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COST OF CAPITAL AND EFFECTIVE TAX RATES: A SURVEY ARTICLE

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ABSTRACT

The *marginal effective tax rate* provides an aggregate measure of the distortions caused by the tax system on resources allocation, essentially on investment and saving. The main variable underlying this concept is *the user cost of capital*. This chapter puts forward the methodology for measuring effective tax rates and surveys the main contributions to the theory. Direct extensions deal with more complicated tax devices in domestic and international settings, investment incentives, economic depreciation, spatial productivity differentials and reporting conventions. The literature also refers to the average effective tax rate and effective tax rate on income from any factors of production.

1. Introduction

The *marginal effective tax rate* concept has become a widely used tool in literature. It provides an aggregate measure of the distortions caused by the tax system on resources allocation, essentially on investment and saving and has given rise to numerous applications for more and more countries.

The main variable underlying the marginal effective tax rate is *the user cost of capital*. First developed by Jorgenson (1963), it does not only include the cost of financing new investments but it also accounts for statutory tax rates, the economic depreciation rate of the asset, public allowances and inflation. In the seminal work of King and Fullerton (1984), largely inspired by King (1977), the user cost of capital was used to calculate marginal effective tax rates for domestic investments while accounting for corporate as well as personal taxes. Different assets, industries, sources of finance and ownership categories were compounded to provide a comparison on the way taxes affect the incentives to save and invest. The methodology was applied to the United Kingdom, Sweden, Germany and the United States. Even though Boadway, Bruce and Mintz's (1984) approach is based on the small open economy assumption in order to fix the cost of finance, the first contribution considering foreign direct investment was that of Alworth (1988). Assuming a multinational company composed of a parent and a single subsidiary, Alworth (1988) essentially extended the marginal effective tax rate concept to international double taxation systems and multiple financing policies. The last decade, the major improvements consisted in extending the multinational structure of companies

as well as relaxing some common assumptions such as for instance perfect competition, certainty, symmetric tax treatment of profits and losses and homogeneous space.

The purpose of this chapter is to develop the methodology underlying the marginal effective tax rate concept and to survey the main extensions brought to the theory. It is vain to hope to provide an exhaustive overview of the literature. We rather intend to give an insight of the main developments making explicit the concepts of user cost of capital and effective tax rate. Boadway and Shah's (1995) contribution provides us with valuable help. Moreover, their paper already discusses a large number of extensions regarding namely the implications of tax holidays, monopoly behaviour, adjustment costs, loss offsetting, risk, inflation and investments in different types of assets.

The remainder of this chapter is organised as follows. The second section sets out to define the marginal effective tax rate on income from capital. The third section analyses its two components: the before- and after-tax rates of return. The former rate corresponds to the concept of the user cost of capital. The last two sections provide an overview of major extensions. In section four, we focus on direct extensions to the basic model dealing with more and more complicated tax devices in domestic and international settings, investment incentives, economic depreciation, spatial productivity differentials and reporting conventions. Section five takes a step back and puts the question into perspective: the marginal effective tax rate is compared to the average effective tax rate and the approach is widened to allow multiple production factors to be considered.

2. The marginal effective tax rate

The marginal effective tax rate is the rate of tax that summarises all income and wealth taxes levied on the return of an additional unit of capital. It is a statistic aggregating the numerous taxes and rules involved in determining taxable income.

Consider an individual who provides funds to a firm planning to invest. All methods for determining the marginal effective tax rate are based on two rates of return,

- p, the pre-tax real rate of return on investment earned by the firm;
- and s, the post-tax real rate of return to the saver.

The difference between p and s is called the total *tax wedge* symbolised by W. In the absence of taxes, p equals s. However, levying corporate and personal taxes results in the saver earning a smaller return, s, than the one received by the investor, p.

$$W_{total} = p - s$$

To distinguish the effect of corporate taxes from personal ones, let r be the real return obtained on the capital market. It is the net-of-corporate tax return that the firm has to pay to the saver before this latter has met personal tax liabilities. The tax wedges relating to corporate and personal taxes are computed as follows:

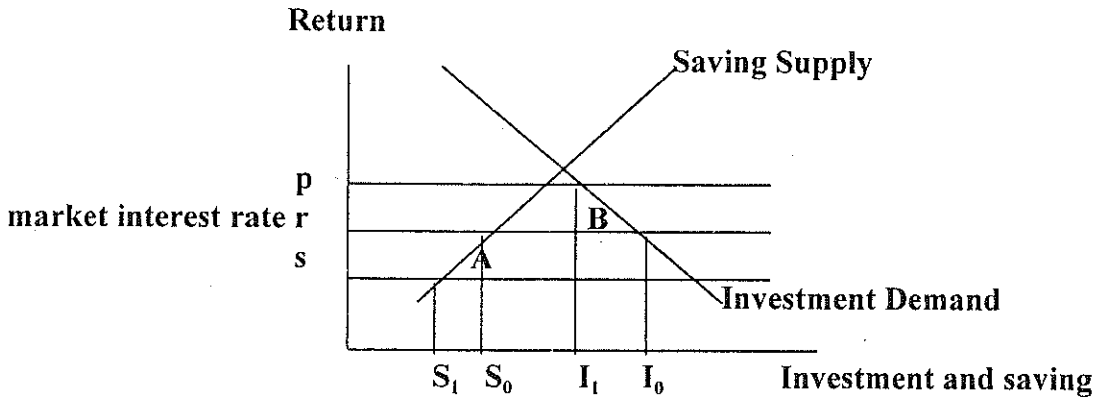
$$W_{corporate} = p - r$$

$$W_{personal} = r - s$$

An illustration of these concepts and their impact on investment and saving is given in Bovenberg, Andersson, Aramaki and Chand (1992) for closed as well as open economies. The latter case is depicted here.

In a small, open economy, international capital markets fix the domestic market return at the rate of return on world capital markets r^1. The investment demand curve is downward sloping owing to the assumption of decreasing marginal returns while household saving increases with the yield obtained. Without taxes, both the before- and after-tax returns coincide with r, the investment level is I_0 and the domestic saving S_0. The difference between I_0 and S_0 accounts for investment funds provided by foreigners.

Figure 1: The tax wedge in a small open economy



Source: Bovenberg, Anderson, Aramaki and Chand (1992), p.292.

The case depicted here is the one of a negative current balance. The introduction of corporate taxes requires the investment to produce a higher gross return in order to keep r constant. Consequently, the investment level reduces to I_1. Likewise, personal taxation decreases the net-of-tax return on saving such that the level of domestic saving is now S_1. The personal and corporate tax wedges, depicted respectively by surfaces A and B, measure the efficiency losses resulting from taxes. Indeed, investment units I_0 I_1 and saving units S_0 S_1 are now crowded out even though they were initially profitable.

To convert the measure to an effective tax rate, the tax wedge is divided by either the pre-tax rate of return p or the after-tax rate of return s. In the former case, the marginal effective tax rate is a « tax-inclusive » indicator in which the denominator denotes the net income received as well as taxes paid. In the latter case, the measure is said to be "tax-exclusive"[2].

$$t_{inclusive} = \frac{p - s}{p}$$

3. The before- and after-tax rates of return, *p* and *s*

In sub-sections 3.1 and 3.2, we focus on the methodology built up to determine the before-tax rate of return on investment and the after-tax rate of return on saving.

3.1. The before-tax rate of return, p

The before-tax rate of return, p, is expressed as the difference between the user cost of capital and the true economic depreciation rate of the asset.

The user cost of capital is the central parameter of the approach and is commonly derived in the context of the dynamic neo-classical theory of the firm, that is the standard framework in literature. It focuses on the marginal unit of capital that, just profitable, equalises its return and cost. Consequently, the user cost of capital expresses the minimum rate of return an investment must yield before taxes in order to be just profitable. Deriving this parameter amounts to determining what the required marginal product of capital is to cover all costs relating to the additional unit invested. The following approach, borrowed from Boadway and Shah (1995), relies on the behavioural problem of the firm in the presence of taxes and assumes investment in depreciable capital.

Considering a partial equilibrium model, the firm's overall optimisation program consists in choosing an investment strategy that maximises its shareholders' wealth, that is the equity value of the firm. The production function F(K)[3] is strictly concave and the capital stock is denoted K. P and Q respectively express the price of output and capital.

In a closed and competitive environment with no adjustment costs, we assume that firms face two sources of finance: debt issue and retained earnings. Temporarily, we neglect new share issue. For convenience, statutory tax rates are supposed to be time-invariant, there is perfect certainty and all prices are uniform over time. There is no corporate wealth tax. In such a context, the capital market equilibrium requires that the shareholders' net dividends and capital gains reach the expected nominal after-tax rate of return on equity. In time t, this condition is written as follows:

$$\rho E_t = (1-m_g)E_t^o + (1-m_d)D_t \qquad (1)$$

where

- ρ is the required nominal after-tax rate of return on equity to existing shareholders;
- E_t is the value of equity in the firm in time t;
- m_g is the personal tax rate on capital gains (converted in an effective accrued tax rate accounting for the benefit of deferral of tax because capital gains are taxed only on realisation);
- E_t° refers to the capital gain resulting in time t;
- m_d is the shareholders effective tax rate on dividends taking into account any systems alleviating or eliminating economic double taxation of dividends[4];
- D_t is the amount of dividends in time t.

In the absence of new share issue, the dividend stream D_t is given by expression (2):

$$D_t = (1-\tau)P_tF(K) - (1-\phi)Q_t(K_t^\circ + \delta K_t) + \tau\alpha A_t + B_t^\circ - i(1-\tau)B_t \qquad (2)$$

where

- τ is the corporate tax rate;
- ϕ is the rate of investment tax credit;
- K_t° is the time rate of change in capital stock, that is $\delta K_t/\delta t$[5];
- δ is the economic depreciation rate of capital which is assumed to be exponential;
- α denotes the tax depreciation rate;
- A_t refers to the undepreciated value of capital for tax purposes in time t;

- B_t is the current debt of the firm;
- B_t° is the time variation in debt of the firm, that is $\delta B_t/\delta t$;
- i is the nominal interest rate.

The dividend is the after-tax added value due to capital which is reduced by the price of new investment net of investment tax credit, increased by tax savings due to depreciation allowances and finally affected by new debt issue and interest payments on existing debt. Following Boadway and Shah (1995), for the sake of simplicity, let's write the dividend flow as the sum of the cash flow of the firm X_t and its financial flows with non-shareholders.

$$D_t = X_t + B_t^{\circ} - i(1-\tau)B_t \tag{3}$$

The problem of the firm consists in choosing an optimal level for both capital and debt. In the present model, this would however not give an internal solution[6]. An alternative procedure commonly used in literature is treating the decision in two sequential stages. First, the debt-equity ratio is fixed and then the optimal investment level is determined. « Since the effective tax rate literature has not been concerned with financial decisions, the financial structure of the firm has usually been assumed exogenous despite the fact that tax considerations may well have an influence on the financing decision. A typical procedure followed (implicitly or explicitly) has been to take as given the debt-equity ratio of the firm b »[7].

$$b = B/E_t \tag{4}$$

Given (3) and (4), the capital market equilibrium condition (1) can be rewritten as follows:

$$\rho E_t = (1-m_g)E_t^{\circ} + (1-m_d)X_t + bE_t^{\circ}(1-m_d) - (1-m_d)i(1-\tau)bE_t \tag{5}$$

Solving equation (5) for E_t gives the equity value of the firm to be maximised. After some transformations, we obtain expression (6):

$$E_t = \int_t^{\infty} e^{-N.(s-t)} X_s \left(b + \frac{1-m_g}{1-m_d}\right)^{-1} ds \tag{6}$$

where N is the nominal cost of finance to the firm.

Parameters b, m_g and m_d being constants, the maximisation problem reduces to a simpler expression corresponding to the present value of the cash flow:

$$E_t = \left[b + \frac{1-m_g}{1-m_d}\right]^{-1} \int_t^{\infty} e^{-N.(s-t)} X_s ds \tag{7}$$

The discount factor N is given by

$$\frac{\frac{\rho}{1-m_g} + i(1-\tau)b\frac{1-m_d}{1-m_g}}{1+b\frac{1-m_d}{1-m_g}} \tag{8}$$

or more simply, according to BOADWAY (1987)[8], by

$$(1-\beta)\frac{\rho}{1-m_g}+(1-\tau)i\beta \qquad (9)$$

From expression (9), the financial capital cost appears to be a weighted average of the before-personal-tax costs of equity finance ($\rho/(1-m_g)$) and debt finance ($i(1-\tau)$). The weights β and (1-β) express the proportions in which additional investment is financed by new debt and retained earnings respectively.

Boadway and Shah (1995) extend the approach to new share issue: the discount factor N has to include the cost of obtaining finance through share issue, just as it incorporates the cost of using retentions and debt finance. Let σ be the nominal net-of-tax return required by new shareholders. The following expression is obtained for the nominal financial cost relating to share issue. It is the sum of the real financing cost and the inflation rate π:

$$\frac{\sigma-\pi(1-m_g)}{1-m_d}+\pi \qquad (10)$$

The real financing cost paid by the firm is defined as the nominal gross-of-tax return required by shareholders $\sigma/(1-m_d)$ minus the inflation rate which, expressed in before-tax terms, suffers taxation at the capital gains tax rate m_g rather than m_d. Indeed, shareholders receive a dividend stream corresponding to the real return plus a stream of nominal capital gains of π as share value rises with inflation[9].

Assuming a, the proportion of equity financed from retained earnings, the total financial capital cost N is given by expression (11):

$$N=\beta i(1-\tau)+(1-\beta)\left[a\frac{\rho}{1-m_g}+(1-a)\left(\frac{\sigma-\pi(1-m_g)}{1-m_d}+\pi\right)\right] \qquad (11)$$

This parameter is differently treated in KING and FULLERTON (1984). In their analysis, the marginal investment unit is totally financed either by debt, retained earnings or new share issue. So, the discount factor is defined for every finance source. In KING and Fullerton (1984), when several financing methods are used, a weighted average is calculated afterwards, directly from the estimated marginal effective tax rates.

Furthermore, they impose an arbitrage condition to derive this financial capital cost N. In their « fixed-p » case, the investment is supposed to provide the same before-tax return, whatever the financing method. In their « fixed-r » case , however, the ultimate providers of funds require the same before-personal-tax return on loans, new share holdings and undistributed profits. In the developments of Boadway, Bruce and Mintz (1984), the costs of debt and equity are determined by the interdependence of world capital markets: the real after-tax return on domestic loans and equity[10] received by foreigners must equal the amount earned abroad on an equivalent investment, given that exchange rate variations are treated as capital gains for tax purposes.

The equity value of the firm (equation (7)) is maximised subject to expression (12):

$$A_t^{\circ}+\alpha A_t=(1-\phi)Q_t(K_t^{\circ}+\delta K_t) \qquad (12)$$

Equation (12) suggests that the investment expenditure to be depreciated for tax purposes (at a rate α) does not include the investment tax credit[11].

Following the mathematical techniques of dynamic optimisation, the first-order condition on real investment decision of the firm can be shown to equal:

$$\frac{P\,F'(K)}{Q} = \frac{N+\delta-Q^{\circ}/Q}{1-\tau}(1-\phi)\left(1-\frac{\alpha\tau}{N+\alpha}\right) \qquad (13)$$

Where time subscripts have been omitted for simplicity.

The last stage consists in deflating P and Q to obtain the real prices of output and capital, p^* and q. The result turns out to be the marginal product of capital required to cover all costs relating to the additional unit of investment, that is the gross cost of capital. It is expressed on the right-hand side of expression (14).

$$\frac{p^{*}F'(K)}{q} = \frac{(N-\pi)+(\delta-q^{\circ}/q)}{1-\tau}(1-\phi)\left(1-\frac{\alpha\tau}{N+\alpha}\right) \qquad (14)$$

Interpretation of expression (14) is as follows. In a world without taxes, (14) reduces to the sum of two terms: $(N - \pi)$ and $(\delta - q^{\circ}/q)$. The former expresses the real financial cost while the latter denotes the true economic depreciation of capital goods. Every term is measured as a rate. Every rate applies to an investment expenditure of one monetary unit. The true economic depreciation captures the expected decline in the real market value of the asset (δ) and corrects it by any real capital gain due to a nominal increase in capital price in excess of general inflation $(-q^{\circ}/q)$. When taxes are considered, the income from capital is subject to corporate tax so that the expression is divided by $(1-\tau)$ and the net price of investment is reduced by any grants[12] including investment tax credits and tax allowances given for the asset $(1-\phi)(1-\frac{\alpha\tau}{N+\alpha})$. Integrating all these parameters makes the gross cost of capital a forward-looking measure to determine the minimum yield firms are likely to require on investments.

In order to measure the net cost of capital p, the true economic depreciation is deducted from the gross cost of capital, as shown in (15):

$$p = \frac{(N-\pi)+(\delta-q^{\circ}/q)}{1-\tau}(1-\phi)\left(1-\frac{\alpha\tau}{N+\alpha}\right)-(\delta-q^{\circ}/q) \qquad (15)$$

3.2. The after-tax rate of return, s

The real after-tax yield obtained by the providers of funds expresses the return to saving, s. Bearing in mind that i, ρ and σ are respectively the nominal before-personal-tax interest rate on loans, the nominal after-tax rate of return on undistributed profits and the nominal after-tax rate of return on new shares, s can be expressed as the weighted sum of the after-tax returns on the three sources of finance.

$$s = \beta i(1-m_i)+(1-\beta)(a\rho+(1-a)\sigma)-\pi \qquad (16)$$

where m_i is the personal tax rate on interest receipts.

4. Direct extensions to the basic model

Since Jorgenson (1963), the major developments of the effective tax rate theory generally focused on specific parameters involved in the cost of capital expression. For instance, the inclusion of *personal taxes* and *international tax rules* alters the expressions of the financial capital cost N and of the tax rate τ. Other improvements concern the range of *investment tax incentives*. The relationship between *inflation* and the user cost of capital is another well-discussed issue. When considering *different types of investment assets*, for instance nondepreciable as well as risky investments, the expression of the economic rate of depreciation is adjusted. The cost of capital expression also varies according to the *reporting convention* that the tax authorities impose on corporations. Another extension affecting the capital cost deals with releasing the basic assumption of *homogenous space* across regions.

The purpose of this section consists in highlighting how these few topics impact on the specification of the capital cost and marginal effective tax rate.

4.1. Personal taxation and the cost of capital

From Jorgenson (1963) to King and Fullerton (1984), the developments were still confined to a closed economy but integrated wealth and personal taxes to corporate ones[13]. Consequently, it considered the possible alleviation of *economic double taxation.*

Economic double taxation occurs when the same revenue is taxed twice, within the corporate sector and at personal level. Integration of personal taxes with corporate taxes provides a means of relieving this double taxation. It depends however on the tax system in use. Under the *classical system*, the tax liability of the company is supposed to be independent of that of its shareholder. In this case, no double tax relief is granted. The three other systems, however, provide alleviation. The *imputation system* allows shareholders to credit all or a proportion of the corporate tax against their personal tax liability. Under the dividend *deduction principle*, the company can deduct from its tax base a part of the profits for distribution. Finally, in the *split-rate mechanism*, distributed profits are taxed at a lower rate than retained earnings.

King and Fullerton (1984) implement these mechanisms using a specific variable: the opportunity cost of retaining earnings in the parent company in terms of gross dividends to shareholders. It represents the before-personal-tax amount obtained by shareholders after that the firm has distributed one unit of profit net-of-corporate tax. In other words, it denotes the opportunity cost of retained earnings in terms of dividends forgone. Of course, N and p are influenced by any value of this opportunity cost when investment is financed (at least partially) by new share issue.

In Boadway and Shah (1995), such a specific variable is implicitly introduced in m_d, the *effective* personal tax rate on dividends. It integrates the personal statutory tax rate with the rules preventing economic double taxation[14].

4.2. International taxation and the user cost of capital

The cost of capital was given an international dimension with the introduction of foreign investments. First limited to *foreign direct investments*, multinational's operations

were then considered to be performed through *intermediary companies*. Moreover, given the actual range and complexity of *international tax rules and practices,* the impact of some of them has been analysed in depth. Sub-section 4.2 is aimed at developing the above mentioned topics in connection with international taxation and the cost of capital.

4.2.1. Foreign direct investments

The complex matter of international taxation was introduced by ALWORTH (1988). In this contribution, a domestic firm invests abroad (in the so-called host or source country) through a wholly owned foreign subsidiary and obtains the funds from domestic personal shareholders (located in the so-called home or residence country). In that context, the variable τ becomes an *effective* tax rate, that is a combination of the domestic and foreign countries' statutory corporate tax rates and the rules alleviating *international double taxation.* Such double taxation occurs when different jurisdictions tax the same revenue.

In the event of repatriation from the foreign affiliate to the parent company, the revenue is indeed likely to be subject to corporate tax in both the host and residence countries and may, in addition, suffer a withholding tax. Nevertheless, it generally benefits from double tax agreements that specify a method to avoid international double taxation: *the exemption*, deduction and credit systems. In the first case, the revenue is simply exempt from tax in the domestic country. According to the *deduction principle*, the latter country considers as tax base the total revenue generated by investment minus foreign taxes. Finally, under the *credit mechanism*, the domestic tax base is the full revenue generated by the affiliate but taxes paid abroad can be totally or partially used to reduce the domestic tax liability. If the foreign tax is higher than the domestic one, a situation of excess credit (or "overspill") is said to occur and generally implies no reimbursement of the surplus of the foreign tax liability on the domestic tax. The two latter systems may occur with or without deferral[15].

Another effect of considering foreign subsidiaries' investments is the enlargement of the financing methods. In Alworth (1988), the subsidiary may choose either an autonomous financing policy or a parent-dependent one. The former possibility refers, as in King and Fullerton (1984), to borrowing locally, using retained benefits or even issuing new shares[16]. Otherwise, the parent company can provide the subsidiary with the funds by granting a loan or buying its shares. In turn, the parent company supplies the finance either by borrowing from a bank, using undistributed profits or issuing new shares. Each of these nine financing methods corresponds to a specific - possibly different - cost of finance N.

Using a similar approach as Alworth's (1988), KEEN (1990) also highlights the impact of taxes on multinationals' investment decisions and identifies a policy achieving full neutrality in international corporate taxation. In a context of increasing integration of capital markets and tax reform, his work has been used in the OECD (1991) study. The latter intends to emphasise the effects on capital movements of differences in national corporate tax provisions. Such investment location problems and the need to strengthen corporate tax harmonisation among European countries are also largely discussed in the report of the Ruding Committee[17]. JUN (1995) also focuses on how international tax

rules affect the cost of capital of U.S. foreign subsidiaries compared with U.S. domestic firms, local firms of foreign markets and other multinationals established abroad.

These works and other ones like Mignolet (1998a) highlight some counter-intuitive results. A lowering of corporate tax rate in the source country may keep the cost of capital unchanged. It may even increase it. The former case occurs when the credit method without deferral is applied and when there is no "overspill". Indeed, when there is no excess credit, it is the Treasury of the residence country rather than the parent company that benefits from the lowering of the tax rate in the source country. Decreasing the corporate tax rate gives rise to an increase in the capital cost when the affiliate finances the investment by borrowing and when the residence country applies the credit system with deferral. The explanation is the following. Interest payments are (at least partially) deductible from tax base. A lowering of the corporate tax rate diminishes the tax savings due to interest payments and therefore increases the financial capital cost *N*. With the increase of this discount rate, the present value of depreciation allowances is reduced. Combining both effects results in a capital cost increase.

4.2.2. The use of intermediary companies

Limited to a simple binational group of companies, Alworth's (1988) model has been extended to include intermediary companies aimed at intercepting the funds flowing from the parent company to its subsidiary and vice-versa. These extensions concern the practice of treaty shopping and the intermediation of tax-aided finance companies.

A) Treaty shopping

The practice of treaty shopping consists in setting up intermediary subsidiaries in countries with profitable double tax treaties in order to benefit from these agreements. The process is the following: a parent company located in country A wishes to establish a subsidiary in country C. However, the absence of double tax agreement between both countries would result in the group supporting high taxes when repatriating income. Locating an intermediary firm in a state B that has concluded double tax agreements with both countries A and C allows a reduction of this tax burden.

Pierre (1996) develops the marginal effective tax rate integrating the possibility of treaty shopping. The presence of a third company that intercepts repatriated dividends is reflected in the effective tax rate variable τ. Even more complex than in Alworth (1988), this parameter now takes into account the three countries' statutory tax rates, withholding taxes and the double tax mechanisms applied in both the domestic and intermediary locations.

B) Intermediation of tax-aided finance companies

Over the last decades, international tax planning also consisted in taking advantage of the favourable regimes granted in some European countries to multinationals' treasury centres. Indeed, owing to their numerous tax advantages, these centres offer the opportunity to invest abroad at a low cost and turn out to be a powerful financing tool of multinationals' foreign investments.

Hespel (1997) highlights the advantages of providing foreign subsidiaries with investment funds through a Belgian coordination centre. This study has recently been

extended by Hespel, Mignolet and Pierre (1998) to other famous finance structures in Europe: the Dutch finance company, the Irish IFSC and the Luxembourg company coupled with Swiss finance branch. The study answers the following question: where to locate the treasury centre in order to minimise the cost of capital? The results vary with the subsidiary's location country and the double tax alleviation mechanism implemented in the domestic country.

4.2.3. International tax rules and practices

The literature deals with many issues on international tax rules and practices as well as their consequences for tax policies. Some contributions are evoked below.

Leechor and Mintz (1992) measure the cost of capital when the credit with *deferral* method is implemented in the location country of the parent company. They show that deferral affects multinational's investments and financing decisions depending on the statutory tax rates of the host and domestic countries but also on any differences in tax bases and on the amount of dividends repatriated. According to them, the famous Hartman theorem[18] according to which « subsidiary investments financed at the margin by retentions are only influenced by the host country tax system even if remitted dividends are taxed by the home country »[19] holds only when both countries have similar corporate tax bases.

Using the model in Sinn (1991 and 1993) and Hines (1994), Weichenrieder (1996) analyses *anti-tax-avoidance provisions* that prevent the deferral or exemption of passive investment income. The U.S. Subpart-F legislation can be cited in that respect. It stipulates that the profits of U.S. foreign subsidiaries arising from holding financial assets (passive income) bear U.S. taxation even if they are maintained abroad. Another anti-tax-avoidance provision consists in allowing foreign passive income only up to a proportion of active income (profits arising from production or trade). In the event of limit overstepping, all profits are treated as if repatriated. It emerges from the study that such provisions may lower the cost of capital of foreign firms and restrictions on the relative volume of passive income may increase the size of foreign subsidiaries.

In his paper on *transfer pricing*, double taxation and the cost of capital, Weichenrieder (1995) discusses another tax-saving device. It turns out to be indeed interesting for a subsidiary located in a high tax country to shift profits to its parent by underpricing its intra company sales and overpricing its intra company purchases. By fixing a maximum amount of profits to be shifted, the author comes to the paradoxical result that, if profits are high enough to allow a dividend distribution in addition to profit shifting, an increase in foreign dividend taxation implies a lower cost of capital. In that respect, consider the reduction of dividend distributions as the affiliate's investment source of finance. With higher withholding taxes, the parent company has to forgo fewer dividends in order to provide the subsidiary with the same amount of funds. Hence, the financial cost decreases and so does the cost of capital.

By lowering the corporate tax rate from 46% to 34%, the U.S. Tax Reform Act of 1986 caused many multinationals to switch to an excess credit position. In this context, Altshuler and Fulghieri (1994) analyse how the required rate of return on foreign investments is altered when parent companies switch *to and from excess credit positions*. The Tax Reform Act of 1986 also strengthened the rules on *interest allocation* between

foreign and domestic source income. It is required that the parent allocates interest expenses to U.S. and foreign source income on a consolidated basis according to the distribution of U.S. and foreign assets. Consequently, as a multinational with excess credits pays no tax to the U.S. treasury, it is not able to deduct the interest expenses attributable to foreign investment. This loss of interest tax shields increases the required marginal product of debt-financed domestic and foreign investments. Moreover, U.S. companies undertaking new investments turn out to be disadvantaged compared with foreign corporations that do not have to allocate interest expenses. The impact of such measures on the financing methods of foreign and domestic investments are considered namely in Froot and Hines (1994) as well as in Altshuler and Mintz (1995).

4.3. Tax incentives and the cost of capital

This sub-section starts with outlining general investment incentives such as investment tax credits, depreciation allowances and capital grants. Tax holidays also belong to the range of tax incentives aimed at encouraging investments. The issue of loss offsetting is worth analysing too.

4.3.1. General investment incentives

Tax incentives allow a reduction of investment cost. To identify these advantages in the capital cost expression presented in BOADWAY and SHAH (1995), let's express equation (14) as follows:

$$\frac{p^* \cdot F'(K)}{q} = \frac{(N-\pi)+(\delta - q^{\circ}/q)}{1-\tau}\left[1-\left(\phi+(1-\phi)\frac{\alpha\tau}{N+\alpha}\right)\right]$$

The last term in brackets refers to the marginal investment expenditure: 1 monetary unit minus public incentives. Investment tax credits (ϕ) as well as the present value of the tax benefits due to depreciation allowances are taken into consideration.

King and Fullerton (1984) and Alworth (1988) integrate capital grants as well. They model investment incentives as $f_1A^* + f_2\tau + f_3g$. A* refers to the present value of tax savings from standard depreciation allowances; f_1, f_2 and f_3 express in turn the proportion of investment expenditure qualifying for standard depreciation allowance, which is entitled to immediate expensing and on which a capital subsidy can be granted at rate g.

4.3.2. Tax holiday

A tax holiday refers to an investment incentive involving parameters varying in time. To attract foreign companies, some governments do indeed provide tax exemptions for a fixed period. The cost of capital with respect to such a provision is given in Boadway and Shah (1995)[20]. Investment tax credits are neglected here.

$$\frac{(N_t-\pi)+(\delta - q_t^{\circ}/q_t)}{1-\tau_t}(1-Z_t)+\frac{Z_t^{\circ}}{1-\tau_t}$$

where

- τ_t is set equal to 0 during the tax holiday period; it is equal to τ otherwise;
- Z_t is the present value in time t of future tax depreciation allowances per dollar of gross investment. It takes into account the carryforward provision from the tax holiday to the taxpaying period of accumulated tax savings as well as the variable discount rate. To determine the value of Z_t for investments undertaken during the tax holiday period, a different discount rate is used for annual tax savings relating to the tax holiday period and to the non-tax holiday period;
- the last term reflects the fact that an additional cost of holding an incremental monetary unit of capital is the postponing of the purchase of capital that will increase future tax savings by $Z^{\circ}_t(=\delta Z_t/\delta t)$ [see Boadway and Shah (1995), p.64].

Mintz and Tsiopoulos (1994) focus on the extent to which U.S. multinationals' affiliates in Europe can take advantage of tax holiday incentives. The issue is of great interest as U.S. firms with no excess credits are subject to corporate taxation on foreign source income. The authors develop the user cost of capital under different scenarios : no tax holiday and excess credits, no tax holiday and no excess credits, a tax holiday and excess credits, a tax holiday and no excess credits. They show that in any credit position, the tax holiday decreases the effective tax rate on capital but the reduction is far greater in the presence of excess credits. The U.S. government is said to claim back about one half of the incentives granted by CEE countries; in this case, the tax holiday is a little effective tool for attracting U.S. affiliates.

4.3.3. Loss offsetting

Generally, tax authorities do not treat profits and losses symmetrically. Indeed, while profits are subject to tax, there is no reimbursement in case of losses. This phenomenon is partially offset by carryback and carryforward provisions that enable firms to write off current losses against past or future profits. With the former provision, the period is limited in time so that the loss offsetting system may not be complete.

Basing his work on the 1979-1981 aggregate data available for Canadian industries, Mintz (1988) shows that the extent to which losses can be used to shelter taxable income affects the marginal effective tax rate. It depends on the status of the firm: taxpaying firms using all deductions and credits immediately, nontaxpaying firms at the time of investment expecting to use marginal tax losses slowly over time, and finally risky start-up firms having few past losses and being uncertain of their tax position in the years following investment. Especially if future returns are highly risky, the latter category of firms turns out to be heavily penalised by imperfect loss offsetting since fast write-offs and deductions cannot be used.

4.4. Inflation and the user cost of capital

Even though the calculation of effective tax rates takes as exogenous the inflation rate, a common interest found in literature concerns the impact of varying inflation rates on effective tax rates.

In theory, this relationship is ambiguous. Indeed, on the one hand, inflation reduces the present value of depreciation allowances since it is calculated on a historic

rather than replacement cost basis. On the other hand, inflation affects the cost of finance either positively or negatively. According to Cohen, Hassett and Hubbard (1997), the sign of this relationship depends on whether the economy is closed or open. The authors conclude that inflation increases the real cost of equity finance in a closed economy while it is neutral in an open economy. As regards the cost of debt, in an open economy, it is unambiguously reduced in the presence of inflation owing to the interest deduction allowance within the firm. In a closed economy, however, considering that personal investors are taxed on nominal interest receipts may offset this reduction. Hence, the impact of inflation on the cost of debt in a closed economy depends on the level of the corporate and personal interest tax rates. Indeed, the gain stemming from interest deductions is calculated using the corporate tax rate while the level of the additional tax faced by the individual is contingent upon the interest personal tax rate.

Consequently, the user cost of capital increases with inflation when equity is used as a source of finance while the relationship is ambiguous in the case of debt finance. With such indeterminacy, empirical studies turn out to be helpful. The comparative study of King and Fullerton (1984) shows a positive relationship between inflation and effective tax rates. Thus, a reduction in the general rate of inflation creates an incentive on the margin for a higher level of capital accumulation. The same observation follows from Boadway, Bruce and Mintz (1984) and the OECD (1991) study.

The effect of inflation varies, however, across investment categories. King and Fullerton (1984) find that effective tax rates on income from depreciable capital rise with inflation while those for inventories fall slightly. For Boadway, Bruce and Mintz (1984), effective tax rates increase slightly for depreciable assets, significantly for inventories, and fall for land. The case of inventories is of particular interest. With FIFO accounting and inflation, the cost of capital is expected to increase. Indeed, as the oldest units are removed from stock, the most expensive units constitute the taxable value.

Finally, we may not neglect the impact of inflation on investment incentives. Let's just mention that lowering tax rates may slow down the tax base enlargement effect due to inflation. Moreover, accelerated depreciation allowances enable a reduction in the loss of value of future depreciated amounts. In that respect, investment tax credits are even more valuable as immediate write-offs simply cancel any effect of inflation.

4.5. Investment assets and the cost of capital economic depreciation

In addition to the capital cost for depreciable assets, Boadway and Shah (1995) developed the user cost for non-depreciable capital (land), inventories and non-renewable resources. Determining the cost of capital for land simply requires setting to zero the asset depreciation rate δ and the tax allowances rate α. For the other cases, the reader is advised to refer to the authors' contribution[21] owing to the specific assumptions set to tackle the problem.

Risk is another distinctive criterion of investment categories. The model in Boadway and Shah (1995) considers non-risky investment assets. However, the incorporation of *risk* in the marginal effective tax rate is largely dealt with in literature. Moreover, to really assess tax distortions under uncertainty, we cannot leave out the issue of *irreversible investments*. Finally, capital-type specific *adjustment costs* are considered.

4.5.1. Risky investments

Bullow and Summers (1984) identify two types of risks in connection with an investment asset :

- income risk, that is uncertainty regarding the future level of net revenues owing to variations in demand and output prices;
- capital risk, that is uncertainty regarding the economic rate of depreciation owing to a stochastic physical rate of depreciation as well as an unknown future supply price of capital.

The main conclusion of risk incorporation is the following[22]: under a full loss offset tax system, income risk totally cancels as it is shared in by the government through fluctuations in its tax revenue. Indeed, a reduction in income is followed by a corresponding reduction in tax liability. Moreover, taxable losses are used to reduce future tax bases as carryback and carryforward provisions are supposed unlimited in time. The result is quite different as regards capital risk because depreciation schedules for tax purposes are predetermined at the time of investment and are not adjusted for changes in depreciation rates.

To compensate for the risk they bear, investors require risk premia. The one possibly[23] dealing with income risk is to be added to the investment return while the capital risk premium contributes to increasing the depreciation rate. Consequently, the user cost of capital or minimum return required on investment projects is positively affected by risk. Besides, SHOVEN and TOPPER (1992) emphasise that risk premia are extremely important components of the cost of capital. In their implementation results, it is indeed the low cost of risk capital that provides Japan with a large cost of capital advantage relative to Canada and the United States while tax factors play a relatively minor role.

4.5.2. Irreversible investments

It is quite illusory to consider that investments are fully reversible. As industrial investments are generally valuable in a certain type of production, their conversion to alternative uses is at least costly, if not impossible. In such circumstances, the ability to delay an additional investment unit in order to obtain new information on the future evolution of economic variables has a certain value. As emphasised by Pindyck (1988 and 1991), it is equivalent to a financial call option, the value of which is determined by two components working against each other : the beneficial effect of getting new information and the loss of current operating profits resulting from postponing the investment. The option value represents the opportunity cost of sinking resources in the investment unit and must be included as part of the cost of investment.

In addition to risk, the issue of irreversibility impacts on the relationship between uncertainty and the user cost of capital. McKenzie (1994) generalised Jorgenson's user cost of capital to a risky environment with irreversible capital. To show that the marginal effective tax rate is larger for irreversible investments, his analysis was based on four types of risks : systematic and unsystematic income and capital risks. When investments are risky but fully reversible, the author talks about systematic capital and income risks. Unsystematic income and capital risks respectively relate to variability in demand and

capital price and arise upon considering risky and irreversible investments. Basing on the approach of Bertola (1988) and Bertola and Caballero (1991), McKenzie (1994) argues that the marginal effective tax rate increases in all four types of risk, while under full loss offsets and reversibility, it is only impacted on by systematic capital risk.

4.5.3. Adjustment costs

Adjustment costs in connection with installing new capital refer to the fact that higher rates of investment imply a loss of output. Indeed, to set up new capital, resources must be diverted from production and a certain length of time is necessary to achieve a new long run equilibrium. Ignoring adjustment costs amounts to overstating the adjustment speed and incorrectly assessing the effects of policy changes.

The importance of such an issue in determining marginal effective tax rates is dealt with in Boadway and Shah (1995) but also in Goulder and Thalmann (1991). They define the marginal cost of a physical unit of investment for shareholders as the share of investment cost not financed by debt, net of investment tax credit and depreciation allowances, plus the marginal adjustment cost. Indeed, adjustment costs decrease profits and then dividends. Hence, the capital cost increases.

4.6. The "spatialized" user cost of capital

The various works on the user cost of capital have been developed considering undifferentiated space. By releasing this assumption, Mignolet (1998b) intends to extend the theoretical framework to regional differences in productivity and factor prices as well as to imperfect competition.

Spatial productivity differentials are apprehended using some specialised literature. The basic capital cost is multiplied by an index expressing productivity in a given region relative to a benchmark entity. The index is assumed to capture all factors explaining productivity variations across locations namely interregional differences in factor endowments on the one hand, and localisation and urbanisation economies related to the number of nearby firms, on the other hand. Likewise, regional differences in factor prices are taken into consideration through the relative price of an asset in the given region to the benchmark entity.

The framework of competitive analysis used for measuring the cost of capital is not the most appropriate. The author discusses this question. In order to illustrate how some market power affects the analytical expression of capital cost, he considers two limiting cases: a pure monopoly for the commodity market and a pure monopsony on the capital market.

4.7. Reporting conventions and the cost of capital

Corporate behavior and tax incentives generally depend on the institutional and legal constraints faced by corporations such as, for instance, the reporting convention to which a corporation tax is required to adhere. Kanniainen and Södersten (1995) studied the economic effects of such conventions on the capital cost.

Uniform reporting and separate reporting coexist. The former convention requires that the tax balance sheet drawn up for the tax authorities coincides with the commercial balance sheet drawn up for the shareholders. Under the latter principle, both balance sheets may diverge.

These principles imply that different limits are imposed on dividend remittances, essentially when economic and tax depreciation rates do not equal, and lead on to different capital cost expressions. From these expressions, it can be seen that different tax rates determine the capital cost under both reporting conventions: the corporate tax rate on retained earnings cannot be used as an investment incentive in the case of uniform reporting while it proves to be a useful policy tool under separate reporting.

5. Taking the extensions to the basic model a step further

The marginal effective tax rate described in the above sections summarises taxes on capital income resulting from an additional unit of investment. When releasing the basic assumption of marginal investment, the concept of *average effective tax rate* is referred to in literature. Some authors also extend the range of taxes to include not only capital income taxes but also *taxes on any factor of production.* Section five deals with developing the main arguments regarding these concepts.

5.1. The average effective tax rate

Even though the theory on effective tax rates has largely been developed considering additional investments, the concept of average effective tax rate has deserved some interest. Defined as the ratio of a year's taxes to income, it measures the tax burden on existing investments. On the other hand, the marginal effective tax rate captures the incentives to use new capital. These definitions imply that legal complexities such as graduated tax schedules, depletion allowances and export subsidies are automatically accounted for in average effective tax rates while they are hardly introduced in the marginal measure. Differences in both rate estimates turn out therefore to be quite understandable. Besides, Fullerton (1984) provides 11 reasons explaining estimation disparities and specifies the purpose for which each rate is best suited.

Slemrod (1987) emphasises the discrepancy between marginal and average effective tax rates in a steady state. His contribution focuses on the contradictory claim that a tax reform may reduce the corporate marginal effective tax rate while at the same time substantially increase the steady state tax revenue or average effective tax rate. This assertion depends on the level of two rates: the real after-tax discount rate introduced in the marginal effective tax rate and the growth rate of economy which alters the average measure. Indeed, the higher the latter rate or the higher the investment tax credits[24], the more taxable income is reduced. If the growth of rate of economy exceeds the real discount rate, it is shown that a policy decelerating tax rebates may imply the above contradictory result.

Hulten and Robertson (1982) provide historical estimates of average and marginal effective corporate tax rates. They show a variable relationship pattern between both rates. Gravelle (1985) considerably criticises their results, claiming that the marginal effective tax rate has tended to lie considerably below the average rate. Using the notion

of change in Tobin's average q, Iwamoto (1992) proposes a theoretical explanation for the relationship between these rates. The main idea underlying his approach is the following: because it measures the tax burden on existing capital, the average effective tax rate includes changes in asset price in case of uneven tax treatment of old and new capital. For instance, an investment subsidy granted to new capital reduces the attractiveness of holding old capital and decreases its market value. In contrast, the marginal effective tax rate disregards the asset price change as it refers to new capital only. Iwamoto (1992) therefore defines the average effective tax rate as the sum of the marginal effective tax rate and the asset revaluation rate. The latter rate expresses the tax revenue created by reducing the market price of existing capital and is defined using Tobin's average q, the ratio of the market valuation of capital to the replacement value of capital.

5.2. Effective tax rate on income from any factor of production

Because the marginal effective tax rate is a summary statistic of the taxes relating to capital income only, it does not provide a reliable tool to determine investment locations. Indeed, according to Gerard, Beauchot, Jamaels and Valenduc (1997), such decisions are contingent upon other tax parameters as for instance statutory charges in connection with labour costs (which are basically employers' contributions to social security). So, they extend King and Fullerton's (1984) approach to include tax parameters dealing with the use of labour resources, in addition to capital ones. The marginal effective tax rate is turned into a marginal effective statutory charge that actually measures the effective tax on the marginal added value. Applications of their model to European Member States reveals that social charges dominate capital income taxes and turn out to be the major determinant of the required minimum return in each possible location. The relevance of this result is nevertheless contingent upon the elasticity degree of factors supply.

Similarly, Boadway, Chua and Flatters (1995) measure marginal effective tax rates in the presence of indirect taxes. Indirect taxes are seldom thought of as altering investment incentives. In some countries however, they provide the government with a large part of its revenue, for instance roughly one half in Malaysia. Investment location decisions should therefore take such information into consideration. In this context, the authors enlarge the marginal effective tax rate concept to import taxes, sales taxes, export subsidies and excise duties.

According to McKenzie, Mintz and Scharf (1997), the approach of Gerard, Beauchot, Jamaels and Valenduc (1995) only allows to apprehend the impact of taxes on capital investment location and is, moreover, inappropriate as it tends to overestimate the effective tax rate on capital for non-capital intensive firms. Going one step further, McKenzie, Mintz and Scharf (1992) and (1997) provide a convenient measure of the potential impact of all input taxes on production location decisions: the effective tax on marginal production costs. The methodology relies on the idea that firms produce output until marginal revenue is equal to the marginal cost of production. This cost reflects the inputs use and is increased by taxes on inputs and outputs. The effective tax on marginal production costs is then defined as the difference between the tax-inclusive and tax-exclusive marginal cost of production. In order to calculate it, the marginal effective tax

rate relating to each input factor is derived and aggregation is then implemented. In the 1992 paper, their method is already applied to measure the impact of taxation on the cost of providing transportation services, considering fuel, labour and capital as inputs.

Other approaches focus on the impact of taxation considering other taxes than capital. Using a macro economic approach, Mendoza, Razin and Tesar (1994) consider consumption, labour and capital taxation in determining average effective tax rates. Their methodology consists in dividing tax revenues by the corresponding tax bases. Such information may be obtained from national accounts and revenue statistics. A comparison is provided with marginal effective tax rates. Basing on a utility maximisation model, McKee, VISSER and Snauders (1986) also construct marginal and average tax rates on labour use as well as marginal tax rates on capital use. They observe that the former rate is generally high by comparison with the latter rate.

Conclusion

This chapter presented an overview of the current state and developments along with effective tax rates. The contribution of Boadway and Shah (1995) provided us with valuable help in deriving the expression of the marginal effective tax rate, a summary statistic for the various taxes affecting the return of an additional unit of investment. The capital cost is the central parameter of the approach. It is defined as the minimum yield required on the additional unit of capital so that investment is just profitable. This statistic captures the cost of financing investments, taking into account the general inflation rate, the real capital price growth of rate and the asset economic rate of depreciation. Moreover, all provisions of the tax system that may affect the investment return including amortization allowances and capital incentives are considered.

The objective of the chapter was to present the main contributions to the effective tax rate theory. In this respect, section three set out to develop direct extensions to the basic model.

It first considered more complicated tax devices. In King and Fullerton (1984), personal income taxes were integrated to calculate marginal effective tax rates for domestic investments. The measure was extended to cross-border investments in Alworth (1988) and later applied to multinational groups of companies practicing treaty shopping and intermediation of tax-aided finance companies. Other results dealing with international tax rules and practices have been emphasized. In addition to investment tax credits as well as tax benefits due to depreciation allowances, tax holidays, capital grants and carryback- and forward provisions of unused tax savings have been considered. Even though ambiguous, the relationship between inflation and the effective tax rate was shown to be generally positive. One of the main results of risk introduction is that under a full loss offset tax system income risk totally cancels. McKenzie (1994) also showed that the marginal effective tax rate is larger for irreversible investments. Adjustment costs also turn out to increase the capital cost. The last but one sub-section referred to the "spatialized" user cost of capital, which takes into account regional differences in productivity and factor prices as well as imperfect competition. Finally, we focused on the importance of reporting conventions in determining the capital cost and tax policy tools.

The specific concepts of average effective tax rate and effective tax rate on multiple production factors have been analyzed in section five. The average effective tax rate, not built under the assumption of marginal unit of investment, measures the tax burden on existing investments. Discrepancies between marginal and average effective tax rates have been emphasized in several contributions. Using Tobin's q, Iwamoto (1992) provided a theoretical explanation for the relationship between both rates.

Because it integrates the only capital income taxes, the marginal effective tax rate turns out to be a biased indicator of location decisions. Indeed, taxes on any input factor are likely to influence firm's location decisions. So, recently, the literature dealing with measuring effective tax rates in the presence of multiple input taxes considerably expanded. Particularly, the effective tax rate on marginal costs of production developed in McKenzie, Mintz and Scharf (1992 and 1997) turns out to be a powerful tool to determine the impact of taxes on production facilities across jurisdictions.

Owing to the numerous extensions brought to theory, the concept of effective tax rate has become a more and more powerful tool in determining investment and production location. It even seems to constitute a useful tool as much for industrial groups as for policy makers.

Endnotes

1. Since the income from capital is taxed according to the residence principle, investors will receive the same after-tax return on foreign and domestic assets when the foreign and domestic pre-tax interest rates are the same.
2. See King and Fullerton (1984).
3. For the sake of simplicity all other arguments are omitted.
4. For further details, see Section 4.1.
5. We work in continuous time for convenience.
6. See Boadway (1987).
7. Boadway (1987), p.66.
8. Boadway (1987) proves this assertion basing his developments on the capital market equilibrium and considering a fixed debt-equity ratio. He shows that the proportion of new investment financed by debt, β, is equal to $\left[b\frac{1-\theta}{1-c}\right]/\left[1+b\frac{1-\theta}{1-c}\right]$
9. See Boadway, Bruce and Mintz (1984), p.67.
10. The cost of equity finance is the same for both retained earnings and new issues.
11. According to the tax regime implemented in North America. In some other countries - in Belgium for example - the investment tax credit is not deducted from the amount that is entitled to depreciation allowances.
12. This expression does not include the possibility of a capital grant. But integrating it is straightforward.
13. The King and Fullerton (1984) model also includes corporate wealth taxes that are not considered here for the sake of simplicity.
14. When combining King and Fullerton (1984) with BOADWAY and SHAH (1995), it is possible to show that *md* equals *d* under the classical system, $1-[(1-d)/(1+\tau d-\tau u)]$ under the split-rate system, $1-[(1-d)/(1-cr)]$ under the imputation system, and $1-[(1-d)/((1-x.\tau)]$ under the deduction system; where *d* is the statutory personal tax

rate on dividends, τd and τu are the corporate statutory tax rates for respectively distributed and undistributed profits, cr is the credit rate and x, the proportion of profits planed for distribution.

15. Deferral means that the subsidiary's profits are subject to the domestic country tax in case of repatriation.
16. Alworth (1988) considers that the subsidiary sells shares directly to the home country personal shareholder.
17. Cee (1992).
18. See Hartman (1985).
19. Leechor and Mintz (1992), p.76.
20. See also Mintz (1990). From another point of view, BOND and SAMUELSON (1986) deal with tax holidays as signals.
21. See Boadway and Shah (1995), 67-70.
22. See for instance Jog and Mintz (1989).
23. When there is no full loss offsetting.
24. And the cost recovery allowances that apply to early years of capital assets' lifetimes.

References

Altshuler R. and Fulghieri P. (1994), "Incentive Effects of Foreign Tax Credits on Multinational Corporations", *National Tax Journal*, vol. XL, VII, 2, 349-362.

Altshuler R. and Mintz J.M. (1995), U.S. Interest Allocation Rules: Effects and Policy, International Center For Tax Study Discussion paper, 2, University of Toronto.

Alworth J.S. (1988), *The Finance, Investments and Taxation Decisions of Multinationals*, Basil Blackwell, Oxford.

Auerbach A.J. (1979), "Wealth Maximization and the Cost of Capital", *Quaterly Journal of Economics*, 93, 433-449.

Bertola G. (1988), "Adjustment Costs and Dynamic Factor Demands: Investment and Employment under Uncertainty", Unpublished PH D thesis, MIT.

Bertola G. and Caballero R.J. (1994), "Irreversibility and Aggregate Investment", *Review of Economic Studies*, 61, 223-246.

Boadway R. (1987), "The Theory and Measurement of Effective Tax Rates", in J.M. Mintz and D. Purvis (eds.), *The Impact of Taxation on Business Activity*, Kingston, Queen's University, John Deutsche Institute for the Study of Economic Policy, 61-98.

Boadway R. and Shah A. (1995), "Perspectives on the Role of Investment Incentives in Developing Countries", in A. Shah (ed.), *Fiscal Incentives for Investment and Innovation*, Oxford University Press, Oxford, 31-136.

Boadway R., Bruce N. and Mintz J. (1984), "Taxation, Inflation, and the Effective Marginal Tax Rate on Capital in Canada", *Canadian Journal of Economics*, 17, February, 62-79.

Boadway R.W., Chua D. and Flatters F. (1995), "Indirect Taxes and Investment Incentives in Malaysia", in Shah A. (ed.), *Fiscal Incentives for Investment and Innovation*, Oxford University Press, Oxford, 375-397.

Bond E. and Samuelson L. (1986), "Tax Holidays as Signals", *American Economic Review*, 76, 820-826.

Bovenberg A.L., Andersson K., Aramaki K. and Chand S.K. (1990), "Tax Incentives and International Capital Flows: The Case of the United States and Japan", in A. Razin and J. Slemrod (eds.), *Taxation in the Global Economy*, NBER, University of Chicago Press, 283-330.

Bulow J.I. and Summers L.H. (1984), "The Taxation of Risky Assets", *Journal of Political Economy*, 92, 20-39.

CEE (1992), Rapport du comité de réflexion des experts indépendants sur la fiscalité des entreprises, mars, Bruxelles.

Cohen D., Hasset K.A. and Hubbard R.G. (1997), "Inflation and the User Cost of Capital: Does Inflation Still Matter?", NBER Working Paper, 6046.

Froot K.A. and Hines J.R. (1994), "Interest Allocation Rules, Financing Patterns, and the Operations of U.S. Multinational", NBER Working Paper, 4924.

Fullerton D. (1984), "Which Effective Tax Rate?", *National Tax Journal*, vol. XXXVII, n°1, 23-41.

Gerard M., Beauchot L., Jamaels S. and Valenduc C. (1997), *MESC (Marginal Effective Statutory Charge), an Extension of King-Fullerton Methodology*, XXXIII^{ème} Colloque de l'ASRDLF, Lille, 1-3 Septembre.

Goulder L.H. and Thalmann P. (1993), "Approaches to Efficient Capital Taxation, Leveling the Playing Field vs. Living by the Golden Rule", *Journal of Public Economics*, 50, 169-196.

Gravelle J.G. (1985), "Which Effective Tax Rate? A Comment and Extension", *National Tax Journal*, vol. XXXVIII, n°1, 103 - 108.

Hartman D. (1985), "Tax Policy and Foreign Direct Investment", *Journal of Public Economics*, 26, 107 - 121.

Hespel A. (1997), Les centres de coordination et la taxation internationale: un modèle de calcul, Mémoire de la faculté des sciences économiques, sociales et de gestion de Namur.

Hespel A., Mignolet M. and Pierre I. (1998), "The Multinational Companies Cost of Capital and Some Financial Tax-Aided Structures", Cahier de la faculté des sciences économiques, sociales et de gestion de Namur, 202.

Hines J.R. (1994), "Credit and Deferral as International Investment Incentives", *Journal of Public Economics*, 55, 323-347.

Hulten C.R. and Robertson J.W. (1982), "Corporate Tax Policy and Economic Growth: An Analysis of the 1981 and 1982 Tax Acts", The Urban Institute Discussion Paper, Washington D.C.

Iwamoto Y. (1992), "Effective Tax Rates and Tobin's q", *Journal of Public Economics*, 48, 225-237.

Jog V.M. Mintz J.M. (1989), "Corporate Tax Reform and its Economic Impact: an Evaluation of the Phase 1 Proposals", in J.M. Mintz and J. Whalley (eds.), *The Economic Impacts of Tax reforms,* Canadian Tax paper, 84, Toronto, Canadian Tax Foundation.

Jorgenson D. (1963), "Capital Theory and Investment Behavior", *American Economic Review*, 53, 247-259.

Jun J. (1995), The Impact of International Tax Rules on the Cost of Capital, in M. Feldstein, J.R. Hines and R.G. Hubbard (eds.), *The Effects of Taxation on Multinational Corporations*, NBER, University of Chicago Press, 95-122.

Kanniainen V. and Södersten J. (1995), "The Importance of Reporting Conventions for the Theory of Corporate Taxation", *Journal of Public Economics*, 57, 417-430.

Keen M. (1990), "Corporation Tax, Foreign Direct Investment and the Single Market", mimeo, University of Essex.

King M.A. (1977), *Public Policy and the Corporation*, Chapman and Hall, London.

King M.A. and Fullerton D. (1984), *The Taxation of Income from Capital*, NBER, University of Chicago Press, Chicago.

Leechor C. and Mintz J. (1993), "On the Taxation of Multinational Corporate Investment When the Deferral Method is Used by the Capital Exporting Country", *Journal of Public Economics*, 51, 75-96.

McKee M.J., Visser J.J.C. and Snauders P.G. (1986), "Marginal tax Rates on the Use of Labor and Capital in OECD Countries.", *OECD Economic Studies*, vol.7, 45-102.

McKenzie K.J. (1994), "The Implications of Risk and Irreversibility for the Measurement of Marginal Effective Tax Rates on Capital", *Canadian Journal of Economics*, XXXVII, n°3, 604-619.

McKenzie K.J., Mintz J.M. and Scharf K. (1992), "Differential Taxation of Canadian and U.S. Passenger Transportation, in Directions", Royal Commission on national passenger transportation, Final Report, vol. 4, 1645-1698.

McKenzie K.J., Mintz J.M. and Scharf K. (1997), "Measuring Effective Tax Rates in the Presence of Multiple Inputs : A Production based Approach", *International Tax and Public Finance*, 4, 337-359.

Mendoza E.G., Razin A. and Tesar L.L. (1994), "Computing Effective Tax Rates on Factor Incomes and Consumption : an International Macroeconomic Perspective", CEPR Discussion Paper, 866.

Mignolet M. (1994), "Effective tax rates : A Generalization of Iwamoto's (1992) Result", Cahier de la faculté des sciences économiques et sociales de Namur, 133.

Mignolet M. (1998 a), "The Multinational Companies Cost of Capital and Regional Policy : Tax Cut or Capital Grant ?", Cybergeo, European Journal of Geography, n°50, 36 p.

Mignolet M. (1998 b), "Towards a "Spatialized" Cost of Capital Concept", in D. Griffith, C.G. Amrhein and J.M. Huriot (eds.), *Advances in Spatial Modelling and Methodology : Essays in Honor of Jean Paelinck*, Kluwer Academic Publishers, Dordrecht.

Mintz J.M. (1988), "An Empirical Estimate of Corporate Tax Refundability and Effective Tax Rates", *Quaterly Journal of Economics*, February, 1, 255-232.

Mintz J.M. (1990), "Corporate Tax Holidays and Investment", *The World Bank Economic Review*, vol. 4, 1, 81-102.

Mintz J. M. and Tsiopoulos T. (1994), "The Effectiveness of Corporate Tax Incentives for Foreign Investment in the Presence of Tax Crediting", *Journal of Public Economics*, 55, 233-255.

OCDE (1991), *L'imposition des bénéfices dans une économie globale*, Paris.

Pierre I. (1996), Le treaty shopping, la taxation effective et le coût du capital des sociétés multinationales, *Bulletin de documentation du Ministère des Finances*, 1, Janvier-février, 83-150.

Pindyck R. (1988), "Irreversible Investment, Capacity Choice and the Value of the Firm", *American Economic Review*, 78(5), 969-985.

Pindyck R. (1991), "Irreversibility, Uncertainty and Investment", *Journal of Economic Literature*, vol. XXIX, September, 1110-1148.

Shoven J.B. and Topper M. (1992), "The Cost of Capital in Canada, the United States and Japan", in J.B. Shoven and J. Whalley (eds.), *Canada-U.S. Tax Comparisons*, NBER, University of Chicago Press, 217-235.

Sinn H.-W. (1991), "The Vanishing Harberger Triangle", *Journal of Public Economics*, 45, 271-300.

Sinn H.-W. (1993), "Taxation and the Birth of Foreign Subsidiaries", In H. Herberg and N.V. Long (eds.), *Trade, Welfare and Economic Policies : Essays in Honor of Murray C. Kemp* (pp.325-352),Ann Arbor : University of Michigan Press.

Slemrod J. (1987), "On Effective Tax Rates and Steady-State Tax Revenues", *National Tax Journal*, vol. XL, n°1, 127-132.

Weichenrieder A.J. (1995), "Transfer Pricing, Double Taxation and the Cost of Capital", CES Working Paper, July, Munich.

Weichenrieder A.J. (1996), "Anti-Tax Avoidance Provisions and the Size of Foreign Direct Investment", *International Tax and Public Finance* 3, 67-81.