role in the cost structure of SMEs because they do not have the financial and human capacity to developed sophisticated tax avoidance strategies.

Furthermore, it is a general belief that SMEs have limited access to capital markets, both nationally and internationally, in part because of the perception of higher risk, informational barriers and the involvement in smaller projects, etc. As a result, SMEs have quite often been unable to obtain long-term finance in the form of term debt and equity, and a larger part of their investments have traditionally been self- financed. According to Chen et al. (2002) the corporate tax system encourages debt financing and discriminates against SMEs in most OECD countries, since corporate interest payments are tax deductible. Such a type of tax non-neutrality between the financing methods favours large firms, which have easier access to bank loans.

Some EU countries including the UK have traditionally had lower tax rates for SMEs, whereas such a corporate tax reduction does not exist in countries like Austria, Finland and Germany at all. Although it is disputable, those countries that provide fiscal incentives and preferential tax treatment to SMEs claim that they (1) create a large number of jobs and (2) enhance the level of entrepreneurship, which implies flexibility, speed, risk-taking and innovation (Chen et al., 2002). A further reason for the tax policy attention paid to SMEs is that

Final version accepted on January 19, 2006

Chang Woon Nam, Doina Maria Radulescu
Ifo Institute for Economic Research
Poschingerstrasse 5, 81679, Munich
Germany
E-mail: nam@ifo.de

they represent "an important breeding ground for large, profitable, tax-paying employers of the future and [experience] high growth rates in comparison to large enterprises" (Hendricks et al., 1997, p. 1). According to Santarelli and Vivarelli (2002), however, those less-efficient SMEs tend to have a higher expected probability to exit from the market than larger firms do and for this reason it is optimal for them to invest more gradually in the course of time, since entry and other investment costs made at the setting-up phase are sunk. In this context a government subsidy may reduce differences between the efficient and the inefficient firms, and consequently disturb not only investment decisions but also market selection as well as the learning process undergone by entrepreneurs.

The statutory corporate tax rate is clearly important in calculating the overall tax burden. However, this tax rate does not, in itself, establish the ultimate tax burden on a firms' investment activity. Equally crucial are the effects of depreciation and other investment promotion provisions that determine the tax base (Sørensen, 2004). In the practice of corporate tax policy different tax depreciation rules are employed that do not typically ensure the so-called true economic depreciation (Samuelson, 1964; Sinn, 1987). Furthermore, their generosity has been extended to stimulate private investment.

On the other hand, depreciation based upon historical cost is undervalued during inflationary phases, as the real cost of depreciation of today's assets is underestimated when the asset base is measured in nominal terms (Cohen and Hasset, 1999; Haufler and Schjelderup, 2000; Ott, 1984). There have been a number of attempts to estimate the current value of a capital good on the basis of indexation (Feldstein, 1979; Feldstein and Summers, 1979; Hulten and Wykoff, 1996). "Such a method would provide for equitable accounting whether inflation rates were high or low. [But] many agree that it would be too complicated to compute the rate of inflation for the multitude of different assets. The idea of using an overall index was rejected on the grounds that some assets such as computers actually [decline] in price over time and this method would bias investment towards those assets that increased in price" (Evans, 1983, p. 150).

The tax-rate-cut-cum-base-broadening reform experienced in the developed countries in last two decades "has interesting effects on firms' investment incentives. Most empirical research on the impact of taxes on investment and – most theoretical work on tax competition aimed at attracting mobile capital in the global context – has focussed on the impact of taxes at the margin (Hines, 1999; Wilson, 1999; Devereux and Griffith, 2002). Typically corporate income taxes raise the cost of capital – the required rate of return on an investment – and therefore act as a disincentive to invest. The two aspects of these reforms have offsetting effects on this disincentive: the lower tax rate typically increases the incentive to invest, while the lower allowance decreases it. The combined effect depends on the details of each reform" (Devereux et al., 2002, p. 452).

The research of the effective capital income tax rates based on the so-called user cost of capital approach received a significant stimulus from King and Fullerton (1984). The follow-up studies in this area often suggested that "the tax systems of most [advanced] economies were characterized by serious non-neutralities in the early and mid-1980s, [...] reflected in large differences in marginal effective tax rates on capital across different asset types, modes of finance, and investor groups, [and] their overall burden was quite high, in particular because of failure to adjust the nominal tax base for inflation" (Sørensen, 2004, p. 2). Triggered by the liberalisation of international capital flows in the 1980s, Alworth (1988) and Keen (1991) further developed the King-Fullerton approach – originally focussed on domestic investments financed by domestic savings – to capture the aspect of taxing multinational companies. The studies made by Devereux together with Griffith and Klemm (including Devereux and Griffith, 1998, 2003; Devereux et al., 2002; Devereux, 2004) have made a decisive contribution to the generalisation and expansion of the same approach for estimating average[1] and marginal effective tax rates on domestic and foreign investment in the EU and OECD countries

(European Commission, 2001; OECD, 1991). According to these international studies of effective tax rates, foreign investment is likely to be overtaxed in relation to the domestic type due to incomplete alleviation of international double taxation. Yet an overestimation of the tax burden can emerge since the open-economy King–Fullerton framework does not allow for all the important possibilities for tax planning available to multinational companies, which include taxation of royalties, use of tax havens for financing subsidiaries, allocation of parent interest expense to foreign income, shifting options for debt to high-tax foreign locations or the home country, etc. (Altshuler and Grubert, 2003; Grubert, 1998, 2003, 2004; Sørensen, 2004).

The effective (marginal and average) corporate tax rates are often defined as forward-looking measures demonstrating the effect of tax on future expected earnings on a specific investment project. On the other hand, the calculation of average tax burden – for example, in terms of a proportion of aggregate tax revenue to profit or a certain macroeconomic tax base like a measure of the operating surplus of the economy (Mendoza et al., 1994) – is characterised to be backward-looking since it captures "the impact of tax on the returns in any period of the whole past history of a firm's investment decisions" (Devereux et al., 2002, p. 456). One reason for the low popularity of this method in the field of capital income taxation is that apart from corporate income taxes the aggregate tax revenue also includes, for instance, taxes on land, an immobile factor (Griffith and Klemm, 2004). However, the effects of taxation on such immobile factors and other input taxes for production are increasingly gaining importance for firms' investment decisions and location choices in the international context (Desai et al., 2004).

A similar forward-looking examination can also be carried out based on the present value model (Atkinson and Stiglitz, 1980; Nam and Radulescu, 2005). In other words this study argues that discrete investment choices of profit-maximising SMEs are dependent on the post-tax net present value (NPV). Without taxation, NPV is equal to the present value of future gross return, discounted at an appropriate interest rate less investment cost. After the introduction of tax on corporate income, the present value of the asset generated from an investment amounts to the sum of present value of net return (gross return less taxes) and tax savings led by an incentive depreciation provision. An investment project is considered to be profitable when NPV is positive. Only in an exceptional case when tax depreciation corresponds to Samuelson's true economic depreciation and its calculation is based on current replacement cost of capital is the tax neutrality guaranteed in an inflationary phase. The superior features of such a dynamic investment decision model include, for example, that (1) one can adequately consider the development of gross return generated by an investment, (2) the true economic depreciation rate is not simply assumed but endogenously derived from the trend of gross return, (3) the impacts of adopting different accounting methods of tax depreciation can be well illustrated when inflation prevails, and (4) firms most widely apply this method in practice, especially when carrying out the so-called feasibility study for checking overall profitability of investment projects.

Unlike a large number of previous studies mainly dealing with capital income taxation of large multinational firms based on the user cost of capital approach, this study primarily examines adopting a simple present value model the incentive effect of corporate tax reforms on the SMEs' investment decisions under the particular consideration of inflation, which were carried out in selected EU nations since the beginning of 1980s. Ceteris paribus, (SME-specific) corporate tax rates and depreciation rules vary in the model simulation carried out under the assumption of self-finance, while the application of historical cost accounting method in inflationary phases leads to fictitious increases in nominal NPV (Devereux et al., 2002; Feldstein, 1979; Kay, 1977). As a consequence in period with inflation generous tax concession measures do not provide incentive effects as initially designed, since such fictitious gains prevail (Nam and Radulescu, 2004). In spite of the fact that the inflation rate has been gradually decreased in Europe the low rate still appears to matter for the calculation of the tax base and SMEs' investment decisions.

The agenda of study is as follows. Section 2 briefly explains the recent evolution of corporate tax system in selected EU countries. Section 3 technically describes the major nature of present value model applied for the calculation of true investment promotion effects of tax policy measures. Section 4 illustrates the empirical results based on the calculated nominal NPV under the plausible parameter assumptions and compares the changes in international competitiveness of individual countries led by the numerous corporate tax reforms. The final section summarises the major findings of the study and concludes.

2. Corporate tax reforms for SMEs in selected EU countries

As Devereux et al. (2002) pointed out, "[t]he last two decades have seen considerable reforms to corporate income taxes in major industrialised countries. Statutory rates have fallen from an average of 48% in the early 1980s to 35% by the end of the 1990s. The main wave of reforms occurred in the mid to late 1980s but the pace has continued throughout the 1990s [in many countries]" (p. 451). To a large extent such a 'race to the bottom' process has been triggered by the fierce tax competition among EU members and other advanced nations aimed at attracting capital, in particular direct investment of multinational firms (see also Devereux and Griffith, 2003; Haufler and Schjelderup, 2000; Janeba, 1995; Keen, 1991; OECD, 1998, 2000). Furthermore "tax bases were broadened, particularly during the eighties; effective tax rates, which capture the impact of the tax rate and base on the return from an investment, fell for profitable projects, but remained fairly stable for projects that just break even or make low profits; tax revenues from corporate income have remained broadly stable as a proportion of GDP since 1965; tax revenues from corporate income have declined as a proportion of total tax revenue since 1965, but have remained relatively stable since 1980" (Griffith and Klemm, 2004, p. 30).

In general a series of corporate tax reforms carried out in Austria, Finland, France, Germany, Ireland and the UK between 1980 and 2003 have also entailed lower statutory tax rates accompanied by a reduction in generous tax depreciation provisions (see Tables I and II). Apart from the fact that there are clear differences in country-specific reform features, it should, however, be noted that the timing and direction of changing individual corporate tax parameters did not always take place simultaneously and coherently. In particular some diversifications from the general trend have become increasingly visible in these countries since the mid-1990s.

Germany is the only country that experienced throughout the investigated years a continuous decline of the tax rate from 56 to 25% accompanied by the replacement of geometric-degressive depreciation (30%) to straight-line depreciation (10%) for equipment investment incurred in 2001. Until the beginning of the 1990s, Ireland and the UK also reduced the tax rate (for example, to 40% and 25% in 1994, respectively) and abolished the free depreciation rule at the same time. In recent years, however, both countries realised a type of 'tax-rate-cut-cum-base-narrowing' reform especially addressed to SMEs. In this context the SME-specific corporate tax rate has been lowered continuously to 12.5% and 19% in 2003 in Ireland and the UK, while allowing a more generous straight-line depreciation through shortening the tax lives (from 7 to 5 years) in the former country and providing additional accelerate depreciation for SMEs in the latter. In the UK geometric-degressive depreciation (25%) is allowed for large firms, since free depreciation was replaced in 1993.[2]

Since the beginning of 1990s France has no longer pursued active tax rate reduction but has kept its level of 33.33% until now. In the investigated years there was a single modification of geometric-degressive depreciation rate from 25 to 37.5% in 1994. Compared to the case of the countries mentioned above, Austria and Finland experienced a quite different pattern of tax rate development. Its initial decline in the 1980s was counteracted by the increase of the tax rate in the beginning of 1990s: the Austrian corporate tax rate varied from 55% (1980) to 30% (1989) and 34% (1994) while the same rate changed from 43% (1980) to 19% (1992) and 29% (2000) in Finland. In the second half of the

TABLE I
Statutory corporate tax rates (%) for SMEs in the selected EU countries in the case of profit retention

	Austria	Finland	France	Germany	Ireland	UK
1980	55	43	50	56	45	40 (52)
1981	55	43	50	56	45	40 (52)
1982	55	43	50	56	45	40 (52)
1983	55	43	50	56	50	38 (50)
1984	55	43	50	56	50	30 (45)
1985	55	43	45	56	50	30 (40)
1986	55	33	45	56	50	29 (35)
1987	55	33	39	56	50	27 (35)
1988	55	33	39	56	50	25 (35)
1989	30	33	37	50	47	25 (35)
1990	30	25	34	50	43	25 (34)
1991	30	23	34	50	43	25 (34)
1992	30	19	33.33	50	40	25 (33)
1993	30	25	33.33	45	40	25 (33)
1994	34	25	33.33	45	40	25 (33)
1995	34	25	33.33	45	38	24 (33)
1996	34	28	33.33	45	38	23 (33)
1997	34	28	33.33	45	36	21 (33)
1998	34	28	33.33	45	32	20 (31)
1999	34	28	33.33	40	28	20 (30)
2000	34	29	33.33	40	12.5 (25)	20 (30)
2001	34	29	33.33	25	12.5 (20)	20 (30)
2002	34	29	33.33	25	12.5 (16)	19 (30)
2003	34	29	33.33	25	12.5	19 (30)

Note: The rates shown in parentheses are standard statutory tax rates existing together with SME-specific corporate tax rates. Source: Chen et al. (2002), Taxation, SMEs and Entrepreneuship, OECD, Paris; Devereux et al. (2004), Why Has the UK Corporation Tax Raised So Much Revenue?, Fiscal Studies 25, 367–388; Office of Tax Policy Research (University of Michigan), World Tax Database; KPMG Corporate Tax Rate Survey (Various Years); Ifo Institute for Economic Research.

1990s such a tax-rate-increase reform was combined with a base-broadening policy through reducing the generosity of investment tax allowance (from 20 to 9% of investment cost in Austria) and geometric-degressive depreciation (from 30 to 25% in Finland).

3. Nominal net present value model

The generosity of different types of tax depreciations in combination with corporate tax rates can be measured on the basis of a NPV model. The central issue of the model analyses is that the historical cost accounting method which is applied in inflationary phases when calculating the corporate tax base (instead of current cost accounting method), causes a fictitious gain in nominal NPV. Therefore, in periods with inflation the true investment promotion effect of generous tax concessions can be measured in terms of the nominal NPV with depreciation scheme subtracted by the fictitious gain.

Under the assumptions that (i) an equity-financed investment generates an infinite stream of future gross return and (ii) this return exponentially declines at a given rate α $(0 < \alpha < 1)$, Samuelson (1964) demonstrated in his fundamental theorem of tax-rate invariance that corporate income taxation does not affect firms' investment decisions at all when true economic depreciation (TED) – the negative change in value of the asset in the course of time – is deducted from an expected gross stream of return when calculating tax profits. And the TED rate is the same rate at which the gross return declines in the course of time: i.e. the TED rate $= \alpha$ (Alvarez et al., 2000; Atkinson and Stiglitz, 1980; Nam and Radulescu, 2005; Sinn, 1987).

TABLE II
Most popular generous tax depreciation rules for SMEs' equipment investment in selected EU countries when normal tax life = 10 years

	Austria	Finland	France	Germany	Ireland	UK
1980	ita20% + sld10%	gdd30%	gdd25%	gdd25%	fd100%	fd100%
1981	ita20% + sld10%	gdd30%	gdd25%	gdd30%	fd100%	fd100%
1982	ita20% + sld10%	gdd30%	gdd25%	gdd30%	fd100%	fd100%
1983	ita20% + sld10%	gdd30%	gdd25%	gdd30%	fd100%	fd100%
1984	ita20% + sld10%	gdd30%	gdd25%	gdd30%	fd100%	fd100%
1985	ita20% + sld10%	gdd30%	gdd25%	gdd30%	fd100%	fd100%
1986	ita20% + sld10%	gdd30%	gdd25%	gdd30%	fd100%	fd100%
1987	ita20% + sld10%	gdd30%	gdd25%	gdd30%	fd100%	fd100%
1988	ita20% + sld10%	gdd30%	gdd25%	gdd30%	fd100%	fd100%
1989	ita20% + sld10%	gdd30%	gdd25%	gdd30%	fd100%	fd100%
1990	ita20% + sld10%	gdd30%	gdd25%	gdd30%	fd100%	fd100%
1991	ita20% + sld10%	gdd30%	gdd25%	gdd30%	fd100%	fd100%
1992	ita20% + sld10%	gdd30%	gdd25%	gdd30%	sld15%(6 yrs) + 10%(1 yr)	fd100%
1993	ita20% + sld10%	gdd30%	gdd25%	gdd30%	sld15%(6 yrs) + 10%(1 yr)	fd100%
1994	ita20% + sld10%	gdd30%	gdd37.5%	gdd30%	sld15%(6 yrs) + 10%(1 yr)	gdd25%
1995	ita20% + sld10%	gdd30%	gdd37.5%	gdd30%	sld15%(6 yrs) + 10%(1 yr)	gdd25%
1996	ita20% + sld10%	gdd30%	gdd37.5%	gdd30%	sld15%(6 yrs) + 10%(1 yr)	gdd25%
1997	ita20% + sld10%	gdd30%	gdd37.5%	gdd30%	sld15%(6 yrs) + 10%(1 yr)	gdd25%
1998	ita20% + sld10%	gdd30%	gdd37.5%	gdd30%	sld15%(6 yrs) + 10%(1 yr)	ad30% + sld10%(7 yr) (gdd25%)
1999	ita9% + sld10%	gdd25%	gdd37.5%	gdd30%	sld15%(6 yrs) + 10%(1 yr)	ad30% + sld10%(7 yr) (gdd25%)
2000	ita9% + sld10%	gdd25%	gdd37.5%	gdd30%	sld15%(6 yrs) + 10%(1 yr)	ad30% + sld10%(7 yr) (gdd25%)
2001	ita9% + sld10%	gdd25%	gdd37.5%	sld10%	sld20%	ad30% + sld10%(7 yr) (gdd25%)
2002	ita9% + sld10%	gdd25%	gdd37.5%	sld10%	sld20%	ad30% + sld10%(7 yr) (gdd25%)
2003	ita9% + sld10%	gdd25%	gdd37.5%	sld10%	sld20%	ad30% + sld10%(7 yr) (gdd25%)

Note: ita = investment tax allowance, sld = straight-line depreciation, gdd = geometric-degressive depreciation and fd = free depreciation, ad = accelerated depreciation. The depreciation methods and rates shown in parentheses are standard depreciation rules applicable for the investment in equipment.
Source: Chen et al. (2002), Taxation, SMEs and Entrepreneuship, OECD, Paris; Ifo Institute for Economic Research.

In an economy with the constant inflation rate π but without taxation, an equity-financed investment of a profit-maximising SME is on the margin of acceptance at the year of investment, when

$$C = \mathrm{PV}_0 = \int_0^\infty A_0 e^{-(\alpha - \pi + \mu)u} du = \frac{A_0}{\alpha + r} \quad (1)$$

where $A_0 e^{-(\alpha-\pi+\mu)u}$ means nominal gross return at year u generated by an investment costing C at time 0, which is discounted by the nominal interest rate $\mu = r + \pi$ $(0 < r < 1)$. In this case, the sum of annual gross return exponentially decreases at α but increases at π in the course of time. In such an equilibrium technically expressed in Equation (1), inflation does not play any role for the investment decision and NPV $(= \mathrm{PV}_0 - C)$ amounts to zero. Such a steady-state condition usually plays the basis role for the further analyses on corporate tax systems.

In the case of adopting geometric-degressive depreciation and if its calculation is made based on the current cost accounting system,[3] nominal present value can be expressed as

$$\begin{aligned} {}_n\mathrm{PV}(t)_0^{\mathrm{gdd,cur}} &= (1-t)\int_0^\infty A_0 e^{-\{\alpha - \pi + \mu(1-t)\}u} du \\ &\quad + tC\int_0^\infty \delta\, e^{-\{(\delta - \pi) + \mu(1-t)\}u} du \\ &= \mathrm{PV}_0 + tC\left\{\frac{\delta - \pi}{\delta - \pi + \mu(1-t)} - \frac{\alpha - \pi}{\alpha - \pi + \mu(1-t)}\right\} \end{aligned} \quad (2)$$

where δ indicates the geometric-degressive depreciation rate and $Ce^{-(\delta-\pi)u}$ shows the (nominal) net book value of capital good in the period u. Therefore, with $\delta = \delta^* = \alpha$, ${}_n\mathrm{PV}(t)^*{}_0^{\mathrm{gdd,cur}} = \mathrm{PV}_0 = C$ in equilibrium, the so-called

tax neutrality is guaranteed[4] and inflation does not disturb the investment decision at all.
When the historical accounting method[5] is applied, as the usual case in practice,

$$
\begin{aligned}
&n\mathrm{PV}(t)_0^{\mathrm{gdd,his}} \\
&= (1-t)\int_0^{\infty} A_0\, e^{-\{\alpha-\pi+\mu(1-t)\}u}\, du \\
&\quad + tC\int_0^{\infty} \delta\, e^{-\{\delta+\mu(1-t)\}u}\, du \\
&= \mathrm{PV}_0 + tC\left\{\frac{\delta}{\delta+\mu(1-t)} - \frac{\alpha-\pi}{\alpha-\pi+\mu(1-t)}\right\} \qquad (3)
\end{aligned}
$$

where $Ce^{-\delta u}$ shows the net book value of capital good in the period u in this case.

When $\delta^* = \alpha$, a fictitious gain (FG) in nominal present value with geometric-degressive depreciation emerges through the adoption of historical accounting method since $n\mathrm{PV}(t)_0^{\mathrm{gdd}^*,\mathrm{his}}$ is larger than $n\mathrm{PV}(t)_0^{\mathrm{gdd}^*,\mathrm{cur}}$.

$$
\begin{aligned}
&FG^{\mathrm{gdd}^*} \\
&= n\mathrm{PV}(t)_0^{\mathrm{gdd}^*,\mathrm{his}} - n\mathrm{PV}(t)_0^{\mathrm{gdd}^*,\mathrm{cur}} \\
&= n\mathrm{PV}(t)_0^{\mathrm{gdd}^*,\mathrm{his}} - \mathrm{PV}_0 \\
&= tC\left\{\frac{\delta^*}{\delta^*+\mu(1-t)} - \frac{\delta^*-\pi}{\delta^*-\pi+\mu(1-t)}\right\} \qquad (4)
\end{aligned}
$$

In the case of employing the historical cost accounting method, the nominal present value of the asset with straight-line depreciation at time 0 is

$$
\begin{aligned}
&n\mathrm{PV}(t)_0^{\mathrm{sld,his}} \\
&= (1-t)\int_0^{\infty} A_0 e^{-\{\alpha-\pi+\mu(1-t)\}u} du \\
&\quad + t\int_0^{\Gamma} (C/\Gamma) e^{-\{\mu(1-t)\}u}\, du \\
&= \mathrm{PV}_0 + tC\left\{\frac{1-e^{-\mu(1-t)\Gamma}}{\mu(1-t)\Gamma} - \frac{\alpha-\pi}{\alpha-\pi+\mu(1-t)}\right\} \qquad (5)
\end{aligned}
$$

where Γ indicates the normal tax life of a capital good. The *true* investment promotion (TIP) of corporate taxation system accompanied by straight-line depreciation takes place when $n\mathrm{PV}(t)_0^{\mathrm{sld,his}} - C > \mathrm{FG}^{\mathrm{gdd}^*}$.

In the context of free depreciation the sum of C can be fully written off in the first year. When employing this depreciation method, the nominal present value of asset at year 0 is

$$
\begin{aligned}
&n\mathrm{PV}(t)_0^{\mathrm{fd,his}} \\
&= (1-t)\int_0^{\infty} A_0 e^{-\{\alpha-\pi+\mu(1-t)\}u}\, du \\
&\quad + t\int_0^{1} Ce^{-\mu(1-t)u}\, du \\
&= \mathrm{PV}_0 + tC\left\{\frac{1-e^{-\mu(1-t)}}{\mu(1-t)} - \frac{\alpha-\pi}{\alpha-\pi+\mu(1-t)}\right\} \qquad (6)
\end{aligned}
$$

TIP of free depreciation takes place in spite of applying historical accounting method when nominal NPV with free depreciation ($= n\mathrm{PV}(t)_0^{\mathrm{fd,his}} - C$) is larger than $\mathrm{FG}^{\mathrm{gdd}^*}$.

Furthermore, a certain percentage share of C referred to as investment tax allowance can be deducted from gross profit in the first year when calculating the tax base. Investment tax allowance is commonly applied in combination with straight-line depreciation. As a consequence, this type of tax incentive provides possibilities of depreciating the value, which is significantly higher than the original investment cost of a capital good.

With investment tax allowance, nominal present value of asset at year 0 is

$$
\begin{aligned}
&n\mathrm{PV}(t)_0^{\mathrm{ita,his}} \\
&= (1-t)\int_0^{\infty} A_0 e^{-\{\alpha-\pi+\mu(1-t)\}u}\, du \\
&\quad + t\int_0^{1} (\beta C) e^{-\mu(1-t)u}\, du \\
&\quad + t\int_0^{\Gamma} (C/\Gamma) e^{-\mu(1-t)u}\, du \qquad (7)
\end{aligned}
$$

$$= \mathrm{PV}_0 + tC\left[\frac{\beta\{1-e^{-\mu(1-t)}\}}{\mu(1-t)} + \frac{1-e^{-\mu(1-t)}\Gamma}{\mu(1-t)\Gamma} - \frac{\alpha-\pi}{\alpha-\pi+\mu(1-t)}\right] \quad (7)$$

where β indicates the rate of investment tax allowance ($0<\beta<1$). TIP is expected when $n\mathrm{PV}(t)_0^{\mathrm{ita,his}} - C > \mathrm{FG}^{\mathrm{gdd}*}$.

Accelerated depreciation is also combined with the straight-line depreciation method. Accelerated depreciation expense – as a certain percentage share (σ) of C – is tax-deductible in the first year of a capital good's tax life ($0<\sigma<1$). Consequently, the total depreciation expense in the first year amounts to $\sigma C + C/\Gamma$ and the total tax life of a capital good is reduced correspondingly from Γ to Ω, where $\Omega = (1-\sigma)\Gamma$. In the case of adopting the historical accounting method the nominal present value of the asset with accelerated depreciation at year 0 is

$$\begin{aligned} & n\mathrm{PV}(t)_0^{\mathrm{ad,his}} \\ &= (1-t)\int_0^{\infty} A_0 e^{-\{\alpha-\pi+\mu(1-t)\}u}\,du \\ &\quad + t\int_0^{1} \sigma C e^{-\mu(1-t)u}\,du \\ &\quad + t\int_0^{\Omega} (C/\Gamma) e^{-\mu(1-t)u}\,du \\ &= \mathrm{PV}_0 + tC\left[\frac{\sigma\{1-e^{-\mu(1-t)}\}}{\mu(1-t)} + \frac{1-e^{-\mu(1-t)\Omega}}{\mu(1-t)\Gamma} - \frac{\alpha-\pi}{\alpha-\pi+\mu(1-t)}\right] \end{aligned} \quad (8)$$

Analogously TIP with accelerated depreciation exists when $n\mathrm{PV}(t)_0^{\mathrm{ad,his}} - C > \mathrm{FG}^{\mathrm{gdd}*}$.

4. Major results of model simulation

The study investigates the corporate tax reform and its effect on a SME's nominal NPV in six selected EU nations for the period of 1980–2003. Two tax policy measures – corporate tax rate and depreciation provision – change in the model simulation, whereas other relevant parameters like interest rate, economic depreciation, inflation rate, etc. are given. For the calculation, statutory corporate tax rates and depreciation rules are applied for the individual years, which are demonstrated in Tables I and II. Further assumptions made in the simulations are $A_0 = 100$; $r = 4\%$, $\alpha = \delta^* = 20\%$, $C = \mathrm{PV}_0 = 416.7$, $\Gamma = 10$ years for equipment whereas π varies from 2 to 4% and 6%.

As had been anticipated a priori, the development of $\mathrm{FG}^{\mathrm{gdd}*}$ values were positively correlated to t and π in the observed period (Tables III as well as A1 and A2 in annex). In general a constant increase of π led to a progressively rising $\mathrm{FG}^{\mathrm{gdd}*}$, although t remained unchanged. Moreover, the extent of $\mathrm{FG}^{\mathrm{gdd}*}$ change (i.e. increase and decrease) caused by the variation of t generally became more apparent when the assumed π became higher. As shown in terms of mean values in Tables III, A1 and A2, the corporate tax reduction introduced in the selected countries also contributed to the gradual decrease of $\mathrm{FG}^{\mathrm{gdd}*}$, which is, however, accompanied by the slightly increasing standard deviation values in the course of time.

In most of the investigated countries (except Germany and France) the investment promotion effect of corporate tax system measured in terms of TIP (= NPV with tax depreciation rule subtracted by $\mathrm{FG}^{\mathrm{gdd}*}$) continued to decline. Regardless of assumed π, this fact is well illustrated by the gradually decreasing mean and standard deviation of TIP values in the course of time (Table IV as well as A3 and A4 in annex). Moreover the difference between the highest and the lowest mean value and the corresponding difference of standard deviation grew with π, although their growth appears to be rather moderate.

In addition one can well identify different TIP development types among the investigated EU nations. Austria and Finland belong to the same country group for which those values declined in the course of time but with significant fluctuations in the 1990s. A drop of TIP value at the end of 1990s is also comparable in these two countries (Figure 1), although the decrease is mainly triggered by the generosity reduction of β

TABLE III
Effects of corporate tax rate change on SME's fictitious gain (FG_{gdd*}) when $\pi = 2\%$ and $\delta^* = \alpha$: investment in equipment

	Austria	Finland	France	Germany	Ireland	UK	Mean	Standard deviation
1980	2.63	2.44	2.59	2.64	2.49	2.35	2.52	0.11
1981	2.63	2.44	2.59	2.64	2.49	2.35	2.52	0.11
1982	2.63	2.44	2.59	2.64	2.49	2.35	2.52	0.11
1983	2.63	2.44	2.59	2.64	2.59	2.29	2.53	0.13
1984	2.63	2.44	2.59	2.64	2.59	1.95	2.47	0.24
1985	2.63	2.44	2.49	2.64	2.59	1.95	2.46	0.24
1986	2.63	2.10	2.49	2.64	2.59	1.91	2.39	0.28
1987	2.63	2.10	2.32	2.64	2.59	1.81	2.33	0.30
1988	2.63	2.10	2.32	2.64	2.59	1.70	2.32	0.33
1989	1.95	2.10	2.25	2.59	2.54	1.70	2.19	0.31
1990	1.95	1.70	2.13	2.59	2.44	1.70	2.09	0.34
1991	1.95	1.59	2.13	2.59	2.44	1.70	2.07	0.36
1992	1.95	1.35	2.10	2.59	2.35	1.70	2.01	0.41
1993	1.95	1.70	2.10	2.49	2.35	1.70	2.05	0.30
1994	2.13	1.70	2.10	2.49	2.35	1.65	2.07	0.31
1995	2.13	1.70	2.10	2.49	2.29	1.59	2.05	0.31
1996	2.13	1.86	2.10	2.49	2.29	1.47	2.06	0.32
1997	2.13	1.86	2.10	2.49	2.21	1.41	2.03	0.33
1998	2.13	1.86	2.10	2.49	2.05	1.41	2.01	0.33
1999	2.13	1.86	2.10	2.35	1.86	1.41	1.95	0.30
2000	2.13	1.91	2.10	2.35	0.93	1.41	1.81	0.49
2001	2.13	1.91	2.10	1.70	0.93	1.41	1.70	0.42
2002	2.13	1.91	2.10	1.70	0.93	1.35	1.69	0.43
2003	2.13	1.91	2.10	1.70	0.93	1.35	1.69	0.43

Common assumptions: $A_0 = 100$, $r = 4\%$, $\alpha = \delta^* = 20\%$ and $C = PV_0 = 416.7$.
Source: Table I and own calculations.

from 20 to 9% in Austria and δ from 30 to 25% in Finland.

Ireland and the UK also had a quite similar TIP development pattern in the past. A rapid reduction of its value took place in Ireland in 1992 and 2 years later also in the UK (Figure 2). The major reason for this significant change was the substitution of free depreciation to less generous straight-line depreciation (with 7 years of tax life) in Ireland and to geometric-degressive depreciation (with $\delta = 25\%$) in the UK, while t remained unchanged in both reform years (40% in Ireland and 33% in the UK). In the period before as well as after these 'big bang' reform years mentioned above, the TIP values remained stable and developed comparably in both countries.

The model simulation also suggests that the SME-specific lower corporate tax rates can lead – with the given uniform depreciation rule – to less significant investment promotion effects than is the case with the normal statutory rates, since the reduction of t also causes a decrease in tax savings (Table V). In spite of the lower tax rates, the TIP values for SMEs were smaller than those for large firms in the UK in the period between 1980 and 1997. Yet the combination of lower tax rate with the more generous SME-specific accelerated depreciation (instead of a geometric-degressive one for large firms) has created larger scale promotion effects since 1998.

France and Germany are countries whose individual TIP development patterns are quite unique. For example, French TIP values remained quite stable at a lower level until 1993 but at a higher level since 1994. A fast jump of TIP in 1994 was led by a δ increase from 25 to 37.5% while maintaining $t = 33\%$. German TIP values grew rapidly thanks to the increase in δ from 25% (1980) to 30% (1981) by given $t = 56\%$. Thereafter the TIP value remained quite constant, which however sank to the level

TABLE IV
True investment promotion (TIP) effect for SMEs in the selected EU countries with $\pi = 2\%$: investment in equipment

	Austria	Finland	France	Germany	Ireland	UK	Mean	Standard deviation
1980	44.15 (1)	7.83 (4)	5.00 (5)	4.92 (6)	23.51 (2)	22.46 (3)	17.98	14.01
1981	44.15 (1)	7.83 (5)	5.00 (6)	**8.33 (4)**	23.51 (2)	22.46 (3)	19.55	13.53
1982	44.15 (1)	7.83 (5)	5.00 (6)	8.33 (4)	23.51 (2)	22.46 (3)	18.55	13.53
1983	44.15 (1)	7.83 (5)	5.00 (6)	8.33 (4)	**24.10 (2)**	**21.92 (3)**	18.56	13.54
1984	44.15 (1)	7.83 (5)	5.00 (6)	8.33 (4)	24.10 (2)	**19.11 (3)**	18.09	13.47
1985	44.15 (1)	7.83 (5)	**4.70 (6)**	8.33 (4)	24.10 (2)	19.11 (3)	18.04	13.52
1986	44.15 (1)	**6.75 (5)**	4.70 (6)	8.33 (4)	24.10 (2)	**18.67 (3)**	17.78	13.65
1987	44.15 (1)	6.75 (5)	**4.39 (6)**	8.33 (4)	24.10 (2)	**17.78 (3)**	17.58	13.70
1988	44.15 (1)	6.75 (5)	4.39 (6)	8.33 (4)	24.10 (2)	**16.82 (3)**	17.42	13.70
1989	**23.25 (2)**	6.75 (5)	**4.26 (6)**	**8.23 (4)**	**23.73 (1)**	16.82 (3)	13.84	7.84
1990	23.25 (1)	**5.55 (5)**	**4.04 (6)**	8.23 (4)	**23.14 (2)**	16.82 (3)	13.51	7.95
1991	23.25 (1)	**5.19 (5)**	4.04 (6)	8.23 (4)	23.14 (2)	16.82 (3)	13.45	8.01
1992	23.25 (1)	**4.44 (5)**	**4.00 (6)**	8.23 (3)	**6.08 (4)**	16.82 (2)	10.47	7.14
1993	23.25 (1)	**5.55 (5)**	4.00 (6)	**7.98 (3)**	6.08 (4)	16.82 (2)	10.61	7.01
1994	**26.51 (1)**	5.55 (5)	**9.76 (2)**	7.98 (3)	6.08 (4)	**3.29 (6)**	9.86	7.71
1995	26.51 (1)	5.55 (5)	9.76 (2)	7.98 (3)	**5.89 (4)**	**3.20 (6)**	9.82	7.74
1996	26.51 (1)	**6.03 (4)**	9.76 (2)	7.98 (3)	5.89 (5)	**3.16 (6)**	9.89	7.70
1997	26.51 (1)	6.03 (4)	9.76 (2)	7.98 (3)	**5.69 (5)**	**2.88 (6)**	9.81	7.76
1998	26.51 (1)	6.03 (5)	9.76 (2)	7.98 (3)	**5.24 (6)**	**6.75 (4)**	10.83	7.36
1999	**11.23 (1)**	**3.53 (6)**	9.76 (2)	**7.57 (3)**	**4.73 (4)**	6.75 (4)	7.26	2.67
2000	11.23 (1)	**3.62 (5)**	9.76 (2)	7.57 (3)	**2.33 (6)**	6.75 (4)	6.88	3.14
2001	11.23 (1)	3.62 (5)	9.76 (2)	−1.15 (6)	**4.56 (4)**	6.75 (3)	5.80	4.10
2002	11.23 (1)	3.62 (5)	9.76 (2)	−1.15 (6)	4.56 (4)	**6.47 (3)**	5.75	4.09
2003	11.23 (1)	3.62 (5)	9.76 (2)	−1.15 (6)	4.56 (4)	6.47 (3)	5.75	4.09

Common assumptions: $A_0 = 100$, $r = 4\%$, $\alpha = \delta^* = 20\%$, $C = \text{PV}_0 = 416.7$ and $\Gamma = 10$ years.
Note: The bold numbers indicate the TIP values (= nominal net present values minus $\text{FG}^{\text{gdd}*}$) and the ranks led by corporate tax reforms. The ranks are shown in parentheses.
Source: Tables I–III; own calculations.

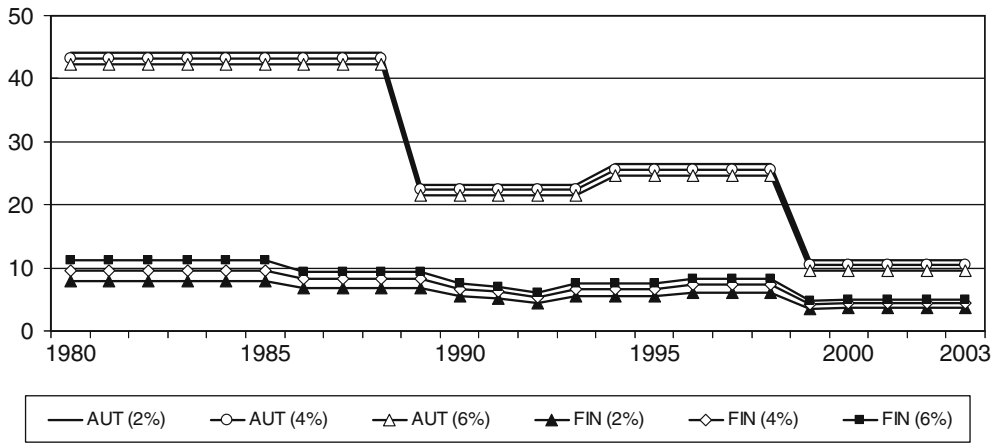

Figure 1. True investment promotion effect for SMEs shown by nominal NPV: Austria and Finland.

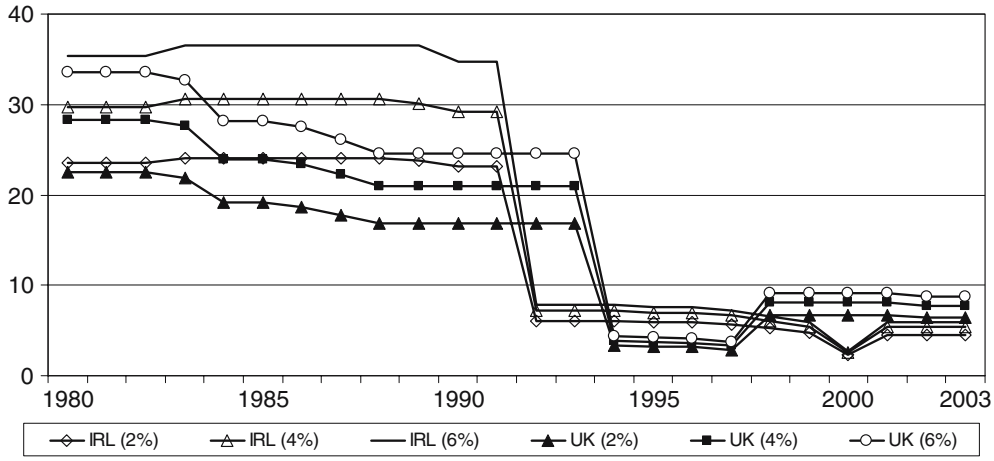

Figure 2. True investment promotion effect for SMEs shown by nominal NPV: Ireland and UK.

TABLE V
Comparison of true investment promotion (TIP) effect between SMEs and large firms in the UK: investment in equipment

	SMEs			Large firms		
	$\pi = 2\%$	$\pi = 4\%$	$\pi = 6\%$	$\pi = 2\%$	$\pi = 4\%$	$\pi = 6\%$
1980	22.46	28.32	33.56	24.19	30.79	36.82
1981	22.46	28.32	33.56	24.19	30.79	36.82
1982	22.46	28.32	33.56	24.19	30.79	36.82
1983	21.92	27.61	32.66	24.08	30.62	36.54
1984	19.11	23.91	28.13	23.50	30.30	35.38
1985	19.11	23.91	28.13	22.46	29.51	33.56
1986	18.67	23.36	27.47	20.99	26.36	31.13
1987	17.78	22.20	26.08	20.99	26.36	31.13
1988	16.82	20.98	24.60	20.99	26.36	31.13
1989	16.82	20.98	24.60	20.99	26.36	31.13
1990	16.82	20.98	24.60	20.65	25.92	30.57
1991	16.82	20.98	24.60	20.65	25.92	30.57
1992	16.82	20.98	24.60	20.29	25.44	30.00
1993	16.82	20.98	24.60	20.29	25.44	30.00
1994	3.29	3.87	4.37	3.97	4.79	5.44
1995	3.20	3.75	4.22	3.97	4.79	5.44
1996	3.16	3.62	4.07	3.97	4.79	5.44
1997	2.88	3.35	3.76	3.97	4.79	5.44
1998	6.75	8.10	9.17	3.80	4.58	5.19
1999	6.75	8.10	9.17	3.72	4.47	5.06
2000	6.75	8.10	9.17	3.72	4.47	5.06
2001	6.75	8.10	9.17	3.72	4.47	5.06
2002	6.47	7.75	8.76	3.72	4.47	5.06
2003	6.47	7.75	8.76	3.72	4.47	5.06

Common assumptions: $A_0 = 100$, $r = 4\%$, $\alpha = \delta^* = 20\%$, $C = \mathrm{PV}_0 = 416.7$ and $\Gamma = 10$ years.
Source: Tables I, II and IV as well as A3 and A4 in annex; own calculations.

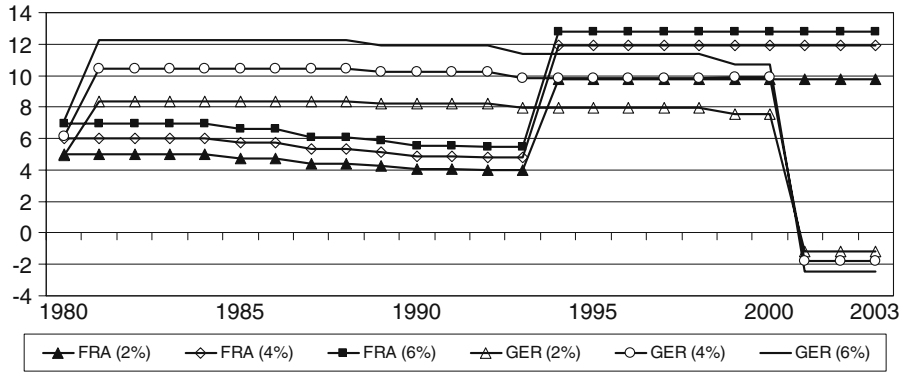

Figure 3. True investment promotion effect for SMEs shown by nominal NPV: France and Germany.

below zero in 2001, due to the simultaneous reduction of t from 40 to 25% and the change of geometric-degressive depreciation with $\delta = 30\%$ to straight-line one with $\Gamma = 10$ years (Figure 3).

The TIP values of individual countries are also compared in terms of international rank of competitive position as shown in the parentheses of Tables IV as well as A3 and A4 in annex. With $\pi = 2\%$ the Austrian corporate tax system with investment tax allowance maintained the leading position throughout all of the considered years. Under the assumption of $\pi = 4\%$ and 6%, however, the country's first rank was shared with other nations like Ireland (1989–91) and France (1999–2003). A number of corporate tax reforms did not change the ranking much. This fact applies most apparently for those reforms – in particular the reduction of t – carried out in Finland (1986, 1990–3, 1996 and 1999), Germany (1989, 1993 and 1999), France (1985, 1987, 1989–90 and 1992), Ireland (1997), and the UK (1983–84, 1986–88, 1995–96 and 2002). Despite numerous amendments of the corporate tax system, the competitive position of individual countries remained less favourable in these reform years.

On the other hand, some significant consequences of reforms of a positive and also a negative kind are observed in France, Ireland and the UK. As illustrated above, the increase of δ from 25 to 37.5% in 1994 (while keeping $t = 33.33\%$) improved France's position from last to second place. The Irish 1992 big bang reform, which reduced t from 43 to 40% and switched the traditional free depreciation to straight-line depreciation (with seven years of tax life), made the country's competitive position worse off from second to fourth place. A more serious negative consequence was led by British 1994 reform: the change from free to geometric-degressive depreciation ($\delta = 25\%$) in 1995 – but maintaining specific $t = 25\%$ for SMEs – demolished the country's position. The further reduction of t to 20% and the introduction of accelerated depreciation with $\sigma = 30\%$ in 1999 was able to offset this disadvantage to a certain extent (from the last to the third rank).

5. Conclusion

For the selected six EU countries this study examines under the particular consideration of inflation the effects of corporate tax reforms on SMEs' investment decisions implemented since the beginning of the 1980s. By and large corporate tax reforms carried out in the investigated countries have entailed lower statutory tax rates accompanied by a reduction in generous tax depreciation provisions. Among them the UK has traditionally had the SME-specific, reduced tax rates. Yet the timing and direction of changing individual tax policy measures did not always take place simultaneously and coherently. Especially diversifications from the general trend have become evident since the mid-1990s, which include the tax-rate-cut-cum-base-narrowing reform for SMEs in the UK and the tax-rate-increase-cum-base-broadening type in Austria and Finland.

Unlike a large number of previous studies on measuring effective marginal tax rate this forward-looking study measures the tax incentive and/or burden on investment activity in terms of nominal net present value (NPV) under the specific assumptions of relevant parameters and self-finance. In particular it highlights the fact that the application of the historical cost accounting system (instead of the current cost accounting method) in the inflationary economy when calculating tax depreciation amounts creates the fictitious gain in nominal NPV (FG^{gdd*}), although the equity of tax depreciation and TED – the important condition for tax neutrality – is assumed. In general this type of gain decreased gradually in the period between 1980–2003, since the corporate tax rate and the inflation rate continued to sink in the investigated EU nations.

A down-sloping development is also observed for the TIP value (=nominal NPV with tax depreciation scheme minus FG^{gdd*}), which, in turn, means that the investment promotion effect of corporate tax policy measures has gradually reduced in the course of time. France, with an increasing trend, was the only exception. This fact suggests that EU-wide tax competition could also have negative effects on firms' investment activities, while the series of tax reforms surely made a contribution to an achievement of better tax neutrality and convergence of capital tax burden in the investigated countries.[6] In addition the true investment promotion for SMEs was not strongly associated with lower SME-specific corporate tax rates in the UK in the period 1980–97. Therefore an additional endowment with a more generous SME-specific depreciation rule appeared to be necessary to create a larger scale promotion effect than that provided for large firms, as happened in 1998. Such recent experiences in France and the UK again signal that investment promotion of SMEs can be better achieved in the form of tax-rate-cut-cum-base-narrowing strategy in an inflation phase if the generosity of tax depreciation reaches a substantial level. Moreover the survey countries are classified according to the reform patterns based on the TIP values for SMEs. A clear similarity of the TIP development prevails between Austria and Finland, and also between Ireland and the UK. Apart from France, Germany also had a unique feature.

Since SMEs form the majority of firms in the advanced countries, their competitiveness significantly affects the competitiveness of an individual nation's economy as a whole. In this context it should be borne in mind that not only the attraction of mobile capitals of multinationals but also investment activities of domestic SMEs play a crucial role for a nation's economic growth. Basically competitive position of a country has a relative character in an international context, because changes of policy action of one country also simultaneously lead to the alteration of others'. According to the ranking constructed on the basis of annual TIP values, the Austrian investment tax allowance system provided the most favourable condition for SMEs in the survey years, when the inflation rate is 2%. Yet the country shared its first position with Ireland and France if the same rate increases to 4 or 6%. This finding once again emphasises that the significance of inflation rate combined with the application of historical cost accounting method should be more seriously taken into account in the calculation of capital income tax burden in an international comparison.

Germany, Ireland and the UK were the countries whose rankings visibly changed corresponding to the series of reforms, whereas Finland was unable to improve its low rank much throughout the investigated period in spite of its effort. Yet those corporate tax reforms did not always achieve positive results as were the case for France in 1994 mentioned above. For example, Irish and British tax rate reduction accompanied by the replacement of free depreciation destroyed their leading competitive position in the first half of 1990s. Repeatedly such experiences indicate that the tax-rate-cut-cum-base-broadening type of corporate tax reforms could eventually lead to a somewhat unexpected, adverse result in an international setting, although these measures were originally designed to enhance the nations' competitiveness.

Appendix

TABLE A1
Effects of corporate tax rate change on SME's fictitious gain (FG_{gdd*}) when $\pi = 4\%$ and $\delta^* = \alpha$: investment in equipment

	Austria	Finland	France	Germany	Ireland	UK	Mean	Standard deviation
1980	7.13	6.47	6.94	7.16	6.63	6.20	6.76	0.35
1981	7.13	6.47	6.94	7.16	6.63	6.20	6.76	0.35
1982	7.13	6.47	6.94	7.16	6.63	6.20	6.76	0.35
1983	7.13	6.47	6.94	7.16	6.94	6.00	6.77	0.41
1984	7.13	6.47	6.94	7.16	6.94	5.06	6.62	0.73
1985	7.13	6.47	6.63	7.16	6.94	5.06	6.57	0.72
1986	7.13	5.44	6.63	7.16	6.94	4.93	6.37	0.87
1987	7.13	5.44	6.11	7.16	6.94	4.66	6.24	0.94
1988	7.13	5.44	6.11	7.16	6.94	4.37	6.19	1.02
1989	5.06	5.44	5.90	6.94	6.77	4.37	5.75	0.91
1990	5.06	4.37	5.56	6.94	6.47	4.37	5.46	0.98
1991	5.06	4.07	5.56	6.94	6.47	4.37	5.41	1.04
1992	5.06	3.44	5.48	6.94	6.20	4.37	5.25	1.15
1993	5.06	4.37	5.48	6.63	6.20	4.37	5.35	0.85
1994	5.56	4.37	5.48	6.63	6.20	4.37	5.44	0.85
1995	5.56	4.37	5.48	6.63	6.00	4.22	5.38	0.85
1996	5.56	4.80	5.48	6.63	6.00	4.07	5.42	0.82
1997	5.56	4.80	5.48	6.63	5.79	3.77	5.34	0.88
1998	5.56	4.80	5.48	6.63	5.32	3.61	5.23	0.91
1999	5.56	4.80	5.48	6.20	4.80	3.61	5.08	0.81
2000	5.56	4.93	5.48	6.20	2.35	3.61	4.69	1.31
2001	5.56	4.93	5.48	4.37	2.35	3.61	4.38	1.13
2002	5.56	4.93	5.48	4.37	2.35	3.45	4.36	1.15
2003	5.56	4.93	5.48	4.37	2.35	3.45	4.36	1.15

Common assumptions: $A_0 = 100$, $r = 4\%$, $\alpha = \delta^* = 20\%$ and $C = PV_0 = 416.7$.
Source: Table I and own calculations.

TABLE A2
Effects of corporate tax rate change on SME's fictitious gain (FG_{gdd*}) when $\pi = 6\%$ and $\delta^* = \alpha$: investment in equipment

	Austria	Finland	France	Germany	Ireland	UK	Mean	Standard deviation
1980	13.65	12.10	13.16	13.72	12.44	11.54	12.77	0.81
1981	13.65	12.10	13.16	13.72	12.44	11.54	12.77	0.81
1982	13.65	12.10	13.16	13.72	12.44	11.54	12.77	0.81
1983	13.65	12.10	13.16	13.72	13.16	11.13	12.82	0.92
1984	13.65	12.10	13.16	13.72	13.16	9.26	12.51	1.55
1985	13.65	12.10	12.44	13.72	13.16	9.26	12.39	1.52
1986	13.65	10.00	12.44	13.72	13.16	9.00	12.00	1.84
1987	13.65	10.00	11.34	13.72	13.16	8.47	11.72	1.98
1988	13.65	10.00	11.34	13.72	13.16	7.93	11.63	2.13
1989	9.26	10.00	10.92	13.16	12.75	7.93	10.67	1.85
1990	9.26	7.93	10.24	13.16	12.10	7.93	10.10	1.98
1991	9.26	7.37	10.24	13.16	12.10	7.93	10.01	2.09
1992	9.26	6.20	10.08	13.16	11.54	7.93	9.70	2.28
1993	9.26	7.93	10.08	12.44	11.54	7.93	9.86	1.70

TABLE A2
Continued.

	Austria	Finland	France	Germany	Ireland	UK	Mean	Standard deviation
1994	10.24	7.93	10.08	12.44	11.54	7.93	10.03	1.68
1995	10.24	7.93	10.08	12.44	11.13	7.65	9.91	1.69
1996	10.24	8.74	10.08	12.44	11.13	7.37	10.00	1.62
1997	10.24	8.74	10.08	12.44	10.70	6.79	9.83	1.74
1998	10.24	8.74	10.08	12.44	9.76	6.49	9.63	1.79
1999	10.24	8.74	10.08	11.54	8.74	6.49	9.31	1.58
2000	10.24	9.00	10.08	11.54	4.18	6.49	8.59	2.51
2001	10.24	9.00	10.08	7.93	4.18	6.49	7.99	2.13
2002	10.24	9.00	10.08	7.93	4.18	6.20	7.94	2.17
2003	10.24	9.00	10.08	7.93	4.18	6.20	7.94	2.17

Common assumptions: $A_0 = 100$, $r = 4\%$, $\alpha = \delta^* = 20\%$ and $C = PV_0 = 416.7$.
Source: Table I and own calculations.

TABLE A3
True investment promotion (TIP) effect for SMEs in the selected EU countries with $\pi = 4\%$: investment in equipment

	Austria	Finland	France	Germany	Ireland	UK	Mean	Standard deviation
1980	43.27 (1)	9.63 (4)	5.99 (6)	6.12 (5)	29.75 (2)	28.32 (3)	20.51	14.15
1981	43.27 (1)	9.63 (5)	5.99 (6)	**10.41 (4)**	29.75 (2)	28.32 (3)	21.23	13.49
1982	43.27 (1)	9.63 (5)	5.99 (6)	10.41 (4)	29.75 (2)	28.32 (3)	21.23	13.49
1983	43.27 (1)	9.63 (5)	5.99 (6)	10.41 (4)	**30.62 (2)**	**27.61 (3)**	21.26	13.53
1984	43.27 (1)	9.63 (5)	5.99 (6)	10.41 (4)	30.62 (2)	**23.91 (3)**	20.64	13.31
1985	43.27 (1)	9.63 (5)	**5.75 (6)**	10.41 (4)	30.62 (2)	23.91 (3)	20.60	13.35
1986	43.27 (1)	**8.22 (5)**	5.75 (6)	10.41 (4)	30.62 (2)	**23.36 (3)**	20.27	13.53
1987	43.27 (1)	8.22 (5)	**5.33 (6)**	10.41 (4)	30.62 (2)	**22.20 (3)**	20.01	13.57
1988	43.27 (1)	8.22 (5)	5.33 (6)	10.41 (4)	30.62 (2)	**20.98 (3)**	19.81	13.55
1989	**22.37 (3)**	8.22 (5)	**5.16 (6)**	**10.22 (4)**	**30.16 (1)**	20.98 (3)	16.19	8.92
1990	22.37 (3)	**6.68 (5)**	**4.89 (6)**	10.22 (4)	**29.24 (1)**	20.98 (3)	15.73	8.98
1991	22.37 (3)	**6.24 (5)**	4.89 (6)	10.22 (4)	29.24 (1)	20.98 (3)	15.66	9.06
1992	22.37 (1)	**5.32 (5)**	**4.82 (6)**	10.22 (3)	**7.15 (4)**	20.98 (2)	11.81	7.20
1993	22.37 (1)	**6.68 (5)**	4.82 (6)	**9.83 (3)**	7.15 (4)	20.98 (2)	11.97	7.03
1994	**25.59 (1)**	6.68 (5)	**11.95 (2)**	9.83 (3)	7.15 (4)	**3.87 (6)**	10.85	7.06
1995	25.59 (1)	6.68 (5)	11.95 (2)	9.83 (3)	**6.90 (4)**	**3.75 (6)**	10.78	7.11
1996	25.59 (1)	**7.29 (4)**	11.95 (2)	9.83 (3)	6.90 (5)	**3.62 (6)**	10.86	7.07
1997	25.59 (1)	7.29 (4)	11.95 (2)	9.83 (3)	**6.64 (5)**	**3.35 (6)**	10.78	7.14
1998	25.59 (1)	7.29 (5)	11.95 (2)	9.83 (3)	**6.06 (6)**	**8.10 (4)**	11.47	6.59
1999	**10.41 (2)**	**4.24 (6)**	11.95 (1)	**9.90 (3)**	**5.43 (5)**	8.10 (4)	8.34	2.74
2000	10.41 (2)	**4.36 (5)**	11.95 (1)	9.90 (3)	**2.59 (6)**	8.10 (4)	7.89	3.35
2001	10.41 (2)	4.36 (5)	11.95 (1)	−1.80 (6)	**5.36 (4)**	8.10 (3)	6.40	4.51
2002	10.41 (2)	4.36 (5)	11.95 (1)	−1.80 (6)	5.36 (4)	**7.75 (3)**	6.34	4.49
2003	10.41 (2)	4.36 (5)	11.95 (1)	−1.80 (6)	5.36 (4)	7.75 (3)	6.34	4.49

Common assumptions: $A_0 = 100$, $r = 4\%$, $\alpha = \delta^* = 20\%$, $C = PV_0 = 416.7$ and $\Gamma = 10$ years.
Note: The bold numbers indicate the TIP values (=nominal net present values minus FG^{gdd*}) and the ranks led by corporate tax reforms. The ranks are shown in parentheses.
Source: Tables I, II and A1; own calculations.

TABLE A4
True investment promotion (TIP) effect for SMEs in the selected EU countries with $\pi = 6\%$: investment in equipment

	Austria	Finland	France	Germany	Ireland	UK	Mean	Standard deviation
1980	42.29 (1)	11.13 (4)	6.94 (6)	7.16 (5)	35.38 (2)	33.56 (3)	22.74	14.64
1981	42.29 (1)	11.13 (5)	6.94 (6)	**12.23 (4)**	35.38 (2)	33.56 (3)	23.59	13.84
1982	42.29 (1)	11.13 (5)	6.94 (6)	12.23 (4)	35.38 (2)	33.56 (3)	23.59	13.84
1983	42.29 (1)	11.13 (5)	6.94 (6)	12.23 (4)	**36.54 (2)**	**32.66 (3)**	23.63	13.91
1984	42.29 (1)	11.13 (5)	6.94 (6)	12.23 (4)	36.54 (2)	**28.13 (3)**	22.88	13.52
1985	42.29 (1)	11.13 (5)	**6.63 (6)**	12.23 (4)	36.54 (2)	28.13 (3)	22.83	13.58
1986	42.29 (1)	**9.40 (5)**	6.63 (6)	12.23 (4)	36.54 (2)	**27.47 (3)**	22.43	13.80
1987	42.29 (1)	9.40 (5)	**6.10 (6)**	12.23 (4)	36.54 (2)	**26.08 (3)**	22.11	13.82
1988	42.29 (1)	9.40 (5)	6.10 (6)	12.23 (4)	36.54 (2)	**24.60 (3)**	21.86	13.76
1989	**21.45 (3)**	9.40 (5)	**5.89 (6)**	**11.90 (4)**	36.54 (1)	24.60 (2)	18.30	10.46
1990	21.45 (3)	**7.57 (5)**	**5.56 (6)**	11.90 (4)	**34.73 (1)**	24.60 (2)	17.64	10.29
1991	21.45 (3)	**7.06 (5)**	5.56 (6)	11.90 (4)	34.73 (1)	24.60 (2)	17.55	10.37
1992	21.45 (2)	**5.99 (5)**	**5.48 (6)**	11.90 (3)	**7.88 (4)**	24.60 (1)	12.88	7.52
1993	21.45 (2)	**7.57 (5)**	5.48 (6)	**11.40 (3)**	7.88 (4)	24.60 (1)	13.06	7.31
1994	**24.61 (1)**	7.57 (5)	**12.76 (2)**	11.40 (3)	7.88 (4)	**4.37 (6)**	11.43	6.49
1995	24.61 (1)	7.57 (5)	12.76 (2)	11.40 (3)	**7.58 (4)**	**4.22 (6)**	11.36	6.55
1996	24.61 (1)	**8.34 (4)**	12.76 (2)	11.40 (3)	7.58 (5)	**4.07 (6)**	11.46	6.51
1997	24.61 (1)	8.34 (4)	12.76 (2)	11.40 (3)	**7.20 (5)**	**3.76 (6)**	11.35	6.60
1998	24.61 (1)	8.34 (5)	12.76 (2)	11.40 (3)	**6.59 (6)**	**9.17 (4)**	12.15	5.92
1999	**9.53 (3)**	**4.80 (6)**	12.76 (1)	**10.68 (2)**	**5.86 (5)**	9.17 (4)	8.80	2.72
2000	9.53 (3)	**4.93 (5)**	12.76 (1)	10.68 (2)	**2.71 (6)**	9.17 (4)	8.30	3.43
2001	9.53 (2)	4.93 (4)	12.76 (1)	**−2.48 (6)**	**5.95 (3)**	9.17 (3)	6.64	4.81
2002	9.53 (2)	4.93 (5)	12.76 (1)	−2.48 (6)	5.95 (4)	**8.76 (3)**	6.58	4.78
2003	9.53 (2)	4.93 (5)	12.76 (1)	−2.48 (6)	5.95 (3)	8.76 (3)	6.58	4.78

Common assumptions: $A_0 = 100$, $r = 4\%$, $\alpha = \delta^* = 20\%$, $C = \mathrm{PV}_0 = 416.7$ and $\Gamma = 10$ years.
Note: The bold numbers indicate the TIP values (=nominal net present values minus $\mathrm{FG}^{\mathrm{gdd}^*}$) and the ranks led by corporate tax reforms. The ranks are shown in parentheses.
Source: Tables I, II andA2; own calculations.

Notes

* This paper was presented at the 61st Congress of the International Institute of Public Finance (IIPF) held in Jeju Island, Korea in 2005. The authors are grateful to discussants and participants at the conference. Special thanks to two anonymous referees for helpful comments. Responsibility for errors remains the authors'.

1 For a given value of financial return generated by an investment, the effective average tax rate is defined to be NPV of tax payments expressed as a proportion of NPV of total pre-tax capital income. For a marginal investment, therefore, the effective average tax rate is same as the effective marginal tax rate (Devereux et al., 2002).

2 In the context of corporate tax law it should also be noted that the definition of SMEs for tax purpose also differs from one country to another. In the UK SMEs are generally those firms that yield profits between GBP50,000 and GBP300,000 annually. For the limited years from 2000 to 2002, Ireland also had a corporate tax rate of 12.5% for SMEs. Yet the total trading income on which this reduced rate was imposed changed from €63,500 (2000) to €254,000 (2001). France has recently introduced a special tax rule for SMEs but in a rather limited manner: those companies that realise a maximum turnover of €7,630,000 and at least 75% of whose capital is continuously owned by individuals or companies satisfying the same conditions are subject to corporate tax at a reduced rate of 15% (2004) on the proportion of the taxable profit that does not exceed €38,120 (Chen et al., 2002; KPMG Corporate Tax Rate Survey for various years from 2000 to 2004).

3 If input prices change, it is necessary to recover the cost of replacing the services consumed in producing the goods or services for sale at their current prices. Hence, the current cost accounting is generally understood as accounting for the current replacement cost of non-monetary assets (see also Nam and Radulescu, 2004).

4 Comparably the condition $\delta = \alpha$ is also the compulsory prerequisite to obtain tax neutrality in the marginal approach (King and Fullerton, 1984; Sinn, 1987; Sørensen, 2004).

5 More precisely, under the historical cost accounting system the capital to be recovered before a profit is recognised as simply the amount of money originally invested in

the firm. Historical profits are, therefore, the current period's revenue subtracted by the historical cost of inputs necessary to secure the current period's expenses. It has long been recognised that increases in input prices can cause historical cost accounting to seriously overstate a firm's ability to distribute its reported profits, continue producing the same physical volume of goods and services, and understate the firm's capital (see also Nam and Radulescu, 2004).

[6] To a certain extent this finding is in line with outcomes of those studies highlighting the inefficiencies of public subsidies to SMEs (Santarelli and Vivarelli, 2002).

References

Altshuler, R. and H. Grubert, 2003, 'Repatriation Taxes, Repatriation Strategies and Multinational Financial Policy', *Journal of Public Economics* **87**, 73–107.

Alvarez, L., V. Kanniainen and J. Södersten, 2000, 'Why Is the Corporation Tax Not Neutral?', *Finanzarchiv* **56**, 285–309.

Alworth, J., 1988, *The Finance, Investment and Taxation Decisions of Multinationals*, New York: Basil Blackwell.

Atkinson, A. B. and J. E. Stiglitz, 1980, *Lectures on Public Economics*, London: McGraw-Hill.

Chen, D., F. C. Lee and J. Mintz, 2002, *Taxation, SMEs and Entrepreneuship, STI Working Paper 2002/9*, Paris: OECD.

Cohen, D. and K. A. Hassett, 1999, 'Inflation, Taxes and Durability of Capital', *National Tax Journal* **52**, 91–98.

Coyne, E. J., 1995, *Proposed Analytical Model for FDI Attraction Into Developing Countries, Essays in International Business 1, The International Business Center, College of Professional Studies*, Washington, D.C: University of the District of Columbia.

Desai, M., F. Foley and J. R. Hines, 2004, 'Foreign Direct Investment in a World of Multiple Taxes', *Journal of Public Economics* **88**, 2727–2744.

Devereux, P. M., 2004, Measuring Taxes on Income from Capital, in P. B. Sørensen (ed.), *Measuring the Tax Burden on Capital and Labor*, Cambridge: MIT Press, 35–71.

Devereux, P. M. and R. Griffith, 1998, 'Taxes and the Location of Production: Evidence from a Panel of US Multinationals', *Journal of Public Economics* **68**, 335–367.

Devereux, P. M. and R. Griffith, 2002, 'The Impact of Corporate Taxation on the Location of Capital: A Review', *Swedish Economic Policy Review* **9**, 79–102.

Devereux, P. M. and R. Griffith, 2003, 'Evaluating Tax Policy for Location Decisions', *International Tax and Public Finance* **10**, 107–126.

Devereux, P. M., R. Griffith and A. Klemm, 2002, 'Corporate Income Tax Reforms and International Tax Competition', *Economic Policy* **35**, 451–495.

Devereux, P. M., R. Griffith and A. Klemm, 2004, 'Why Has the UK Corporation Tax Raised So Much Revenue?', *Fiscal Studies* **25**, 367–388.

European Commission, 2001, Company Taxation in the Internal Market, Commission Staff Working Paper SEC(2001) 1681.

Evans, M. K., 1983, *The Truth About Supply-Side Economics*, New York: Basic Books.

Feldstein, M. S., 1979, *Adjusting Depreciation in an Inflationary Economy: Indexing versus Acceleration*, Cambridge, Mass: NBER Working Paper Series 395.

Feldstein, M. S. and L. Summers, 1979, 'Inflation and the Taxation of Capital Income in the Corporate Sector', *National Tax Journal* **32**, 445–471.

Gordon, R., L. Kalambokidis and J. Slemrod, 2004, A New Summary Measure of the Effective Tax Rate on Investment, in P. B. Sørensen (ed.), *Measuring the Tax Burden on Capital and Labor*, Cambridge: MIT Press, 99–128.

Griffith, R. and A. Klemm, 2004, *What Has Been the Tax Competition Experience of the Last 20 Years?, IFS WP04/05*, London: The Institute for Fiscal Studies.

Grubert, H., 1998, 'Taxes and the Division of Foreign Operating Income among Royalties, Interest, Dividends and Retained Earnings', *Journal of Public Economics* **68**, 269–290.

Grubert, H., 2003, 'Intangible Income, Intercompany Transactions, Income Shifting, and the Choice of Location', *National Tax Journal, Part 2,* **56**, 221–242.

Grubert, H., 2004, The Tax Burden on Cross-border Investment: Company Strategies and Country Responses, in P. B. Sørensen (ed.), *Measuring the Tax Burden on Capital and Labor*, Cambridge: MIT Press, 130–170.

Hall, R. E. and D. Jorgenson, 1967, 'Tax Policy and Investment Behavior', *American Economic Review* **57**, 391–414.

Haufler, A. and G. Schjelderup, 2000, 'Corporate Tax System and Cross Country Profit Shifting', *Oxford Economic Papers* **52**, 306–325.

Hendricks, K., R. Amit and D. Whistler, 1997, *Business Taxation of Small and Medium-sized Enterprises in Canada*, Ottawa: Department of Finance Working Paper 97–11, Government of Canada.

Hines, J. R., 1999, 'Lessons from Behavioural Responses to International Taxation', *National Tax Journal* **52**, 305–322.

Hulten, C. R. and F. C. Wykoff, 1996, 'Issues in the Measurement of Economic Depreciation: Introductory Remarks', *Economic Inquiry* **34**, 10–23.

Janeba, E., 1995, 'Corporate Income Tax Competition, Double Taxation, and Foreign Direct Investment', *Journal of Public Economics* **56**, 311–325.

Kay, J. A., 1977, 'Inflation Accounting: A Review Article', *Economic Journal* **87**, 300–311.

Keen, M. J., 1991, Corporation Tax, Foreign Direct Investment and the Single Market, in L. A. Winters and A. J. Venables (ed.), *The Impact of 1992 on European Trade and Industry*, Cambridge: Cambridge University Press.

King, M. A. and D. Fullerton, 1984, *The Taxation of Income from Capital: A Comparative Study of the United States, the United Kingdom, Sweden, and West Germany*, Chicago: University of Chicago Press.

Mendoza, E. G., A. Razin and L. L. Tesar, 1994, 'Effective Tax Rates in Macroeconomics: Cross-country Estimates on Factor Incomes and Consumption', *Journal of Monetary Economics* **34**, 297–323.

Nam, C. W. and D. M. Radulescu, 2004, 'Do Corporate Tax Concessions Really Matter for the Success of Free Economic Zones', *Economics of Planning* **37**, 99–123.

Nam, C. W. and D. M. Radulescu, 2005, 'The Role of Tax Depreciation for Investment Decisions: A Comparison of

European Transition Countries', *Eastern European Economics* **43**(5), 5–25.

OECD, 1991, *Taxing Profits in a Global Economy: Domestic and International Issues*, Paris: Organisation for Economic Co-operation and Development.

OECD, 1998, *Harmful Tax Competition: An Emerging Global Issue*, Paris: Organisation for Economic Co-operation and Development.

OECD, 2000, *Towards Global Tax Co-operation: Progress in Identifying and Eliminating Harmful Tax Practices*, Paris: Organisation for Economic Co-operation and Development.

Ott M., 1984, Depreciation, Inflation and Investment Incentives: The Effects of the Tax Acts 1981 and 1982, Monthly Review of Federal Reserve Bank of St. Louis, November 1984: 17–30.

Samuelson, P. A., 1964, 'Tax Deductibility of Economic Depreciation to Ensure Invariant Valuation', *Journal of Political Economy* **72**, 604–606.

Santarelli, E. and M. Vivarelli, 2002, 'Is Subsidizing Entry an Optimal Policy?', *Industrial and Corporate Change* **11**, 39–52.

Sinn, H. W., 1987, *Capital Income Taxation and Resource Allocation*, Amsterdam: North-Holland.

Sørensen, P. B., 2004, Measuring Taxes on Capital and Labor: An Overview of Methods and Issues, in P. B. Sørensen (ed.), *Measuring the Tax Burden on Capital and Labor*, Cambridge: MIT Press, 1–33.

Wilson, J., 1999, 'Theories of Tax Competition', *National Tax Journal* **52**, 269–304.