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Working Paper

Types of Tax Concessions for Attracting Foreign Direct Investment in Free Economic Zones

CESifo Working Paper, No. 1175

Provided in Cooperation with:
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Suggested Citation: Nam, Chang Woon; Radulescu, Doina Maria (2004) : Types of Tax Concessions for Attracting Foreign Direct Investment in Free Economic Zones, CESifo Working Paper, No. 1175, Center for Economic Studies and ifo Institute (CESifo), Munich

This Version is available at:
https://hdl.handle.net/10419/76610

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TYPES OF TAX CONCESSIONS FOR ATTRACTING FOREIGN DIRECT INVESTMENT IN FREE ECONOMIC ZONES

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CESIFO WORKING PAPER NO. 1175
CATEGORY 1: PUBLIC FINANCE
APRIL 2004

An electronic version of the paper may be downloaded
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CESifo *Working Paper No. 1175*

TYPES OF TAX CONCESSIONS FOR ATTRACTING FOREIGN DIRECT INVESTMENT IN FREE ECONOMIC ZONES

Abstract

Not only transition countries but also a large number of developing (and developed) countries have established free economic zones (FEZs) with the aim of attracting foreign capital by providing tax incentives, creating employment opportunities and promoting exports as well as regional development. Major theoretical justifications for the establishment of such economic zones generally maintain that there are economies of scale in the development of land and in the provision of common services and utilities as well as external economies of agglomeration by having similar industries grouped together. One of the main characteristics of FEZs is the provision of generous tax investment promotion schemes solely allowed in this enclave. In general such measures include: (a) profit tax exemption, (b) free or accelerated depreciation, (c) investment tax allowance, (d) subsidy for investment costs, etc. The incentive efects of various tax concessions on firms' investment decisions can be compared on the basis of the net present value model. Without taxation, the net present value (NPV) is equal to the present value of future gross return, discounted at an appropriate interest rate less investment cost. An investment project is therefore considered to be profitable when the NPV is positive. After introducing the corporate income tax, the present value of the asset generated from an investment amounts to the sum of the present value of net return (gross return less taxes) and the tax savings, led by, for example, an incentive depreciation provision. In this study the theoretical approach is accompanied by a model simulation based on selected parameters.

JEL classification: H25, R11.

Keywords: tax concessions, free economic zone, investment decision, net present value.

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1 Introduction

The establishment of a free economic zone (FEZ) is arguably one of the most significant institutional innovations that has spread throughout the world economy in recent years[1]. The FEZ as a territorial enclave in which foreign firms (in many cases also in co-operation with indigenous companies) benefit from generous incentives and privileges and thereby produce industrial goods mainly for export. FEZs have found popularity in developing countries, notably in the newly industrialised countries in Asia. The diffusion of this development concept as a growth-oriented policy instrument in developing countries is likely to continue in the near future. In recent years, however, this measure has also been adopted in the former centrally planned economies of Eastern Europe as an instrument of stimulating economic and structural transformation. The first application of this type of development measure began with the creation of special economic zones in China. Nowadays the FEZ concept is increasingly gaining importance in other transformation countries in Europe including the former USSR, Poland, Hungary and Bulgaria as well as in Asian countries such as Vietnam and North Korea (UNCTC 1990 and 1991).

One of the crucial characteristics of the FEZ is the provision of generous tax investment promotion schemes solely permitted in this enclave, although it is often asserted that tax incentives alone have not been successful in attracting foreign direct investment — FDI (OECD 1995; Clark 2000). A negative implication of such incentive schemes is the erosion of the tax base (Zee, Stotsky and Ley 2002). Such measures include: (a) profit tax exemption[2] or reduction, (b) free or accelerated depreciation, (c) investment tax allowance, (d) subsidy for investment costs, etc. According to Easson (1996/97), export-oriented investment is

[1] "There is no clear-cut definition of FEZs. .... [FEZs are geographically defined areas] within which certain types of economic activity take place without some of the government taxation and regulation that applies to them in the rest of the economy. ... [FEZs] are designated areas free of customs duties and import controls that provide an attractive environment for investment, technology, promotion of exports and employment opportunities [as also summarised in Kibritçioğlu 1996]. Free trade zones or commercial free zones ... are warehousing areas where goods are stored and re-exported to the host country or abroad without substantial transformation. Free trade zones that include export-oriented industrial activities are named export processing zones ...." (Tahir 1999, p. 3).

[2] Corporate tax exemption for a specific period of time, which is allowed to the qualified newly-established firms, is generally referred as tax holidays (OECD 2001).

generally much more sensitive to (corporate) taxation and likely to be influenced by incentives than is investment aimed at the domestic market, since the tax is in effect exported as a part of the cost of the product.

Investors generally tend to adopt a two-stage process when evaluating FDI locations. In the first stage they examine countries and regions based on their fundamental determinants like market size, access to raw materials, availability of skilled labour, etc. Only those areas that satisfy these criteria go on to the next stage of evaluation where tax rates, grants and other incentives become important. However, government can quickly and easily change the range and extent of tax incentives they offer, whereas changing other location factors mentioned above may be difficult and time-consuming, or even beyond government control (UNCTAD 2000).[3]

In this study the incentive effects of various tax concessions on firms' investment decisions can be compared on the basis of the net present value model.[4] Such a theoretical approach is accompanied by a model simulation based on selected parameters. Without taxation, net present value (NPV) is equal to present value of future gross return, discounted at an appropriate interest rate less the cost of investment. An investment project is therefore considered to be profitable when NPV is positive. After introducing corporate income tax,

[3] Tax incentives can also be "targeted at investment in regions that are disadvantaged due to their remoteness from major urban centres. Operating in a remote area may entail significantly higher transportation and communications costs in accessing materials used in production, and in delivering end products to markets. ... Moreover, firms may find it difficult to encourage skilled labour to relocate and work in remote areas that do not offer the services and conveniences available in other [economic] centres. ... Tax incentives may be provided in such cases to compensate investors for these additional business costs" (UNCTAD 2000, p. 7).

[4] "The vast majority of theoretical and empirical research on investment has focussed on marginal choices — typically how much to invest, given a diminishing expected return. ... [Consequently], the impact of public policy on investment has ... been modelled by evaluating the impact of taxation on the cost of capital — the minimum pre-tax rate of return on an investment required by the investor. ... The basic approach of [the effective marginal tax rate (EMTR)] is to construct a forward-looking hypothetical marginal investment project, for which the impact of tax on the cost of capital can be computed. A second empirical approach has been to proxy the EMTR by the ratio of tax payments to profit, taken either from aggregate data or accounting data. ... [Therefore] it generates a backward-looking measure of an average tax rate [which are appropriate for measuring cash flows and distributional burdens, while the EMTRs are designed to capture incentives to use new capital (Fullerton 1984)]" (Devereux and Griffith 2003, p. 107). However, in this paper, we argue that discrete investment choices are dependent upon the post-tax net present value.

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. If the investment is self-financed, the interest rate directly corresponds to the investor's opportunity cost. Under the assumption of a perfect competitive market structure, there is only one interest rate in the financial market.

In addition, anticipated effects of inflation on firms' investment decisions are examined in the context of corporate income taxation. The central issue is that the so-called historical cost accounting method, which is applied in practice when calculating the (corporate or income) tax base, causes fictitious profits in inflationary phases that are also subject to tax. This type of increased tax burden is generally referred to as inflation loss (Kay 1977; Feldstein 1979; King and Fullerton 1984; Gonedes 1984; OECD 2001; Devereux, Griffith and Klemm 2002).[5] Therefore, in periods with inflation generous tax concession measures do not adequately promote private investment in the FEZ, as intended, but only (or partly) compensate the losses caused by inflation.

2 Free Economic Zones as an Instrument of Economic Growth and Transformation

Over the last two decades, many developing (as well as developed) countries have established free economic zones with the aim of attracting foreign capital through the provision of tax incentives, promoting exports, creating employment opportunities and promoting regional development (Chen 1993). Regarding the general effects of tax incentives (and other public policy measures such as easing of foreign currency regulations, decentralisation of development policy making, etc.) on firms' location in the FEZ and other types of enterprise zones, Bartik (1991) and Ge (1995) argue that there are positive relationships between the presence

[5] Under the historical cost accounting the capital to be recovered before a profit is recognised as simply the amount of money originally invested in the firm. Historical profit is, therefore, the current period's revenues minus the historical cost of the inputs necessary to secure them, 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 (Nam and Radulescu 2003).

of such incentives and increased economic activity.[6] Particularly tax incentives in areas of high unemployment are more likely to be cost-effective and progressive, although this empirical finding is questioned by Fisher and Peters (1998) and Gross and Phillips (1999). In this context the success of a zone is frequently measured by the amount of investment undertaken after the designation, the increase in the number of firms in the zone, and the change in zone employment (Papke 1992). In many cases, the zone's achievements have also been measured in terms of exports, technology transfer and industrial modernisation, diversification of local economies, etc. (UNCTC 1990; Tuppen 1993).[7]

For example, in the context of the so-called open-door policy, which has been promulgated since 1978, the central government of China granted the coastal regions (special economic zones — SEZs) more autonomy in foreign trade and allowed them to charge foreign-invested firms lower taxes than permissible in other regions. In this special economic zone, the corporate tax rate presently amounts to 15%. This compares to the 55% tax rate Chinese firms pay elsewhere in the country and the 33% levied on foreign-funded enterprises in the hinterland. Furthermore, (a) regions and provinces are authorised to set up various types of trading corporations for their own territories, (b) some selected enterprises can conduct foreign trade negotiations independently (without the control of the central government), (c) local governments at different levels and enterprises can retain part of their foreign currency earnings, and (d) some provinces such as Guangdong and Fujian were allowed to transfer a smaller share of tax revenue to the central government. Not surprisingly, these special economic zones have made major contributions to the remarkable growth of Chinese exports and national income. By attracting investments from abroad, SEZs have also provided access to business know-how in light industry and the service sector. To a certain extent, they have also had significant impact on the inflow of modern high-technology (Wall 1993). On the other hand, this type of growth-pole oriented policy has led to a serious spatial

[6] In the literature it is argued that FEZs can lead to capital inflows, which have potential important welfare implications. "It is believed that regulation and protection in many ... countries represent serious barriers to the inflow of capital. The establishment of [FEZs] which removes such barriers can induce the flow of capital [raising the labour productivity, generating linkage effects and increasing tax revenues, etc. These revenues] can be translated into gain in welfare, and, in the long run, development of the host country" (Tahir 1999, p. 5).

[7] Regarding the effects of tax incentives, however, contrasting methodologies have quite often produced conflicting empirical results (Gross and Phillips 2001).

imbalance caused by the concentration of foreign direct investments in coastal regions and has consequently widened the east-west disparity in the economic growth of Chinese regions (Bishop, Formby and Zheng 1996).

In addition, major theoretical justifications for the establishment of such economic zones generally include that "... there [are] economies of scale in the development of land and in the provision of common services and utilities [and] ... external economies of agglomeration by having similar industries grouped together. [Furthermore]... governments may wish to impose a geographical limit on the operation of some policies ... and... to restrict certain activities to specific areas" (Wall 1993, p. 248). For the application of the latter justification in the transformation countries, it is additionally suggested that, with the enclave nature of the FEZ, the process of gradually opening former command economies to the outside world can be controlled and modulated in a much more subtle and sophisticated way than through a rapid global liberalisation of the total national economy (UNCTC 1990).

According to the theory of agglomeration economies, economic growth and technology development — particularly at the regional level — is influenced and stimulated by the economies generated by spatial proximity and associated externalities (Glaeser et al. 1992; Mills and McDonald 1992; Moulaert and Djellal 1995). By being located near various numbers and types of firms in agglomerations or free economic zones, an easy and speedy business access (with low transportation costs) to other service and industrial firms (suppliers, distributors etc.) or research institutions is guaranteed. Furthermore, in the case of expanding similar industrial branches in a given location, firms can realise economies of scale by using jointly supplied products (and raw materials) or by specialising in production. An additional benefit includes the savings resulting from intensive sharing of given major capital investment and infrastructure by a number of firms in a geographic enclave. Within an economic zone that has a concentration of rapidly growing (foreign and domestic) firms in an emerging dynamic industry and service sector, the recruitment of a specialised labour force is also convenient: modern industrial and service firms "that are growing quickly need to be able to recruit specialised, experienced and skilled professionals who can meet specific requirements" (Mills and McDonald 1992, p. 42). Additionally, such a geographic proximity makes the inter-firm communication of new ideas, experiences and know-how among firms more efficient and innovative (the so-called Marshall-Arrow-Romer externality of knowledge

spillovers between firms, Glaeser et al. 1992). Consequently, such advantages of agglomeration economies provided by a FEZ can have a positive effect on a local economy and stimulate efficient production and generate productivity growth leading to higher per capita income than that in the rest of the country (Bartik 1991).

In recent years the concept of FEZ has evolved and has been diversified. The following facts illustrate this development. Instead of being further concentrated in a well-defined territorial area, investment and other types of incentives provided in FEZs (like tax concessions, easing of foreign currency regulations, etc.) were gradually extended — in the course of time — to other (local or foreign-owned) enterprises, operating elsewhere in the country (see cases in Hungary).

A number of export-processing zones additionally acquired import-processing functions (see the case of Manaus Free Zone in Brazil that now operates almost exclusively for the domestic market). Major factors which have made such trends towards import processing almost inevitably include:

- the technical difficulty of controlling smuggling of products and technologies from the zone into other parts of the host country,
- the combined pressures of local consumers (who would like to have access to and can also afford the high-quality goods produced in the zone) and foreign investors (who are attracted by the potentially high profitability of sales in the local market, as is the case in China), and
- governments' policy to encourage local linkages in exchange for access to the local market.

A third important development was the establishment of domestic firms in the FEZ. In countries such as India local participation is compulsory when a foreign firm wants to invest in the country's FEZ. This growing importance of domestic enterprises is well-illustrated by the fact that over two thirds of all enterprises located in the FEZ of developing countries are presently either fully-owned indigenous firms or joint ventures between domestic companies and foreign partners.

In China the special economic zones have been rapidly expanded along the large coastal areas, rather than remaining as small industrial enclaves. The selection of initially four SEZs in the southern part of China in 1978/79 was mainly aimed at achieving a geographic proximity to Hong Kong, Macao and Taiwan in order to fully exploit the advantage of the highest concentration of overseas Chinese. Regarding the foreign investment activities, some significant shifts were made thereafter. These include, for example, moving away from the SEZ to a broader geographical spread leading to the subsequent expansion of SEZs along the coast, shifting concentration from real estate development (including hotels and other tourist facilities) towards industry, and turning away from joint-venture-based investment to wholly owned enterprises (Wall 1993).

In the near future the evolution of a classical manufacturing-oriented FEZ into a modern service-oriented zone is expected. This mainly reflects the growing importance of the service sector in total economic activities and the increased tradability caused by the rapid development of information and telecommunication technology. In other words, the growing service-orientation of some FEZs is, therefore, a much wider and more ambitious concept than the free ports, because it encompasses not just traditional trading and transporting activities but also modern financial and business services such as banking, insurance and data processing. The concept of FEZs as such a service-oriented (and services-cum-manufacturing) zone could also encompass some tourism or educational services (UNCTC 1991).

However, according to past experiences world-wide, FEZs have not usually developed along lines originally planned. Furthermore, the economic and social benefits of a zone tend to be much greater (or much smaller) than anticipated, and in most cases quite different from what had originally been planned. These facts are well indicated by the development of a number of zones into industrial mono-cultures, rather than into the well-balanced and highly diversified industrial parks envisaged by the planners. The phenomenon is due to a number of complex sociological and economic reasons which suggest that FEZs maintain a life of its own and an internal dynamism that one can hardly predict in the planning process. The mistakes made during the planning and design stage have also led to the failure of FEZs in many countries, which include, for example, the choice of an underdeveloped region with poor road and air communications; insufficient attention to the other basic infrastructure (such as telecommunications or electricity supply, etc.) and to the overall interregional and/or

international accessibility of the region; a mismatch between skills of indigenous work forces and those required for new production activities, etc. (Chaudhuri and Adhikari 1993). In many cases neighbouring FEZs compete against each other as potential locations for foreign firms, including the case among Hunchun (China), Posyet-Vladivostok (Russia) and Najin-Sonbong (North Korea) in the so-called Tumen River Economic Development Area. To a larger extent, the successful development of a zone also seems to be led by the ability and flexibility of the zone authorities to react to changing (particularly economic) circumstances, to make the necessary mid-course corrections, to adjust the zone's institutional structure to new problems arising with zone development and, more generally, to develop an effective evaluation and problem-solving mechanism (UNCTC 1991; Tuppen, 1993).

3 Effects of Various Tax Concession Measures on Investment Decision

The generosity of different types of tax concessions in combination with corporate tax rates can be determined on the basis of the so-called Samuelson's true economic depreciation (TED). Under the assumption that (1) an equity-financed investment costing C generates an infinite stream of future gross return, (2) this return exponentially declines at a given rate ($0 < \alpha < 1$) and (3) all prices are constant over time (i.e. $\pi = 0$), Samuelson (1964) demonstrated in his fundamental theorem of tax-rate invariance that corporate income taxation does not affect firms' investment decisions at all, when 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 (see also Atkinson and Stiglitz 1980). And the TED rate is the same rate at which the gross return declines in the course of time: i.e. the TED rate $= \alpha$ (Nam and Radulescu 2003).

In the absence of taxation (and also in the case of profit tax exemption), a self-financed investment project is on the margin of acceptance at the year of investment, when

$$C = PV_0 = \int_0^\infty A_0 e^{-(\alpha+r)u} du = \frac{A_0}{\alpha + r} \tag{1}$$

where $A_u (= A_0 e^{-(\alpha+r)u})$ means gross return at year u and r is the real interest rate (0

$< r < 1$) before imposing corporate tax. In such an equilibrium, the NPV amounts to zero. Since the corporate tax rate is believed to be the most crucial tax consideration in investment decisions, the profit tax exemption (or reduction) allowed in a specific region tends to be judged as an important incentive (Easson 1996/97). However, the aspect of tax paradox is ignored in this case.

If a **cash investment subsidy** is provided at the year 0, the equilibrium condition of the equation (1) changes to

$$C - kC < PV_0 = \int_0^\infty A_0 e^{-(\alpha+r)u} du = \frac{A_0}{\alpha + r} \tag{2}$$

where kC is the total amount of cash subsidy at the investment year. By the given PV_0 this subsidy is equivalent to the extra profit for the investor.

Accelerated depreciation is generally used in combination with the straight-line depreciation method. Accelerated depreciation expense (as a certain percentage share of investment cost) is tax-deductible in the first year of a capital good's tax life. Consequently, total depreciation expense in the first year amounts to

$$D_1^{ad+sld} = \sigma C + \frac{C}{\Gamma} \tag{3}$$

where σ indicates the accelerated depreciation rate ($0 < \sigma < 1$), and C/Γ denotes the annual sum of straight-line depreciation over Γ tax lives (Nam and Radulescu 2003).

Because an extra amount of expense can be deducted in the first year, the total tax-life of a capital good is reduced correspondingly from Γ to Ω. And

$$\Omega = (1 - \sigma)\Gamma \tag{4}$$

The present value of the asset with accelerated depreciation at year 0 is

$$\begin{aligned} PV(t)_0^{ad} &= (1-t)\int_0^\infty A_0 e^{-\{\alpha + r(1-t)\}u} du + t\int_0^1 \sigma C e^{-r(1-t)u} du + t\int_0^\Omega (C/\Gamma) e^{-r(1-t)u} du \\ &= PV_0 + tC\left[\frac{\sigma(1-e^{-r(1-t)})}{r(1-t)} + \frac{1-e^{-r(1-t)\Omega}}{r(1-t)\Gamma} - \frac{\alpha}{\alpha + r(1-t)}\right] \end{aligned} \tag{5}$$

In the context of **free depreciation** the total amount of investment cost can be written off in the first year. When employing this depreciation method, the present value of asset at year 0 is

$$\begin{aligned} PV(t)_0^{fd} &= (1-t)\int_0^{\infty} A_0 e^{-\{\alpha+r(1-t)\}u} du + t\int_0^{1} C e^{-r(1-t)u} du \\ &= PV_0 + tC\left[\frac{1-e^{-r(1-t)}}{r(1-t)} - \frac{\alpha}{\alpha+r(1-t)}\right] \end{aligned} \tag{6}$$

Furthermore a certain percentage share of investment cost 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 also applied in combination with straight-line depreciation. However, unlike the case with accelerated depreciation, the total tax-life of a capital good remains unchanged. 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 the present value of asset at year 0 is

$$\begin{aligned} PV(t)_0^{ita} &= (1-t)\int_0^{\infty} A_0 e^{-\{\alpha+r(1-t)\}u} du + t\int_0^{1} (\beta C) e^{-r(1-t)u} du + t\int_0^{\Gamma} (C/\Gamma) e^{-r(1-t)u} du \\ &= PV_0 + tC\left[\frac{\beta(1-e^{-r(1-t)})}{r(1-t)} + \frac{1-e^{-r(1-t)\Gamma}}{r(1-t)\Gamma} - \frac{\alpha}{\alpha+r(1-t)}\right] \end{aligned} \tag{7}$$

where β indicates the rate of investment tax allowance ($0 < \beta < 1$).

4 Consideration of Fictitious Profit and Inflation Losses

In an economy with the constant annual inflation rate π, the stream of nominal gross return which is generated by an investment costing C at year u can be expressed as

$$A_u = A_0 e^{-\alpha u} e^{\pi u} = A_0 e^{-(\alpha-\pi)u} \tag{8}$$

In this case, the sum of annual gross return exponentially decreases at rate α but increases at rate π over the course of time.

The size of fictitious profits and the additional corporate tax burden which are caused by applying the historical cost accounting method in the inflationary phase can also be measured on the basis of the net present value model. Such inflation losses lead to the reduction of nominal net present value. More precisely, the amount of increased tax burden caused by inflation can be described as the difference between the two nominal PVs, one with depreciation measured on the basis of current (replacement) value of a capital good and the other determined on the basis of the historical cost accounting method.

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

$$\begin{aligned} nPV(t)_0^{sld} &= (1-t)\int_0^{\infty} A_0 e^{-\{\alpha-\pi+\mu(1-t)\}u}du + t\int_0^{\Gamma}(C/\Gamma)e^{-\mu(1-t)u}du \\ &= \frac{(1-t)A_0}{\alpha-\pi+\mu(1-t)} + \frac{tC(1-e^{-\mu(1-t)\Gamma})}{\mu(1-t)\Gamma} \end{aligned} \tag{9}$$

where the nominal interest rate $\mu = r + \pi$.

On the other hand, when depreciation expense is determined on the basis of current investment cost, the nominal value of the asset with the same depreciation method at year 0 is

$$\begin{aligned} nPV(t)_0^{sld*} &= (1-t)\int_0^{\infty} A_0 e^{-\{\alpha-\pi+\mu(1-t)\}u}du + t\int_0^{\Gamma}(C/\Gamma)e^{-[\mu(1-t)-\pi]u}du \\ &= \frac{(1-t)A_0}{\alpha-\pi+\mu(1-t)} + \frac{tC(1-e^{-[\mu(1-t)-\pi]\Gamma})}{[\mu(1-t)-\pi]\Gamma} \end{aligned} \tag{10}$$

where the current investment cost at year u is $Ce^{\pi u}$.

The difference between $nPV(t)_0^{sld}$ and $nPV(t)_0^{sld*}$ is defined as the present value of additional corporate tax burden (inflation losses) at year 0 (ATB_0^{sld}), which is caused by the fictitious profit. With the economic life of a capital good Γ*, therefore

$$ATB(\Gamma^*)_0^{sld} = tC\left[\frac{1-e^{-[\mu(1-t)-\pi]\Gamma^*}}{[\mu(1-t)-\pi]\Gamma^*} - \frac{1-e^{-\mu(1-t)\Gamma^*}}{\mu(1-t)\Gamma^*}\right] = tC(FP_0^{sld}) \tag{11}$$

where FP_0^{sld} indicates the present value of fictitious profit per monetary unit at year 0 in the case of adopting straight-line depreciation. In order to examine whether and to

what extent generous tax depreciation provisions promote private investments in inflationary situations, the value FP_0^{sld}(with Γ*) can be adopted as the benchmark.

When the amount of annual depreciation expense is calculated on the basis of historical cost, the incentive effect of **accelerated depreciation** on private investment in an inflationary phase can be measured by

$$nPV(t)_0^{ad} - nPV(t,\Gamma^*)_0^{sld} = tC\left[\frac{\sigma(1-e^{-\mu(1-t)})}{\mu(1-t)} + \frac{e^{-\mu(1-t)\Gamma^*} - e^{-\mu(1-t)\Omega^*}}{\mu(1-t)\Gamma^*}\right] = tC(IE_0^{ad}) \tag{12}$$

where $nPV(t)_0^{ad}$ is the nominal present value of the asset with accelerated depreciation at year 0 and Ω* denotes the reduced tax-life of a capital good, when $\Gamma = \Gamma$*.

With **free depreciation**,

$$nPV(t)_0^{fd} - nPV(t,\Gamma^*)_0^{sld} = tC\left[\frac{1-e^{-\mu(1-t)}}{\mu(1-t)} + \frac{1-e^{-\mu(1-t)\Gamma^*}}{\mu(1-t)\Gamma^*}\right] = tC(IE_0^{fd}) \tag{13}$$

where nPV_0^{fd} indicates the nominal present value of the asset with free depreciation at year 0.

When i**nvestment tax allowance** is adopted and the tax-life of a capital good is Γ*,

$$nPV(t)_0^{ita} - nPV(t,\Gamma^*)_0^{sld} = tC\left[\frac{\beta(1-e^{-\mu(1-t)})}{\mu(1-t)}\right] = tC(IE_0^{ita}) \tag{14}$$

where $nPV_0^{ita}$is the nominal present value of the asset with investment tax allowance at year 0.

Subsequently, generous tax concession measures simply compensate the inflation losses in full-scale when

$$\begin{aligned} IE_0^{ad} &= FP_0^{sld} \\ IE_0^{fd} &= FP_0^{sld} \\ IE_0^{ita} &= FP_0^{sld} \end{aligned} \tag{15}$$

In spite of inflation, tax concession rules shown above guarantee investment promotion effects when IE values (i.e. IE_0^{ad}, IE_0^{fd} and IE_0^{ita}) are greater than FP_0^{sld} (Nam and Radulescu 2003).

5 Model Simulation

Table 1 illustrates NPV under different tax concession measures calculated using standard parameter assumptions in an economy without inflation (i.e. $\pi = 0$). The derived ranking of investment promotion effects (i.e. the extent of tax paradox) varies from one measure to another in the investigated range of corporate tax rates. For example, free depreciation provides the highest NPV within a range of tax rates between 10% to 45%, while the same value under investment tax allowance is highest when t = 50%. Accelerated depreciation guarantees a higher NPV than investment tax allowance does, when, for example, t = 10%.

Table 1

Investment Promotion Effects of Tax Concessions without Inflation

Statutory corporate tax rate for retained earnings (t in %)	Free depreciation	Accelerated depreciation	Investment tax allowance
	Net present value		
10	8.89	5.51	5.37
15	12.85	7.85	8.18
20	16.45	9.89	11.08
25	19.68	11.65	14.08
30	22.51	13.10	17.16
35	24.91	14.26	20.33
40	26.85	15.11	23.58
45	28.30	15.65	26.92
50	29.24	15.88	30.34
Assumptions	Equity finance; $C = PV_0 = 333.33$; $A_0 = 100$; $r = 10\%$; $\alpha = 20\%$; $\Gamma = 10$ years; $\sigma = 50\%$; $\Omega = 5$ years; $\beta = 20\%$		

Source: Calculation of the Ifo Institute for Economic Research

Repeatedly, the application of the historical cost accounting method in calculating the corporate tax base causes fictitious profits in inflationary phases that are also subject to tax. For example, in spite of inflation the 'true' incentives can be guaranteed by free depreciation

under the given parameter assumptions including t = 20%, when π reaches approximately 25% (Table 2). However, with the same tax rate accompanied by $\pi = 14\%$, the promotion effects of accelerated depreciation disappears altogether. Furthermore, the stimulation of private investment through the adoption of an investment tax allowance cannot be expected when the inflation rate is higher than 7%. Additional tax burden positively correlates with the tax rate by the given inflation rate. As a result, the compensation of inflation losses through tax concession measures, ceteris paribus, takes place with lower inflation rates, when t increases to 40%.

Table 2

Investment Promotion Effects of Tax Concessions with Inflation under Given Corporate Tax Rates

Inflation rate (%)	Free depreciation		Accelerated depreciation		Investment tax allowance	
	tC ($IE_o$with various tax concessions − FP_0^{sld})					
	t = 20%	t= 40%	t = 20%	t = 40%	t = 20%	t = 40%
1	17.53	15.00	12.59	10.05	10.81	8.28
2	16.87	11.79	11.56	6.48	8.87	3.79
3	16.21	8.56	10.54	2.89	7.00	-0.65
4	15.55	5.30	9.53	-0.71	5.19	-5.05
5	14.88	2.02	8.53	-4.32	3.44	-9.41
6	14.21	-1.28	7.54	-7.96	1.75	-13.75
7	13.53	-4.62	6.55	-11.62	0.10	-18.06
8	12.85	-8.00	5.57	-15.28	-1.50	-22.34
9	12.17	-11.41	4.59	-18.98	-3.05	-26.62
10	11.47	-14.85	3.62	-22.71	-4.56	-30.33
11	10.78	-18.33	2.65	-26.46	-6.03	-35.14
12	10.08	-21.85	1.69	-30.25	-7.46	-39.39
13	9.38	-25.41	0.73	-34.07	-8.86	-43.65
14	8.67	-29.02	-0.23	-37.92	-10.22	-47.92
.	.	.	.	.	.	.
.	.	.	.	.	.	.
25	0.55	-72.44	-10.58	-83.57	-23.60	-96.60
Assumptions	Equity finance; $C = PV_0 = 333.33$; $A_0 = 100$; $r = 10\%$; $\alpha = 20\%$; $\Gamma = \Gamma^* = 10$ years; $\sigma = 50\%$; $\Omega = 5$ years; $\beta = 20\%$					

Note: In many other studies the economic asset life (Γ^*) is assumed to be around 10 years for equipment (see also Sinn, Leibfritz und Weichenrieder 1999; Bordignon, Giannini and Panteghini 1999).

Source: Calculation of the Ifo Institute for Economic Research.

6 Conclusion

One important characteristic of the FEZ is the provision of generous investment promotion schemes solely allowed in this enclave. Such measures include profit tax exemption, free or accelerated depreciation, investment tax allowance, subsidy for investment costs, etc. From the point of view of the competitive firm that strives to maximise profits, this study, using net present value models, compares incentive effects of various tax concession measures under inflation. These effects are determined on the basis of Samuleson's true economic depreciation.

Tax exemption changes the condition of marginal acceptance in favour of investors, whereas cash investment subsidy means nothing but the additional profit for them. According to the calculation made under the given parameter assumption and $\pi = 0$, the ranking of investment promotion effects differentiate from one measure to another in the investigated range of statutory corporate tax rates. For example, free depreciation provides the highest NPV when the tax rate ranges between 10% to 45%, while the same value with investment tax allowance (with $\beta = 20\%$) is highest when t = 50%. The profit tax exemption expels the possibility of tax paradox in the standard marginal equilibrium condition for the investment decision. Furthermore, the subsidy for investment costs is equivalent to the extra profit for the investor by the given asset value and therefore can change the investors' marginal acceptance level.

The aspect of inflation linked with different depreciation rules is of particular importance in transition and developing countries where their economies have been confronted with rising prices. In particular the application of the historical cost accounting method causes fictitious profits in inflationary phases. Therefore, the extra tax burden increases with the corporate tax rate by the given inflation rate. In this sense the selection of lower corporate tax rates can also be justified in the FEZ. Under the given parameter assumptions including t = 20% and an annual inflation rate higher than 25%, however, the free depreciation scheme does not seem to provide any 'true' incentive effects but only compensates such inflation losses.

Apart from the general tax factors affecting foreign direct investment, it should also be mentioned that firms are strongly attracted to the size of the potential market of the country where the FEZ is located and the relatively low costs, the availability of skilled labour, etc.

Some other factors like uncertainty in the policy stance of governments and the transitional state of the legal framework for a market economy have also impeded large scale investments in the FEZ (OECD 1995; Wunder 2001).

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