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Effects of Tax Depreciation Rules on Firms' Investment Decisions: A Comparison of European Transition Countries

Chang Woon Nam and
Doina Maria Radulescu*

Introduction

Promoting investment is of particular importance in the European transition economies since investments act as growth engines. In this context, the corporate tax regimes adopted in these countries play a crucial role for stimulating private investment. Accordingly, tax systems must be designed to attract capital. Apart from the tax rates, due attention has to be paid to depreciation, since it is one of the important factors affecting firms' investment decisions, as it is deducted from a gross stream of return generated from the asset when calculating tax profits. Along with straight-line depreciation (applied in Hungary and Bulgaria), geometric-degressive depreciation which may be employed in Poland and the Czech Republic, and accelerated depreciation all aim to encourage firms' investment activities (King 1977; King and Fullerton 1984; Sinn 1987; Jacobs and Spengel 1996; Alvarez, Kanniainen and Södersten 1999). In assessing their relative generosity, a useful benchmark is that of Samuelson's true economic depreciation (TED), which is neutral with respect to investment decisions (Samuelson 1964; Atkinson and Stiglitz 1980).

The incentive effects of different tax depreciation rules combined with the corporate tax rate on firms' investment decisions can be compared on the basis of the net present value model (Devereux, Griffith and Klemm 2002). 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 the introduction of tax on corporate income, the present value of the asset generated from an investment amounts to the sum of present value of net return (gross return less taxes) and tax savings led by an incentive depreciation provision. 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 called inflation losses (Aaron 1976; Kay 1977; Feldstein 1979; Kopcke 1981; Streißler 1982; Gonedes 1984). Therefore, in periods with inflation generous tax depreciation provisions do not adequately promote private investment as designed, but only (or partly) compensate the losses caused by inflation.

The aspect of inflation linked with different depreciation rules is of particular importance in transition countries, where economies have continuously been confronted with rising prices during the last decade. The past inflation rate in the Czech Republic ranged between 52 percent in 1991 and 4.9 percent in 2001 compared to that of Poland between 70.3 percent in 1991 and 5.6 percent in 2001, while some years even recorded triple digit inflation in Bulgaria and Romania. For example, the annual change in the consumer price level varied between 333.5 percent in 1991 and 8.0 percent in 2001 in Bulgaria (EBRD 2002). Additionally, the different tax depreciation rules applied in these countries can have different incentive effects.

This study aims at examining the corporate tax incentive schemes currently in effect to stimulate private investment in Bulgaria, the Czech Republic, Hungary, Macedonia, Poland, Romania and Slovenia.

A Brief Note on the Empirical Method for Measuring Incentive Effects of Various Tax Depreciation Rules

In European transition economies, straight-line, geometric-degressive and accelerated depreciation

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measures are quite popular in combination with different corporate tax rates.[1] Their generosity can be determined on the basis of the so-called Samuelson's TED. Under the assumption that

- a self-financed investment generates an infinite stream of future gross return,
- this return exponentially declines at a given rate and
- all prices are constant over time.

Samuelson (1964) showed 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. And the TED rate is the same as the rate with which the gross return declines in the course of time. For instance, the application of geometric-degressive depreciation is advantageous when its rate is larger than the TED rate.

The size of fictitious profits and the additional corporate tax burden, which are caused by the application of the historical cost accounting method in the inflationary phase, can also be measured on the basis of the net present value model.[2] Such inflation losses lead to the reduction of nominal net present value (discounted at the nominal interest rate). More precisely, the amount of increased tax burden caused by inflation can be described as the difference between the two nominal present values, one with tax 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.

[1] Accelerated depreciation is used in practice as an investment promotion scheme 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 the tax-life of a capital good. Correspondingly, the total tax-life of a capital good is reduced.

[2] There have been a number of attempts to estimate the current value of a capital good on the basis of indexation. "Such a method would provide for equitable accounting whether inflation rates were high or low. [But] many agree that it would be too complicated to compute the rate of inflation for the multitude of different assets. The idea of using an overall index was rejected on the grounds that some assets such as computers actually [decline] in price over time and this method would bias investment towards those assets that increased in price" (Evans 1983, p. 150).

Table 1
International comparison of tax incentives measured in terms of net present value: investment in equipment with the normal tax-life of 10 years, 2001

Country	Statutory corporate tax rate for retained earnings (%)	Tax depreciation rules	Nominal net present value			
			Without inflation	2% inflation	4% inflation	6% inflation
Poland	28[a)]	Geometric-degressive depreciation (20%)[b)]	0.0	2.1	4.8	8.0
Czech Republic	31	Geometric-degressive depreciation in 12 years *	–20.1	–19.7	–18.1	–16.3
Macedonia	15	Geometric-degressive depreciation (30%)	3.9	5.4	7.1	5.4
Hungary	18	Straight-line depreciation (14.5%)[c)]	3.1	4.6	6.3	8.3
Slovenia	25	Straight-line depreciation in 3 years	14.0	17.5	21.2	25.1
Romania	25	Accelerated depreciation (50%) + straight-line depreciation in 10 years[d)]	14.3	17.8	21.7	25.7
Bulgaria	20	Straight-line depreciation in 5 years[e)]	7.3	9.5	11.8	14.4
Common assumptions	Equity finance; Investment cost = 333.3; Gross return infinitely generated from the asset at the year of investment = 100; Real interest rate = 10%; TED rate = 20%					

* The depreciation rate amounts to 8.33% for the first year and 15.28%, 13.89%, 12.5%, 11.11%, 9.72%, 8.33%, 6.94%, 5.56%, 4.17%, 2.78% and 1.39% for the consequent years, respectively.
[a)] The rate will be reduced to 24% in 2003 and 22% for 2004 and future years. – [b)] In general the straight-line method is applied, in certain cases the declining-balance method may be allowed, too. For certain types of assets (such as machinery that may become obsolete because of technological developments), depreciation rates may be doubled. – [c)] For automation equipment, computers, equipment for environmental protection, medical equipment the rate of 33% applies. – [d)] Assets may be depreciated using the straight-line method. Useful life for machinery – 4 to 10 years. If the cumulative inflation rate for the preceding 3 years exceeded 100%, assets may be re-valued annually. Companies may use accelerated depreciation if they meet certain criteria subject to the approval of the Ministry of Finance. – [e)] For some assets which are acquired on or after 1.01.1998 accelerated depreciation at a rate of up to 30% is allowed.

Sources: IBFD (1999), Central & East European Tax Directory; Ernst & Young: Worldwide Corporate Tax Guide: http://www.ey.com/global/gcr.nsf/EYPassport/Welcome-Worldwide_Corporate_Tax_Guide-EYPassport; Calculations of the Ifo Institute for Economic Research.

International Comparison of Effects of the Tax Incentive System on Equipment Investment

Table 1 compares the highest corporate tax rate (for retained earnings), tax depreciation methods and the extent of their generosity, as are presently allowed in the context of tax law in seven selected Central and Eastern European countries. In the ranking of the statutory corporate tax rate, the Czech Republic ranks first at 31 percent, followed by Poland (28 percent) and Romania and Slovenia (25 percent). The corporate tax rate is the lowest in Macedonia (15 percent). In Hungary and Slovenia only the straight-line depreciation method can be adopted for equipment. In countries like Poland, the Czech Republic and Macedonia geometric-degressive depreciation is usually applied as the investment incentive scheme for equipment, of which, however, the rate ranges from 20 percent (Poland) to 30 percent (Macedonia).[3] Furthermore, accelerated depreciation can be combined with straight-line depreciation in Romania and even for certain assets acquired after 1998 in Bulgaria. The normal tax-life for equipment amounts to 10 years in the selected countries (except for the Czech Republic where computations are based on a 12-year tax life).

According to the net present value calculated under the standard assumptions for the case of investing in equipment, the Romanian tax incentives, which can be adopted for the specific investments, guarantee the most favourable conditions for the investors in the case of ignoring the impact of anticipated inflation (see Table 1). In a descending order, Slovenia, Bulgaria, Macedonia and Hungary also provide investment incentives. On the other hand, the Polish corporate tax systems remains tax-neutral, since the geometric-degressive depreciation rate is set to be the same as the assumed TED rate, and, therefore, NPV reaches zero in this country. In the Czech Republic a negative net present value was computed.

Table 2
International comparison of investment promotion effect of tax depreciation rules in inflationary phases measured in terms of nominal net present value

Inflation rate %	Poland	Macedonia	Hungary	Slovenia	Romania	Bulgaria
	Tax incentives = Nominal tax savings - Additional tax burden caused by historical account system					
1	–0.3	5.3	4.0	13.1	14.9	8.6
2	–2.0	4.0	2.2	11.8	13.5	7.0
3	–3.7	2.7	0.5	10.5	12.1	5.5
4	–5.3	1.5	–1.3	9.2	10.7	4.0
5	–6.8	0.4	–3.0	7.9	9.3	2.5
6	–8.4	–0.8	–4.6	6.6	7.9	1.0
7	–9.9	–1.9	–6.2	5.3	6.6	–0.5
8	–11.3	–3.0	–7.8	4.0	5.2	–1.9
9	–12.8	–4.0	–9.3	2.7	3.8	–3.4
10	–14.2	–5.1	–10.8	1.4	2.4	–4.8
11	–15.6	–6.1	–12.3	0.1	1.1	–6.2
12	–17.0	–7.0	–13.7	–1.2	–0.3	–7.6
13	–18.4	–8.0	–15.1	–2.5	–1.7	–8.9
14	–19.8	–9.0	–16.5	–3.9	–3.1	–10.3
15	–21.1	–9.9	–17.9	–5.2	–4.5	–11.6
16	–22.4	–10.8	–19.2	–6.5	–5.8	–12.9
17	–23.8	–11.7	–20.5	–7.8	–7.2	–14.3
18	–25.1	–12.6	–21.8	–9.2	–8.6	–15.6
19	–26.4	–13.4	–23.1	–10.5	–10.0	–16.9
20	–27.7	–14.3	–24.3	–11.8	–11.4	–18.1
21	–29.0	–15.1	–25.6	–13.2	–12.8	–19.4
22	–30.3	–16.0	–26.8	–14.5	–14.2	–20.7
Common assumptions	Equity finance; Investment cost = 333.3; Gross return infinitely generated from the asset at the year of investment = 100; Real interest rate = 10%; TED rate = 20%; Economic asset life = Normal tax life = 10 years					

Source: Table 1 and calculations of the Ifo Institute for Economic Research.

According to the model simulation summarised in Table 2, the current Romanian and Slovenian tax incentive systems no longer stimulate private investment in equipment when, ceteris paribus, the annual inflation rate reaches 12 percent. On the other hand, the Hungarian system appears to be less robust against inflation, since the investment incentives start to become negative already at an inflation rate of 4 percent, whereas incentive effects cannot be expected in Bulgaria when the inflation rate is higher than 6 percent.

Future Research Suggestions

Future research appears to be necessary in order to systematically compare the major outcomes of the present value approach with the effective marginal corporate income tax rate measured on the basis of

[3] In the Czech Republic there is a special depreciation scheme over 12 years. Following the tax law, the geometric-degressive depreciation rates applied start with 8.33 percent for the first year, and first rise and then decline during the subsequent years (Table 1).

user-cost of capital approach that is often used in a similar context (Chennells and Griffith 1997; Devereux, Griffith and Klemm 2002). Furthermore, since the investigated countries have different risk profiles which implicitly determine the respective interest rates, it would be interesting to consider the aspect of different interest rates for future research as well. This could deliver better insight into how and to what extent the various tax regimes applied in these transition countries influence firms' investment decisions.

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