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FDI and Taxation: Some Methodological Aspects and New Evidence for Central and Eastern European Countries (CEE-NMS)¹

Christian Bellak

Vienna University of Economics and Business Administration

Markus Leibrecht

OeNB and Vienna University of Economics and BA

Roman Römisch

Vienna Institute of International Economic Studies (WIIW)

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1. Introduction

Recent company taxation policies in the Central and Eastern European New Member States (CEE-NMS) have been frequently characterised as tax-cutting strategies in order to attract Foreign Direct Investment² (FDI; Dobrinsky, 2003; Jarass and Obermair, 2000). Such policies are usually based on predictions that the tax burden levied upon corporate profits will have a substantial influence on (real)

¹ Abbreviations used in the text are explained in section 7.

² In what follows FDI and real multinational activity are normally used interchangeably. The important exception is when we are dealing with FDI-flows or -stocks (see below).

investment of Multinational Companies (MNCs). Whether there is a relationship between the tax burden levied on corporate profits and FDI is an entirely empirical question.³ Answers are usually based upon the estimation of “tax rate elasticities”.⁴ But for reaching reliable results several pre-requisites must be fulfilled. These include adequate measures of FDI and a valid indicator of the tax burden levied on FDI as well as a sound theoretical framework on which the choice of explanatory variables included in an econometric specification rests.

This paper⁵ is concerned with the first two pre-requisites. Specifically, the purpose is to discuss the choice of appropriate FDI data and the choice of an appropriate measure of the tax burden levied upon FDI in studies analysing the determinants of FDI in general and in the CEE-NMS in particular. The paper is structured as follows. First, the results of earlier studies on the value of econometrically estimated tax rate elasticities are briefly reviewed, thereby separating evidence on CEE-NMS and “periphery countries” from evidence on “core countries”. Second, it is discussed which indicators of tax burden should be used as well as disadvantages of using FDI-flow and -stock data as an indicator of MNC real activity. Third, a description and an empirical analysis of the theoretical measures of the tax burden is provided, which are thought to be a reliable indicator for the tax burden levied upon FDI of seven home countries⁶ in the CEE-NMS (i.e., Slovenia (SI), Hungary (HU), Poland (PL), the Czech Republic (CZ) and the Slovak Republic (SK)). These host countries have been selected, since they became members of the EU recently and thus, their tax policies may have provoked taxation related reactions by incumbent EU Member States even more directly than in the past. The seven home countries are the largest investors in these countries on average, ranked by their shares of FDI stocks.⁷

2. Survey of Empirical Studies: Does Tax Policy Work to Attract FDI?

This paper focuses on tax rate elasticities explicitly or implicitly provided by several empirical studies. The studies are grouped into those which deal with FDI mainly within the group of developed or “core” countries (homogenous group) and

³ So far only few studies dealing with this topic have a regional focus on the CEE-NMS.

⁴ These are defined as the percentage change in FDI following a percentage point change in some measure of the tax burden (DeMooij and Ederveen 2001, Appendix).

⁵ This study has been prepared under FWF (Austrian Science Fund) contract Nr. 1008, Sonderforschungsbereich “International Tax Coordination”:
<http://www2.wu-wien.ac.at/taxlaw/sfb/>

⁶ Austria, France, Germany, Netherlands, United Kingdom, U.S.A., Italy.

⁷ On average these countries are among the most important investors in all the host countries considered. Other countries like Switzerland and Belgium are important for single host countries, only (see OECD 2004 and Bank of Slovenia for details).

those which exclusively analyse FDI originating in developed countries and directed to countries with a relatively lower level of development, like the CEE-NMS and periphery countries (heterogeneous group). The separation of these two country groups is based on the idea that motives for FDI directed into the two groups of countries may differ, and hence FDI could react differently to changes in the tax rate. Thus, if cost and efficiency-related motives are predominant, FDI in “core-periphery” pairs of countries should be rather responsive to changes in tax rates, since this affects directly their production costs. Since empirical results suggest a dominance of market-related motives for FDI in both country groups and thus a low share of purely efficiency-related FDI, we do not expect significant differences in tax rate elasticities. However, apart from the motivation, there are a number of FDI related peculiarities of the CEE-NMS and periphery countries, which might lead to differences in tax rate elasticities between the two country groups (core group and the heterogeneous group). Some such peculiarities of the CEE-NMS will be discussed below (section 2.2).

2.1 FDI within Core Countries (Homogenous Group)

Concerning homogenous countries we rely upon the detailed meta-analysis of 25 empirical studies carried out by DeMooij and Ederveen (2001, 2003). Their findings suggest a median value of the tax rate elasticity of -3.3 (excluding extreme values).⁸ That is, a 1 percentage point reduction in the host country tax rate raises FDI in that country by 3.3%. In order to compare different empirical studies, the reported results have been standardised (see below for the various definitions of elasticities and how they are inter-related). The authors note, however, a large variability by type of FDI, by source of finance, by sector, by year etc. A result, which is of particular relevance for our study is that “FDI seems more responsive to effective or average tax rates than to Statutory tax rates” (ibidem 2003, p. 690). Since the publication of DeMooij’s and Ederveen’s paper, several important studies, some of them are listed in column three of table 1 (see below), have been published. Since our focus here is on CEE-NMS, these studies are not reviewed here in greater detail.

2.2 FDI from Core to Periphery Countries (Heterogeneous Group)

From table 1 it is evident that the empirical evidence on the effects taxation has on FDI to the CEE-NMS is still limited. This is in marked contrast to ongoing public debates, both in incumbent EU Member States and CEE-NMS. Before presenting a median tax rate elasticity deduced from the available studies it is insightful to

⁸ An extreme value is defined as a value which is more than 2 standard deviations from the mean value (DeMooij and Ederveen, 2001).

discuss some FDI related peculiarities of the CEE-NMS as these differences may result in a higher propensity of the CEE-NMS to use company taxation as an instrument to attract FDI.

2.2.1 The Share of Efficiency-Related FDI

Following a number of surveys (Lankes and Venables, 1996, Altzinger 1998 on Austrian FDI; Lankes and Wes, 2001; for an overview see Szanyi, 1999) on the motives for manufacturing FDI in the CEE-NMS foreign investment enterprises grosso modo can be separated into re-export-oriented and market-oriented companies. According to this classification by motives the most important motives for FDI were low production costs in the CEE-NMS on the one hand and gaining market access (to the host market or to the CEE-NMS region in total) on the other hand. Up to 1996, these surveys indicate that approximately two thirds to three fourth of manufacturing FDI have been market-oriented. Given that returns for host-market related FDI will diminish the more non-export-oriented companies are established in the CEE-NMS it appears likely that the share of efficiency-oriented FDI in terms of enterprises will increase in the future. Since taxes directly impact on the costs of production, it is conceivable that efficiency-oriented FDI is more responsive to tax changes than market-oriented FDI. Consequently, the probability that CEE-NMS countries *inter alia* use corporate taxation as an instrument to attract FDI will also increase.

2.2.2 The Share of Greenfield FDI in Total FDI

There are two main channels of FDI in the CEE-NMS: either through mergers and acquisitions of existing firms (M&A or brownfield FDI, including privatisation) or through establishing a new firm (greenfield FDI). According to Lankes and Wes (1999) the proportion of greenfield FDI to M&A is approximately 50% if the number of manufacturing investment projects is considered. Yet, the proportion of greenfield FDI to total FDI is considerably lower in terms of the actual amount of FDI or in employment terms – approximately 25% to 33% according to several authors (Lankes and Wes, 2001, Antalóczy and Sass, 2001, Zemplerová and Jarolím, 2001).⁹ Greenfield FDI is expected to be more responsive to tax rate changes than acquisitions, where the location of the target object is given. Since a major part of M&As in the CEE-NMS was due to privatization and the number of privatization objects decreases over time, the proportion of greenfield FDI will

⁹ It should be mentioned, however, that the distinction between greenfield FDI and M&A is somewhat artificial, as the latter do not differ from the former in many cases, if the acquired firm has been totally restructured.

increase. This may raise the importance of corporate taxation as a determinant of FDI.

2.2.3 Maturity of FDI

The profitability of affiliates in CEE-NMS is related to their age. For example, Dell'mour (2003) reports for Austrian FDI in the CEE-NMS that the profitability of affiliates, which existed for five or more years, is significantly higher (7.3% median value) than for younger affiliates (2.7%) (see also Altzinger, 2003). Since FDI in today's CEE-NMS generally were not possible before 1989, the foreign affiliates are mostly young firms. The increase of the profitability over time might lead to a change in the financing of the affiliate abroad. The parent company might increasingly rely on reinvested profits rather than on own capital transfers and thus through the interaction of home and host country legislation, taxation becomes a more prominent determinant of FDI.

2.2.4 Small Country Property

With respect to tax policy, the probability that small countries engage in tax competition is higher than for larger countries. This argument is based upon theoretical considerations by Bucovetsky and Wilson (1991) and Wilson (1999), who find that small countries engaging in tax competition might receive net welfare gains from lowering taxes. Related to this Krogstrup (2003) argues that larger countries are less sensitive to tax competition as their agglomeration advantages allow them to set higher taxes than smaller countries. These arguments suggest that the CEE-NMS might find it beneficial to lower their tax rates further, since with the exception of Poland the CEE-NMS are small to medium-sized countries.

2.2.5 Strong Preference of CEE-NMS for FDI

With the start of the transition process FDI was considered to be one of the main vehicles to accelerate economic development in the CEE-NMS. Besides compensating for the lack of domestic investment, the role of FDI was to facilitate restructuring via transferring technology and know-how, removing inefficiencies etc. Though the restructuring aspects might have lost importance over the years, the possibility that FDI generate employment and growth still induces a high preference for foreign capital in CEE-NMS. This might have become even more important, through the recent EU-accession, because of a facilitated access to the EU Common Market and an induced growth of political stability. The high preference for FDI makes CEE-NMS' governments especially prone to tax cuts as a means to attract FDI.

Based upon this FDI related peculiarities of the CEE-NMS we expect the tax rate elasticities to be larger in absolute value in CEE-NMS compared to those of OECD countries. However there also exist several arguments against the existence of a close correlation between taxes and FDI (based on Büttner, 2001). Since the mobility of firms is limited, few re-locations or shifts of profits to low tax countries should occur in the short term due to tax (rate) changes. Therefore, quick success of tax-lowering strategies is not to be expected. A (debated) indication is the fact that despite generally lower tax rates, corporate tax income as percentage of GDP has risen in European countries on average.

2.2.6 Recent Studies on Taxation and FDI

Building on the meta-analysis by DeMooij and Ederveen (2003) reported above, we add and review the following papers (table 1, column 1 and 2)¹⁰:

Table 1: Recent Studies on Taxation and FDI by Country Group

<i>Eastern Europe</i>	<i>Periphery Countries</i>	<i>Core countries</i>
Alfano (2004)	Mintz and Tsiopoulos (1994)	Beaulieu, McKenzie and Wen (2004)
Beyer (2002a)		Benassy-Quere, Fontange and Lahreche-Revil (2003)
Carstensen and Toubal (2004)		Desai, Foley and Hines (2004)
Edmiston, Mudd and Valev (2003)		Hansson and Olafsdotter (2004)
Javorcik (2004)		

For reaching at comparable elasticities a standardisation of different types of elasticities reported in empirical studies (see DeMooij and Ederveen 2001, Appendix) is warranted:

$$\varepsilon = \frac{\partial \ln K}{\partial \ln t}, \text{ the tax elasticity (1)}$$

$$\varepsilon_s = \frac{\partial \ln K}{\partial t}, \text{ the tax rate elasticity or semi-elasticity (2)}$$

$$\varepsilon_a = -\frac{\partial \ln K}{\partial t}(1-t), \text{ the elasticity of the after-tax rate of return (3)}$$

¹⁰ Here, only the results for the CEE-NMS and periphery countries are reported.

$$\varepsilon_s = \frac{\varepsilon}{t} = -\frac{\varepsilon_a}{(1-t)}, \text{ describes how these elasticities are inter-related (4)}$$

K ... measure of foreign capital, t ... tax on K in the foreign country

As some of the studies mentioned in table 1, column 1 and 2 used a specification in levels the following transformation was additionally made:

$$K = a + b * t \quad (5)$$

The *b*-coefficient was transformed into a semi-elasticity by $(100 * b) / K$ where K was evaluated at its sample mean value, which is either directly provided in the studies or is derived from the information provided there.

On the basis of these six empirical studies¹¹ a tax rate elasticity of -0.22 (median value, semi-elasticity) was derived. Clearly, this tax rate elasticity with respect to FDI is smaller in absolute terms in CEE-NMS than in the core countries reported above. This is contrary to our expectations. However, these results are questioned for several reasons:

- methodological shortcomings of the surveyed studies, especially an omitted variable bias as only few studies base their choice of right-hand side variables explicitly on economic theory (notably Carstensen and Toubal, 2004)¹²
- the definition of MNC real activity and
- the lack of a suitable measure of the corporate tax burden.

In this paper we concentrate on the last two issues.

2.3 Measuring Corporate Tax Burden and FDI

This section discusses three features which are of particular importance in deriving tax rate elasticities: first, how to measure company tax burden appropriately, second, how to measure MNC real activity and third, to what extent these two points are interrelated.

¹¹ Several other studies on location choice of MNCs in CEE-NMS (see, e.g. Janicky and Wunnava, 2004) and on taxation in CEE-NMS have been published recently (see, e.g. Dobrinsky, 2003), yet these studies do not combine the aspects of taxation and FDI, which is a serious shortcoming, if location choice is to be explained.

¹² Other methodological shortcomings in one or more of these studies include: static panel data models instead of dynamic models (omitted variable bias) and endogeneity between the endogenous variable and the measure of tax burden used (simultaneity bias).

2.3.1 Measurement of Corporate Tax Burden

Which measures of tax burden should be used in empirical analysis as a determinant of FDI? In order to answer this question, it is split into two sub-questions:

- (i) Which measures of tax burden are available in general?

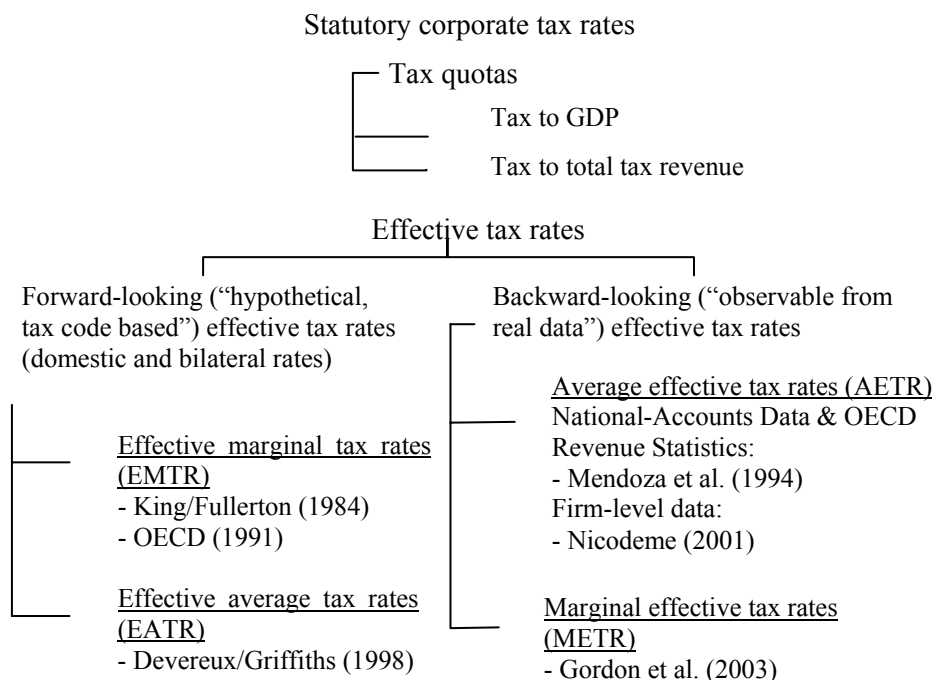
Apart from the statutory corporate tax rates (STRs) and tax quotas the measures of tax burden may be split into backward-looking and forward-looking tax rates on the one hand and marginal and average rates on the other hand (see chart 1).¹³ Each of these measures has advantages and disadvantages. Clearly, the choice of the measure of tax burden should be guided by the underlying research question, in our case the sensitivity of FDI to changes in the tax burden. It should be evident that STRs and tax quotas are no good choice if one wants to examine the tax burden levied upon FDI as these measures do not capture the tax base (STRs) or do so only in an insufficient way (tax quotas). Moreover, backward-looking tax rates are inappropriate, since profits from national and international activities cannot be disentangled and backward-looking rates can be seriously flawed due to data problems. Notably, National Accounts Data do not provide reliable data on corporate profits. Advantages of backward-looking tax rates are that they are easily calculated from real data and include tax planning activities of MNCs.

Forward-looking effective tax rates (ETRs) on the other hand focus on hypothetical (“future”) investments and *inter alia* carry three conceptual advantages for analyzing taxation and FDI: (i) They distinguish between domestic and international investments (domestic vs. bilateral rates). (ii) They are calculated as either effective average tax rates (EATR), measuring the tax burden of an infra-marginal (i.e. profitable) investment or as effective marginal tax rates (EMTRs), measuring the tax burden of an investment which just covers the cost of capital. (iii) They are suited to study FDI decisions of an MNC, which are “forward-looking”, too. Disadvantages are the relatively high degree of complexity in the calculation of these rates – the net present value of a hypothetical investment has to be calculated with and without taxation – and the fact that tax planning activities of MNCs cannot be addressed with those rates.¹⁴

¹³ Chart 1 shows only seminal papers as references.

¹⁴ For a detailed description of advantages and disadvantages of these rates consult *inter alia* OECD (2000) or Leibrecht and Römisch (2002).

Chart 1: Tax Burden Measures



(ii) Which forward-looking measures are appropriate?

In order to answer the second question, we start from a description of the investment decision by an MNC, following Devereux and Griffith (2003; 2002; and 1998). According to Devereux and Griffith as well as the established literature on MNCs, the investment decision should be split into three levels:

- “Level 1” is concerned with the discrimination between different types of market servicing, most importantly whether to produce at home or abroad via FDI.¹⁵
- “Level 2” includes the decision where to locate (where to invest), given that level 1 resulted in the decision to invest abroad. Level 2 thus

¹⁵ Here, we are not concerned with the choice between FDI and other types of foreign market servicing, since our dependent variable is some measure of FDI or the activity of an MNC in a host country. Thus, we take the MNC as given. Needless to mention, the first decision level in Table 2 below is explained by the OLI paradigm.

comprises *discrete* investment decisions (all-or-nothing, Mutti and Grubert 2004, p. 342).

- “Level 3”: production is already in place and adjustment decisions are taken, i.e. expansion or downscaling of an existing investment abroad.

Table 2 summarises the three different decision levels described:

Table 2: Parent Company’s Decision Tree for FDI

	<i>MNC decision</i>	<i>Result</i>
<i>Level 1</i>	Domestic or Abroad	FDI or home production
<i>Level 2 conditionally upon FDI</i>	Where?	Choice of foreign location
<i>Level 3 conditionally upon location</i>	How much?	Scale of production abroad

Source: based on Devereux and Griffith (2002), p. 87.

The two forward looking ETRs mentioned under (i) above are directly related to level 2 and level 3 decisions in the following way: EATR is related to the decision where to locate (level 2), ranking the locations according to the after-tax profitability. EMTRs explain the optimal scaling of an investment (level 3), conditional on the choice of location (Devereux and Griffith, 2003, p. 108).

The conclusions from the foregoing discussion for the analysis of FDI and taxation are:

- From a conceptual point of view ETRs are superior to STRs as indicators of tax burden.
- When dealing with FDI ETRs need to be derived on a bilateral basis, which includes host and home country as well as inter- and supranational tax codes.
- When dealing with location decisions bilateral average effective rates (BEATRs) are appropriate.
- When dealing with scale decisions bilateral marginal effective tax rates are appropriate.
- EATR and EMTRs should ideally be used in empirical studies, if the dependent variable is a measure of *aggregate FDI data*.

The last conclusion merits a short explanation: Ideally, one would have separate data on “level 2” decisions and on “level 3” decisions. However, in most cases only aggregate FDI data are available. These data typically do not allow a separation of FDI into new FDI and expansionary FDI.¹⁶ Therefore, aggregate FDI measures

¹⁶ Empirically this problem of non-separability of certain types of FDI data is mitigated by the fact that the semi-elasticities do not differ significantly between studies separating or not separating these two types of FDI (DeMooij and Ederveen (2001, p. 32).

should be related to both, average and marginal effective tax rates, the former explaining new FDI (where to locate) and the latter explaining expansionary FDI (the scaling of the investment; Devereux and Griffith 1998, p. 344). Virtually all studies reviewed above use only one single measure of tax burden – most of them the STR –, despite the fact that almost all of these studies use aggregate FDI data. Most studies do not even comment on the suitability of the STR or argue that these rates and average effective tax rates behave similar empirically (e.g., Javorcik 2004).

In section 3 it will be shown that using the STR is likely to result in biased estimates of tax rate elasticities of the *location choice* of MNCs. This is simply done by comparing the level and variability of BEATRs¹⁷ with that of the STRs.

2.3.2 The Measurement of Multinational Activity

Despite of several official and internationally agreed definitions of FDI, the choice of the appropriate indicator in empirical research is a difficult task and no commonly agreed measure exists (e.g. Bellak 1998, 1999). Here, the advantages and disadvantages of several commonly used measures are discussed briefly (see also Devereux and Griffith 2002, p. 84f.).

FDI-flows and -stocks as a measure of real multinational activity: FDI-flow and -stock data can be obtained from international databases like UNCTAD, EUROSTAT¹⁸ or OECD. These data have been used in many empirical studies on taxation and FDI for the simple reason of data availability as they have the advantage of covering a broad range of countries and time. However these data should be used with caution:

FDI-flows may reflect only net cross-border capital flows between parent company and the subsidiary and thus exclude reinvested earnings (a problem which was particularly relevant for several Central and Eastern European countries during the early years of transition). Furthermore they may include reinvested earnings of the affiliate, which, by definition, do not cross borders, but constitute an important share of capital invested in many cases (Bellak 1998). For an insightful report, see the Magyar Nemzeti Bank (2004).

FDI stock data are either built from accumulated FDI-flows taken from the annual balance of payments (Eurostat, 2003), in which case the annual differences in stocks (i.e. FDI position data; e.g. Gorter and Parikh, 2003, p. 197) equal the

¹⁷ Since we are concerned with location decisions in this paper, we do not show EMTRs, which we have calculated for the same range of countries and period, yet which refer to “level 3” decisions.

¹⁸ Gorter and Parikh (2003, p. 197), report that Eurostat constructs end of period positions and adjusts this information by correcting for inflation, exchange rate changes as well as for the revaluation of the assets and liabilities. An end of period position should thus represent the market value of the capital stock at current prices at exchange rates.

flows; or they reflect book-values, in which case the annual flows from the balance of payments may be larger or smaller than differences in annual stocks. This is due to valuation issues and the share of locally raised funds, which are not included in the balance of payments definition of FDI issued by the IMF manual. FDI stocks are ideally measured in book values, originating from company accounts. They are closer to measures of real activities than FDI-flows as they measure the capital stock which by definition in the simplified balance sheet includes real and financial assets. FDI stock data suffer, however, from the valuation at historical values, which “can be especially misleading when there has been significant inflation in some countries but not in others” (Mutti, 2003). Yet, FDI stock data carry the advantage that local borrowing in the host country is included. For a more detailed discussion and the empirical relevance of the valuation problem, see Cantwell and Bellak (1998); and Bellak and Cantwell (2004).

Among the measures thought to better reflect real activities of MNCs, the following are the most widely used measures:

Plant, property and equipment (PPE): These are referred to as “fixed assets”. In other words, they are a firm’s real estate, buildings, machines, factories etc. and consist of physical assets. They are carried in the balance sheet as cost, regardless of their actual value, which is the main critique to the use of PPE as reflecting the real activities of MNCs. Even if intangible assets are also carried in the balance sheet, they should be excluded as measures of real activities, since their valuation is largely meaningless. (Rather, the profit and loss account (income statement) gives an insight into the “real” value of intangibles.)

Differently from FDI stocks which reflect book values of ownership claims of controlling foreign investors (debit side of balance sheet) and thus exclude equity supplied by host country investors, PPE reflect book values of real productive assets. As Hines (1996b, p. 11) states: “PPE probably more closely corresponds to capital that enters production functions.” PPEs thus exclude those components of FDI, which are financial investments. The advantage, therefore, is to exclude differences in the behaviour of real and financial assets (e.g. degree of volatility), which are well known from studies comparing portfolio investment vs. FDI. However, these measures suffer from three disadvantages, related to the valuation of capital stock, i.e. exchange rate fluctuations, inflation and the exclusion of intangible assets.

Gross product of affiliates (GPA): This measure is available almost exclusively for the U.S.A. (although other countries like Germany have similar data on sales of affiliates). Gross product is derived from financial and operating data. GPA measures the value of goods and services produced by MNCs. The measure thus differs from “sales”, because sales include the inputs that the company purchases from outsiders as well as what it produces itself. Sales therefore have a drawback, since they may lead to overestimations of the real activity of MNCs in the host country. On the other hand, the drawback of GPA as reported in the BEA (Bureau

of Economic Analysis) statistics is that it does not allow inclusion of industry detail or different types of affiliate ownership.

Number of affiliates (NOA): For several countries, the number of newly established affiliates annually is available. The use of count data has several methodological implications for empirical analysis. The main advantage of this measure is that it addresses the issue of firm location more directly than FDI-flow studies (Beaulieu et al. 2004, p. 7). Also, new foreign firms may be related to the entrepreneurial activity in the host country on the whole. A certain drawback is that this measure excludes expansionary investment, yet the question is whether location choice for new investments and location choice for expansionary investments can be expected to follow the same logic. But the exclusion of expansionary investments implies, too, that there is only one measure of tax burden necessary, namely the BEATR.

The discussion shows that from a conceptual point of view PPE data represent real multinational activity best. Due to data restrictions many studies rely upon FDI-flows or -stocks. As most of the studies in column 1 and 2 of table 1 use aggregate FDI-flow or -stock data, the calculated median tax rate elasticity hence must be interpreted cautionary with respect to the impact taxation in the heterogeneous country group has upon *real* activity of foreign MNCs.

Moreover it should be mentioned that even FDI-flow and -stock data may (partly) not be available for a range of countries. One way to overcome the lack of data in this respect is to use mirror statistics, i.e. the outward FDI originating in the home country, if outward FDI is classified by host countries. But one has to be aware that there exist substantial differences between data reported by home and host countries.

3. Effective Average Tax Rates in CEE-NMS

In this section it will be shown that the usage of STRs is likely to result in biased estimates of tax rate elasticities of new FDI. This is done through a comparison of the variability of the STR and that of the conceptually superior BEATRs.

The variability of the tax rates is considered here, because it matters in an econometric estimation, rather than the absolute value of the regressor. Our prior is that replacing the conceptually appropriate effective tax rates by the STR, which is easily available, is only justified, if the variability in the STRs is not statistically different from that of the BEATR.

We calculated forward-looking ETRs based upon the Devereux and Griffith methodology as no such data have been available so far concerning the CEE-NMS. This amounts to 423 single effective average tax rates (domestic and bilateral) for seven home and five host countries for the time period 1996 to 2004.

3.1 Assumptions

Following Devereux and Griffith (1998 and 2003)¹⁹ we do not consider personal income taxes as for MNCs the majority shareholder²⁰ is not known and/or she may not have the majority vote amongst shareholders and, more importantly, because we do not believe that for the managers of the MNCs the personal income tax position of the shareholders is an important factor for location decisions. We also exclude any other fiscal or non-fiscal incentives which might be provided to MNCs. In line with other studies (e.g. Yoo 2003; Devereux and Griffith 2003), the assumptions and parameters used in our calculation of ETRs are the following:

- 3 types of assets (machinery, building and inventory in the manufacturing sector)
- 3 ways of financing a hypothetical domestic investment of 1 with a pre-tax financial return of 20%²¹: retained earnings, new equity and debt
- 7 ways of financing a cross border investment of 1 with a pre-tax financial return of 20%: (i) retained earnings subsidiary; (ii) new equity subsidiary and retained earnings parent; (iii) debt subsidiary and retained earnings parent; (iv) new equity subsidiary and new equity parent; (v) debt subsidiary and debt parent; (vi) new equity subsidiary and debt parent; (vii) debt subsidiary and new equity parent.
- economic depreciation rates of the various assets: 3.61% for buildings, 12.25% for machinery, 0% for inventory
- nominal interest rate of 7.625%
- common inflation rate of 2.5% and constant nominal exchange rate
- a weighted average structure of assets (buildings / machinery / inventory) of 55% / 35% / 10%
- a weighted average structure across the various types of financing (retained earnings / equity / debt): 55 / 10 / 35 for parent and 1/3 / 1/3 / 1/3 for subsidiary.

Our assumptions about the asset structure differ from those of other studies, which mainly follow OECD (1991), because data on inventories in the CEE-NMS show

¹⁹ The model allows deriving effective tax rates for an average firm. Two limitations should be emphasized: First, effective tax rates are derived upon a fixed pre-tax profitability (see below) and second, profits are assumed to be equal in each location. Despite both limitations are clearly not given *in praxi*, the advantage is to better isolate the effects of changes in effective tax rates (*ceteris paribus*).

²⁰ This is the person who determines the return required on each asset. Her personal sphere needs to be considered in the calculation of “shareholder-level-EATRs” (see Devereux, 2003).

²¹ In the appendix we show how the bilateral effective average tax rates depend on this assumption.

that they are far less important than within the OECD in 1991. In particular, we assign a higher weight to investment in buildings.²²

3.2 Data Description and Analysis

3.2.1 Statutory Corporate Tax Rates and Domestic Effective Average Tax Rates

We start from a simple comparison of overall STRs and domestic effective average rates (DEATRs). The “overall” STRs (that is including local and central government profit taxes) reported in table 3 and 4 suggest that all host countries but Slovenia face a fall in the overall STR over the period under consideration. In Slovenia the rate remained constant. With respect to the home countries only Germany and Italy see a remarkable fall in the STR. These two countries show by far the highest STR in 1996. Furthermore, while in 1996 three host countries had higher STRs than the average rate of 37.6%, all of them have below average rates (average of 29.6%) in 2004. The largest drop occurred in Slovakia and Poland within host countries and Germany within home countries, respectively. No changes in the overall STR occurred in Austria, the U.S.A. and as mentioned in Slovenia.

²² For explanatory notes about other assumptions consult the respective studies directly.

Table 3: Overall Statutory Corporate Tax Rates 1996–2004, CEEC-5, (in %)

	CZ	HU	PL	SK	SI
1996	39.0	19.00	40.0	40.0	25.0
1997	35.0	19.00	36.0	40.0	25.0
1998	35.0	19.14	36.0	40.0	25.0
1999	35.0	19.40	34.0	40.0	25.0
2000	31.0	19.64	30.0	29.0	25.0
2001	31.0	19.64	28.0	29.0	25.0
2002	31.0	19.64	28.0	25.0	25.0
2003	31.0	19.64	27.0	25.0	25.0
2004	28.0	17.66	19.0	19.0	25.0

Source: KPMG (1996–2004) authors' calculations.

Table 4: Overall Statutory Corporate Tax Rates 1996–2004, Home Countries, (in %)

	AUT	FR	GER	NL	UK	USA	IT
1996	34.0	36.7	57.40	35.0	33.0	40.0	52.20
1997	34.0	36.7	57.40	35.0	31.0	40.0	53.20
1998	34.0	41.7	56.70	35.0	31.0	40.0	41.30
1999	34.0	40.0	52.30	35.0	31.0	40.0	41.30
2000	34.0	36.6	51.85	35.0	31.0	40.0	41.25
2001	34.0	35.3	38.67	35.0	30.0	40.0	40.25
2002	34.0	34.3	38.67	34.5	30.0	40.0	40.25
2003	34.0	34.3	39.58	34.5	30.0	40.0	38.25
2004	34.0	34.3	38.67	34.5	30.0	40.0	37.25

Source: KPMG (1996–2004), authors' calculations.

Turning to DEATRs, that is ETRs which cover the host country tax code (STR as well as allowances) only, one observes a similar development as for the overall STR (tables 5 and 6). The DEATR fell in almost all countries. In the U.S.A. there was no change due to a constant overall STR and constant allowances. In Austria and Slovenia there was a slight increase due to a change in allowances combined with a constant overall STR. One may conclude that the development of the DEATR and the overall STR are very similar. This is not surprising as the DEATR usually is more sensitive to changes in the overall STR than to changes in allowances (e.g. Devereux and Griffith 2002).

Table 5: DEATRs 1996–2004 (Selected Years, in %)

	CZ	HU	PL	SK	SI	AUT	FR	GER	NL	UK	USA	IT
2004	24.5	13.6	17.9	16.3	20.5	26.8	26.8	31.1	29.2	24.9	32.9	29.6
2002	27.1	15.7	26.4	22.9	19.2	26.8	26.8	32.8	29.2	24.9	32.9	32.0
2000	27.1	15.7	28.3	26.6	19.2	26.4	28.4	41.6	29.7	24.9	32.9	32.8
1998	32.2	15.3	34.0	36.7	19.2	26.4	32.4	45.6	29.7	25.7	32.9	32.8
1996	35.9	15.2	37.8	36.9	19.2	26.4	28.5	46.1	29.7	27.4	32.9	41.5

Source: Authors' calculations.

It is important to note that tables 3 to 5 show large differences in the levels of the overall STRs and the DEATRs. This is explained by the fact that the tax base matters for the calculation of a valid indicator of the tax burden levied upon corporate profits. The STR may thus be misleading. For example, the STR for Germany is above 55% in 1996, but the DEATR is below 50%.

From these two tables a country ranking of the level of the tax burden levied upon corporate profits is easily deduced.

Table 6: Country Ranking 1996 and 2004

Rank	STR 1996	DEATR 1996	STR 2004	DEATR 2004
1	HU	HU	HU	HU
2	SI	SI	PL, SK	SK
3	UK	AUT	.	PL
4	AUT	UK	SI	SI
5	NL	FR	CZ	CZ
6	FR	NL	UK	UK
7	CZ	USA	AUT	FR
8	PL, SK, USA	CZ	FR	AUT
9	.	SK	NL	NL
10	.	PL	GER	IT
11	IT	IT	IT	GER
12	GER	GER	USA	USA

Source: Authors' calculations.

Table 6 shows that despite the level differences, the ranking of countries is almost independent of the indicator (STR or DEATR). It also shows that the CEE-NMS lowered their tax burden levied upon profits much more than the home countries. Especially Slovakia and Poland improved in the ranking between 1996 and 2004. Furthermore it is evident that the Czech Republic lost grounds within the CEE-

NMS. To conclude, despite the differences in absolute levels one may well use the overall STR if the aim is a simple ranking of countries.

Yet, as mentioned before, for an econometric estimation of tax rate elasticities the variability of the indicator of tax burden is more important than the absolute level of the indicator. Therefore, the standard deviations (STD) of the various rates are compared (table 7).

Table 7: Standard Deviations I (1996–2004)

Country	STD STR	STD DEATR
	percentage points	percentage points
CZ	3.33	3.61
HU	0.64	0.66
PL	6.31	5.97
SK	8.22	7.94
SI	0.00	0.55

Source: Authors' calculations.

The STDs reveal that the variability in the overall STR and the DEATR are similar for most countries.²³ Yet, as has been mentioned already the DEATR is not the relevant rate for an analysis of the response of FDI to changes in the tax burden, rather the STR has to be compared to the BEATR, which will be described in the following subsection.

3.2.2 Statutory Corporate Tax Rates and Bilateral Effective Tax Rates

The crucial point here is that in case of FDI and MNCs one has to consider the international tax code (double taxation agreements, supranational agreements as the parent-subsidiary directive) and the tax code of the home country (home country corporate income tax rate) in addition to the host country tax system. In order to answer the question whether STRs can be used for estimations of tax rate elasticities we now compare its variability to those of the BEATR. Table 8 shows the BEATRs for the seven home countries and Slovenia.

²³ Testing the null hypothesis of equal variability using the median-version of the Levene-Test (e.g. Eckstein, 2000) gives p-values above 20 percent for each country.

Table 8: BEATRs with Slovenia

	AUT	FR	GER	IT	NL	UK	USA	SI (STR)
Year				%				
2004	18.3	19.5	19.7	18.4	18.3	22.8	32.5	25.0
2003	21.8	23.0	30.3	25.4	21.8	22.8	32.5	25.0
2002	18.9	20.1	27.7	22.7	18.9	19.9	30.0	25.0
2001	18.9	20.2	27.7	22.7	18.9	19.9	30.0	25.0
2000	18.9	20.3	28.6	22.7	18.9	19.9	30.0	25.0
1999	18.9	20.5	28.7	22.7	18.9	19.9	30.0	25.0
1998	26.1	20.6	26.9	22.7	18.9	20.9	30.0	25.0
1997	26.1	20.3	27.0	23.1	18.9	20.9	30.0	25.0
1996	26.1	20.3	27.0	23.1	18.9	22.9	30.0	25.0

Source: Authors' calculations.

Table 8 shows that the levels of BEATRs are different from the level of the STR (25%). Also, a substantial drop in almost all bilateral rates occurred. An exception is the BEATR for the U.S.A.-Slovenia country pair, which increased slightly. This increase is due to the constant overall STR in the U.S.A. and in Slovenia compared with constant allowances in the U.S.A. and a change in allowances in Slovenia (in 2003). The exceptional increase in 2003 and the subsequent fall in 2004 are due to a remarkable reduction of allowances in Slovenia and the adoption of the parent-subsidiary directive in 2004, which reduces the BEATRs for countries which apply the exemption method.²⁴

Concerning other BEATRs not shown here, Slovakia had the highest BEATR vis-à-vis all home countries in 1996 (the first year of examination). Hungary (vis-à-vis two) and Slovenia (vis-à-vis five) home countries had the lowest BEATRs. In 2004 the Czech Republic has the highest BEATR vis-à-vis all home countries and again Hungary and Slovenia the lowest. Now Hungary has the lowest rate vis-à-vis five and Slovenia vis-à-vis two home countries. Hungary and Slovenia changed ranks. Why Hungary does not have the lowest rate vis-à-vis the UK and the USA is explained by the credit system combined with a relatively low overall STR. The resulting tax on dividends is therefore higher for dividends from Hungary than from Slovenia.

A comparison of the average BEATR (averaged across home countries) vis-à-vis each single host country for the years 1996 and 2004 shows that in 1996 the host country with the lowest average BEATR is Slovenia, followed by Hungary, Poland, the Czech Republic and Slovakia (table 9). The STD is about 9.4

²⁴ For this reason, the development is different in the UK and the U.S.A., two countries which apply the credit system.

percentage points (pp) in 1996. Until 2004 the ranking has changed: Hungary is in first place, Slovenia in second, Poland remains in third, Slovakia is in fourth and the Czech Republic in fifth place. In 2004 the STD is much lower than in 1996, thus the CEE-NMS-5 converged substantially in BEATRs (see chart 2). This convergence of the BEATRs suggests that the CEE-NMS engage in tax competition among each other and not only vis-à-vis the old EU Member States. The largest drop in the average bilateral rate occurred in Slovakia and Poland. The smallest drop occurred in Slovenia, but Slovenia had relatively low STRs and BEATRs throughout the period 1996–2004.

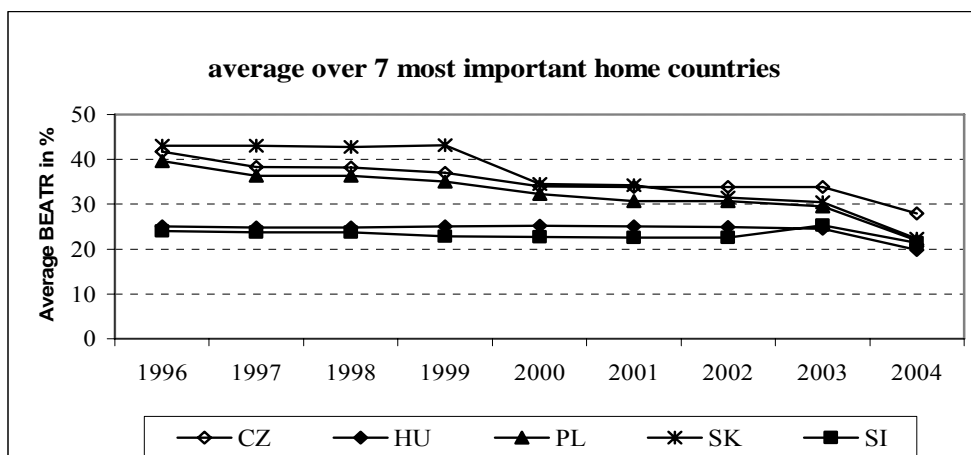
Moreover, the ranking within the CEE-NMS is different to the ranking by the STR and the DEATR. With respect to the BEATR Hungary is the most tax favourable host country and the Czech Republic is the least favourable host country in 2004. On a bilateral basis Slovenia is more favourable than Slovakia and Poland in 1996 and 2004 which is an important difference to the ranking resulting from STRs or DEATRs.

Table 9: BEATRs 1996–2004 (in %)

	CZ	HU	PL	SK	SI
2004	27.97	19.76	21.92	22.25	21.34
2003	33.86	24.52	29.59	30.49	25.36
2002	33.87	25.00	30.74	31.44	22.59
2001	33.88	25.02	30.76	34.20	22.60
2000	34.02	25.17	32.26	34.47	22.75
1999	36.96	25.05	35.07	43.13	22.79
1998	38.25	24.82	36.33	42.78	23.74
1997	38.27	24.76	36.35	43.11	23.75
1996	41.68	25.02	39.69	43.09	24.04
	change –13.71 pp	change –5.27 pp	change –17.77 pp	change –20.84 pp	change –2.70 pp
	STD 2004 3.12 pp			STD 1996 9.37 pp	

Source: Authors' calculations.

Chart 2: Convergence in BEATRs 1996–2004



Source: Authors' calculations.

BEATRs are surely better indicators of the tax burden faced by MNCs than STRs. Yet, if their variability is the same as those of the STRs one could also use the latter in an econometric specification. This, however, need not be the case, notably for host countries with relatively stable STRs. For a particular country pair Austria – Slovenia, table 10 shows that the variability of the BEATR is much higher than those of the STR (which in this extreme case is zero).²⁵ This is because BEATRs cover all important tax codes and hence include more potential sources of variability than the DEATRs and STRs. For the bilateral relationship Austria – Slovenia the main sources of variability are the adoption of the double taxation agreement which entered into force 1999, the changes in allowances in Austria from 2001 and in Slovenia from 2003 onwards as well as the adoption of the parent-subsidiary directive in 2004 by Slovenia. It is important to note that the calculated variability is high despite both countries have constant STRs during the sample period. Note also that one may find several other country pairs with quite different STDs in the BEATRs and the STRs (e.g. Germany-Slovenia (2.98 pp vs. 0.0 pp); Austria-Hungary (3.02 pp vs. 0.65 pp), Italy-Hungary (3.10 pp vs. 0.65 pp)).²⁶

²⁵ In the case of the DEATRs both the STR and DEATR series had no or a very low variability.

²⁶ Using the Levene-Test again we reject the hypotheses of equal variances for several country pairs (e.g. AUT-SI, GER-SI, U.S.A.-SK).

Table 10: Standard Deviations II (1996–2004)

	BEATR AUT-SI	SI STR
Year	%	%
2004	18.28	25.00
2003	21.77	25.00
2002	18.85	25.00
2001	18.85	25.00
2000	18.85	25.00
1999	18.85	25.00
1998	26.12	25.00
1997	26.12	25.00
1996	26.12	25.00
	Percentage points	Percentage points
STD	3.58	0.00

Source: Authors' calculations.

4. Summary and Further Steps

The purpose of this paper was to discuss the appropriateness of measures of tax burden as a factor explaining the location decisions of MNCs. First, on the basis of a survey of six empirical studies a median value of the tax rate elasticities of FDI of -0.22 in CEE-NMS and Mediterranean periphery countries was derived. Second, building on our criticism of FDI-flows or -stocks as a measure reflecting real multinational activity and of the STR as a measure of corporate tax burden, we present EATRs for seven home and five host countries.

Our descriptive data analysis shows:

1. ETRs are warranted as a measure of the tax burden levied upon capital, whereas the STR may be very misleading.
2. BEATRs are better indicators of the tax burden on new FDI than DEATRs or STRs.
3. Empirical estimates of tax rate elasticities of new FDI should be based on BEATRs, which usually have a different variability than STRs and DEATRs. This is in marked contrast to authors who argue that the differences between the STRs and EATRs are negligible (e.g. Javorcik, 2004). However, such a comparison is flawed, since the host country's STR must not be compared to the host country's DEATR, but to the host country's BEATR.
4. As no study has used BEATRs for calculating tax rate elasticities of new FDI in the CEE-NMS so far, one should to be cautionary in deriving policy conclusions from the available elasticities (magnitude and sign). In principle at

least two relevant policy implications²⁷ may be derived from valid tax rate elasticities:

- If tax rate elasticities with respect to FDI are low, lowering corporate tax rates leads to a loss of tax revenues, without increasing the amount of inward FDI.
- If tax rate elasticities with respect to FDI are high, then either the “Leviathan” view (i.e. overprovision of public goods) or the traditional view (i.e. under provision of public goods) may be taken. In the first case, tax competition will be viewed favourably, in the second case, tax coordination or even harmonization will be preferred.

First results from a panel analysis show that using similar exogenous and endogenous variables as the studies listed in table 1 and using BEATRs instead of the STRs increase the estimated tax rate elasticities substantially. Depending on the model estimated the elasticities lie between -4 and -9 . But they probably suffer (in absolute values) from an upward omitted-variable bias as relevant location factors like the quality of public infrastructure have not yet been included. This last point suggests that economic theory should be used to select the other right-hand-variables in order to prevent an omitted-variable bias. Our reading of the literature and the empirical evidence that has been produced so far is that one has to include a large number of factors which may affect FDI besides taxes (e.g. Bernard et al. 2004; Bevan et al. 2004; Mudambi 2002). These factors include firm characteristics as well as home and host country characteristics, defined in relative terms on a bilateral level. The selection of these explanatory and control variables should be guided e.g. by the OLI-paradigm.

Moreover, as almost all studies listed in column 1 and 2 of table 1 rely upon aggregate FDI-flow or -stock data one has to be additionally careful in interpreting the available tax rate elasticities with respect to *real* multinational activity as FDI-flow and -stock data suffer from severe shortcomings in this respect. Hence, for further research we suggest using PPE data and bilateral ETRs instead of FDI-flow or -stock data and STRs when analysing the effects taxation has upon FDI to the CEE-NMS.

²⁷ Since the tax elasticities have been derived under the *ceteris paribus* condition, a caveat seems to be in order here: (a) If despite the tax rate has been lowered, FDI does not react, this could be a sign of a high share of market-oriented FDI or that the tax burden accounts only for a small share in total costs concerning efficiency-oriented FDI. (b) If, despite the tax rate has been increased, FDI does not react this could be interpreted as MNCs engaging in transfer-pricing and like activities.

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6. Data Sources

- The main source for tax data are the European Tax Handbook (various years) of the International Bureau of Fiscal Documentation; KPMG's Corporate Tax Rate Surveys (various years); and Yoo (2003).
- Information about the asset structure in the CEE-NMS is taken from the Vienna Institute of International Comparative Studies' database.

7. Abbreviations

AETR	Average Effective Tax Rate
BEATR	Bilateral Effective Average Tax Rate
BEMTR	Bilateral Effective Marginal Tax Rate
CEE-NMS	Central and Eastern European New Member States
DEATR	Domestic Effective Average Tax Rate
EATR	Effective Average Tax Rate
EMTR	Effective Marginal Tax Rate
ETR	Effective Tax Rate
FDI	Foreign Direct Investment
GPA	Gross Product of Affiliates
METR	Marginal Effective Tax Rate
MNC	Multinational Company
NOA	Number Of Affiliates
PP	Percentage Points
PPE	Plant, Property and Equipment
STD	Standard Deviation
STR	Statutory Corporate Tax Rate

8. Appendix: Impact of the Pre-Tax Financial Return upon the Bilateral Effective Average Tax Rate

The calculation of forward looking ETRs using the Devereux-Griffith methodology requires several assumptions. One crucial assumption is the value of the fixed pre-tax financial return (p). Devereux and Griffith (1998, p. 29) show that in the absence of personal taxes on interest income and capital gains the BEATR approaches an adjusted STR with increasing p . Moreover they show that the BEATR increases with p if the bilateral EMTR is below the adjusted STR and decreases in the other case. The adjusted STR is thereby defined as²⁸:

$$t^{adjusted} = t_{host}^{Statutory} + tax_div * (1 - t_{host}^{Statutory}) \quad (6)$$

As an example the impact of changes in p upon the BEATR of FDI from Austria to Slovenia for the year 2003 is demonstrated. In 2003 the host country STR was 25% and the tax on repatriated dividends (tax_div) was 5%. Therefore the adjusted STR

²⁸ We additionally assume that their discrimination parameter between new equity and retained earnings is one. This is possible as we are excluding the personal sphere of the shareholder (see Yoo, 2003).

is 28.75%. As the BEMTR lies below this value,²⁹ the BEATR should increase with p .

Table 11: Effect of Increasing p on BEATR

p (%)	EATR (%)	p (%)	EATR (%)
5	0.84	80	27.01
10	14.79	90	27.20
20	21.77	100	27.35
30	24.10	1000	28.61
40	25.26	10000	28.73604
50	25.96	100000	28.74860
60	26.42	1000000	28.74986
70	26.76	10000000	28.74998

Table 11 shows that the BEATR indeed approaches the adjusted STR with increasing p .

²⁹ Due to generous allowances for investments in machinery this rate is very low.