The Impact of Implicit Rates on Corporate Tax Revenue in the EU Countries

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Abstract: The aim of this study is to determine whether in corporate income tax sphere exists the competition between states, which allows states with lower tax burdens to get higher tax revenues for the benefit of their budgets. The hypothesis is verified through a simple regression analysis using cross-sectional data for 17 EU countries in 2011. It has been found that the elasticity of the corporate income tax share in the GDP with respect to the implicit tax rate is 0.59 and the elasticity of corporate income tax per capita is 1.07%. Both elasticities are positive, what indicates that tax competition by reducing the effective taxation of corporations hasn’t been detected.

Key Words: Tax Competitiveness; Corporation Income Tax CIT; Implicit Tax Rate; Tax Revenue; Analysis; the European Union Countries.

Introduction

The aim of this study is to determine whether there is the competition between states concerning the tax on corporate profit, which allows states with lower tax burdens to get higher tax revenues for the benefit of their budgets. Tax competition means that states using the favourable tax policy expend efforts to attract mobile tax bases under their legislation, and thereby increase their tax revenues (tax incomes).

Usual empirical research of this relationship is implemented by using the statutory tax rates, alternatively using fictitious EATR (effective average tax rates, also called “tax wedge”) and EMTR (effective marginal tax rates, also called “tax wedge”) or actual microeconomic effective tax rates (for explanation of differences between fictitious and actual tax rates see

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1 The study is processed as an output of a research project “Fiskální opatření uplatňovaná v ČR v souvislosti s ekonomickou krizí a jejich sociálně ekonomické důsledky (realita a víze)”, registered by the University of Finance and Administration, Prague under the registration number 7752.
e.g. Kubátová et al.). If it is found that the tax revenue (or the total taxable income) is negatively dependent on the tax rate, it is concluded that the tax competition acts. The competition is also reconnoitered by using the relationship between the tax rates in neighbouring countries (or at lower administrative levels) and revenues or tax bases in the country which is examined.

The use of effective rates instead of statutory is based on the assumption that “favourable tax policy” is a function of several factors than only rates. Investors make decisions on the basis of a comprehensive assessment of taxes, having regard for the final tax burden. The tax burden depends not only on the tax rate, but on the determination of the tax base as well and aggregate it may be expressed precisely by using the effective tax rate. The so-called tax wedge is not effective tax rate according to the OECD methodology (which uses the methodology of King and Fullerton) as it was already mentioned, but it is a fictitious index working with assumptions about different variables determining taxation, particularly with assumptions about statutory tax rate, system of depreciation and amortization rates, capital structure, taxation system of individuals, the existing or non-existing integration of the corporate and individual taxes, the inflation rate and the method of calculation of the tax base (e.g. inventory valuation). It is clear that such indicator may namely provide the investors with an ex ante orientation concern the taxation in different countries, but may not correspond with the subsequent actual tax burden.

The option of the fictitious EATR is the actual effective tax rate derived from company statements as microeconomic data. Ex post indicator contains the reaction of the companies to the taxes and also i.e. absorbs intra corporate symptoms of international tax competition, because the companies optimize their tax burden by transferring the tax bases to countries with more favourable tax policy (e.g. using transfer pricing). This feature the ex ante indicator does not have because it is the theoretic-

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ical tax rate, which the companies cannot change with their behaviour (they can only change their resulting effective rate).

Concerning the results of the empirical research on the effect of tax rates on their yield, they are not definite, nor the assumptions about the negativity of the coefficients, they are not the law.

The authors often conclude that reducing tax rates does not lead to the desired growth of yields from them (e.g. Riedl and Rocha-Aakis, which used both, the statutory tax rates and EATR). Some authors moreover directly assume the positive reliance between tax rates and the revenues (Clausing, Devereux, and Říhová – all of them comprised the alternative statutory and effective rates). In this case, the primary subject of research is not the tax competition, but it is figuring out, which factors affect the tax revenue. The other “competition generating” factors are comprised to the regression equation than the tax rate in their own country, such as, for example, the tax rates in other countries, the competitiveness index, etc. A second power of rate is also included to check whether from a certain level of rate the revenue actually begins to descend according to the Laffer curve.

Some empirical studies, performed using aggregate data from OECD (Clausing, Brill and Hassett, and Devereux), show that the so-called Laff-
“forbidden zone” starts around 30% of the statutory rate. Till this value the elasticity of the corporate tax revenue is positive, above it is negative. Říhová also found that the square of the statutory rates is statistically important regressor, however the square of the effective rate is not.\(^8\)

Riedl and Rocha-Akis have on aggregated OECD data also found that the corporate tax base is negatively affected by the tax rate (and positively affected by the tax rates in neighbouring countries).\(^9\)

The sectored panel data allowed Gruber and Rauh to estimate the elasticity of the corporate tax due to a marginal tax rate in the positive extent of 0.2.\(^10\) In contrast, in the panel of macro economical data for Germany, Dwenger and Steiner estimated the elasticity of the tax base due to the average rate as negative.\(^11\)

The ambiguous empirical results (both positive and negative correlations and elasticity) may be related to the validity of the Laffer curve theory, respectively non monotonic curve, so to some level of the rate the revenue increases, but then the curve changes to descend. Then it depends on zone, in which the rate is saved in a particular case (whether it has already “swung” into the “forbidden zone” or not yet). Laffer curve counts among the factors decreasing the revenue when rate is growing up and tax emigration or moving the base of taxation to another jurisdiction follow. When there is strong influence of tax competition, we will probably expect the reverse bending of the curve from already small rates.


Data and methods

The empirical analysis is performed using the macroeconomic database of the Eurostat\textsuperscript{12} and the European Commission.\textsuperscript{13} The index numbers of corporation income tax as share in GDP are applied and corporate taxes per capita as the dependent variable and the index of so called implicit corporate tax rate (ITR) as a regressor.

ITR is annually monitoring effective ex post tax rate. The implicit tax rate from corporate income is an index of ratio the collected tax to the potential tax base, what is in this case the actual profit of corporations. This rate is not mentioned in the empirical analysis regarding the elasticity of corporate income tax, what is probably possible to ascribe to its more difficult utilization in econometric modelling. The rate is each year for each state only one, and because it is ascertained since 1995, up to now the time series has 17 data. Wherein, for more than a third of the EU countries the rate is not published at all, or the time series is incomplete. This, in contrast with the microeconomic rates (for each company) or fictitious (for financing and investing), means in order of magnitude or even in two orders of magnitude less data. Nevertheless, the econometric was invented just for those situations where the data is less and when we deduce from them a large file by the methods of mathematical statistics.

Data are cross-sectional with the values of 2011. ITR in 2011 is available in 17 EU countries, namely Belgium, Czech Republic, Estonia, France, Italy, Cyprus, Latvia, Lithuania, Hungary, the Netherlands, Austria, Poland, Slovenia, Slovakia, Finland, Sweden and the UK (in order as those listed in Tables tax statistics). ITR is also given for Norway – data for Norway and the available data of the CIT as share of GDP in Iceland we will comprise in the descriptive statistics, but not in the estimation of elasticity.

If there are any relationships between ITR and yields of corporate income taxes, it is possible to expect zero time delay of investors’ response on tax burden. The corporations optimize their tax and response immediately to adverse taxation by transfers of profits in a more favourable tax regime, which allows them i.e. their holding structure.


Calculations were performed by using software Excel (descriptive statistics) and Gretl (econometric estimation).

**Descriptive statistics**

In 2011, the average share (weighted arithmetic average) of corporate taxes on GDP was in the EU-27 2.5%, in 1995 the share of taxes in GDP was 2.4% and for most years was higher than these two extreme values. The average implicit tax rate in 25 EU countries with different variations decreased from an initial 21.6% in 1995 to 19.8% in 2011.\(^{14}\)

Graph 1 shows the corporate taxes as share of GDP for each country in 2011 (it contains also data for Norway and Iceland). It is seen that a very low taxation have the corporations in some post-communist countries, while high tax burden is in countries declared as tax heavens for corporations, in Nordic countries, but also in the Czech Republic.

Graph 1 Corporate Tax as Share of GDP in 2011 in 27 EU Countries, Norway and Iceland


The lowest implicit rates are in some post-communist countries and in the Netherlands (see Graph 2), while a surprisingly high rate has the

“tax heaven” Cyprus, but also the countries of continental Europe and once again the Czech Republic.

Graph 2 Implicit Corporation Tax Rates in the EU Countries,* Norway and Iceland in 2011

![Graph 2](image1)


Graph 3 Revenue of Corporation Income Tax Per Capita in the EU Countries, Norway and Iceland in 2011

![Graph 3](image2)

The revenues of corporation income tax per capita (see Graph 3) have in the EU countries considerable variability – from 83 to 1,460 EUR per year. Traditionally lowest are in poorer EU countries and high in “tax heavens” Luxembourg and Cyprus. The Nordic countries, especially Norway, show again high yields thanks to the traditionally strong fiscal discipline and high unified taxation.

**The estimating the elasticity of the corporate tax revenue due to the ITR**

Estimating of the elasticity of tax revenues with respect to the implicit tax rate is performed by using the regression equation:

\[ \frac{CIT}{GDP}_i = \alpha ITR^\beta + \varepsilon_i, \]  

where CIT/GDP\(_i\) respectively ITR\(_i\), \(i = 1, 2, \ldots, 17\) are the corporation income taxes as share in GDP respectively implicit tax rate in the \(i\)-th state and where the coefficient \(\beta\) of power function is estimated elasticity.

For purposes of estimating the equation (1) is converted to a linear form using the logarithmic function:

\[ \ln \left( \frac{CIT}{GDP}_i \right) = \ln \alpha + \beta \ln ITR_i + \varepsilon_i \]  

To remove a heteroscedasticity was used a model with robust standard errors (Huber-White standard errors) in relation to heteroscedasticity. For estimating results see Table 1.

Table 1 OLS Estimation, Using Observations 1-17 (17 EU Members in 2011, Dependent Variable CIT/GDP)*

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>St. deviation</th>
<th>t-statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>–0.754 516</td>
<td>0.243 448</td>
<td>–3.099</td>
<td>0.007 3***</td>
</tr>
<tr>
<td>(\ln ITR)</td>
<td>0.592 638</td>
<td>0.107 812</td>
<td>5.497</td>
<td>6.14e–05***</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.628 562</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted (R^2)</td>
<td>0.603 799</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Estonia, Ireland, Greece, Spain, Luxembourg, Malta, Portugal and Romania. Analysis carried out using Gretl.

The results of simple regression by using cross-sectional statistics confirm the influence of the implicit tax rate on the share of this tax in GDP in the EU member countries and the model explains entire 60 % variability of the share. Elasticity has a value of 0.59, thus it is a low elasticity; surprising is its positive value. The “favourable” tax environment policy, according to this analysis, does not lead, therefore, to the strengthening of corporate income tax revenue, but on the contrary. The policy of increased tax burden indicates in the EU member states the growth of tax revenue (which is also consciously used by the politicians to retain the public budgets).

Estimating the elasticity of tax revenues per capita, with regard to the implicit tax rate, is performed by using equation (3) analogous to equation (2):

\[
\ln \text{CIT per capita}_i = \ln \alpha + \beta \ln \text{ITR}_i + \epsilon_i, \text{ where}
\]

\( \text{CIT per capita}_i \) is corporate tax revenue per capita in 2011 in the countries \( i, i = 1, 2, \ldots, 17 \).

Table 2 OLS Estimation, Using Observations 1-17 (17 EU Members in 2011, Dependent Variable CIT Per Capita)*

<table>
<thead>
<tr>
<th>OLS Estimation, Using Observations 1-17 (17 EU Members in 2011, Dependent Variable CIT Per Capita)</th>
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<tbody>
<tr>
<td>Dependent variable: ( \ln \text{CIT per capita} ) (in EUR)</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>St. deviation</th>
<th>t-statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>3.278 26</td>
<td>0.628 990</td>
<td>5.212</td>
<td>0.000 1***</td>
</tr>
<tr>
<td>( \ln \text{ITR} )</td>
<td>1.072 82</td>
<td>0.233 521</td>
<td>4.594</td>
<td>0.000 4***</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.584 553</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted ( R^2 )</td>
<td>0.556 857</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( F(1, 15) )</td>
<td>21.105 72</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Corporate tax revenue per capita, in accordance with Table 2, is with the results of cross-sectional regression for 2011 affected by the implicit tax rate and the elasticity in this case is equal to 1.07. Even these data contradict the hypothesis about the impact of tax competition on tax revenues. The increase of the tax burden leads to growth of yields for public budgets and any mobility of tax bases to more favourable jurisdictions while tax is reducing is not therefore proved. The model explains the variability of CIT revenues per capita of 56%.

Conclusion

The study, by simple regression analysis using cross-sectional data for the year 2011 in 17 EU countries, for which the data are available, verified the hypothesis that the corporations in the EU countries respond to the increase of the tax burden through the transfer of their profits to other countries, respectively with reducing the effective tax the yields increase. The common data, used to identify this relationship, are either fictitious ex ante indicator of the tax wedge by OECD\textsuperscript{15} (which uses the methodology of King and Fullerton),\textsuperscript{16} or ex post actual microeconomic indicators from corporate databases.

In comparison with other authors, the macroeconomic data of actual ex post macroeconomic, so-called implicit tax rate according to the European Commission,\textsuperscript{17} were used in the analysis. The results showed that the tax competition by reducing the implicit tax rate does not act and that the reducing taxation will decrease the tax revenues as a share of GDP (with elasticity 0.59) as well as per capita (with elasticity 1.07). Both regression models, at the same time, explain about 60% variability of the dependent variable.

The results are consistent with the results of similar studies of other authors (Riedl and Rocha-Aakis, Clausing, Devereux, Říhová, and Gruber

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and Rauh);\(^{18}\) the other authors, on the other hand, have found a negative elasticity (Riedl and Rocha-Aakis, and Dwenger and Steiner).\(^{19}\)

**References**


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